

Mandible: Not a Royal Feast Nor A Dog's Bone

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Oral cavity is the surgical home of oral & maxillofacial surgeon. Mandible is the most prominent and integral bone in the facial skeleton and contributes to the esthetics of lower half of the face. Any deformity of the mandible or the dentition it holds, causes a significant change in its facial harmony. Ablative surgeries of mandible secondary to neoplasms and infections and post-traumatic defects needs a proper planning to maintain/bring back the facial macro and micro architecture. It's a great surgical challenge for maxillofacial reconstructive surgeon to bring the normal anatomical contour of the maxillofacial skeleton and improve the psychosocial wellbeing of the patient in the society. The current scenario has been changed. Mandible is being shared by other specialist surgeons like otolaryngologists, plastic and general surgeons. It has become like a dog's bone or rather a royal feast which other specialists want to share it and are indeed fighting for it. The basic principles to establish a functional occlusion by rehabilitation of a mandible is most important and often overlooked by other specialists because of less knowledge about it and an urge to earn more cash. Having a medical degree just doesn't mean they are eligible to encroach the area of maxillofacial skeleton.

Oral & maxillofacial surgeons are the legal authorized surgeons to keep hands on mandible because of their expertise in dealing with basic principles of reconstruction of facial skeleton. Little the other medical specialists know about the occlusion which is the basic criteria to be satisfied

while reconstructing middle and lower third of facial skeleton. There are a few medical specialists who treat mandibular fractures without establishing a proper occlusion which causes other acquired deformities like temporomandibular joint problems. I have seen most of the cases which they treat either go for malunion or the fixation plates get infected, they even fail to restore the anatomical bony contour of the mandible and the cost of the surgical procedure is also high for the quality of the treatment they offer to the patient. By this article I want to request the other respected medical fellow specialists to stop playing with the mandible as it is the key structure in performing the most important functions of the facial skeleton, no more a dog's bone nor a royal feast and any compromise in its management will eventually reflect the personality of the patient both physically and psychologically.

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Role of Protein on Rhodanese Activity on The Brain After Cyanide Ingestion

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Abstract

Purpose: Cyanide is a highly toxic compound that is readily absorbed and causes death by preventing the use of oxygen by tissues causing neurotoxicity. Rhodanese is a mitochondrial enzyme that biotransform cyanide to the less toxic thiocyanate. This research work was carried out to determine rhodanese activity on the brain of white albino rats fed with cyanide for six weeks.

Methods: Twenty rats were purchased from the physiological department of the University of Ibadan, Nigeria. The rats were randomly grouped into three; Group A which served as the control, Group B and group C. They were fed for duration of 6 weeks with different feeds including cyanide and the rats were weighed once in a week.

Results: There was significant difference ($p < 0.05$) in the body weight of group A and group B, also there was significant difference ($p < 0.05$) in the body weight of group A and group C but there was no significant difference ($p > 0.05$) in rhodanese activity in the brain of group A and group B. There was also significant difference ($p < 0.05$) in protein concentration in group A and group B.

Conclusion: The result of this study shows that protein increases the activity of rhodanese in the brain of white albino rat.

Key Words: Neurotoxicity, Rhodanese, Cyanide, Thiocyanate, Brain

Introduction:

A compound containing the group CN in a molecule, or salts of hydrocyanic acid containing the ion CN⁻ is a very rapidly acting poison, which can kill within minutes. Cyanides can be produced by some bacteria, fungi and algae. They are also found in a number of foods and plants, for example, Cyanide occurs naturally in cassava roots, which are potato-like tubers of cassava plants grown in tropical countries; these must be processed prior to consumption (usually by extended boiling). Hydrogen cyanide is rapidly absorbed by the gastrointestinal and respiratory tract; the liquid and possibly the concentrated vapor are absorbed directly through the intact skin.¹ Absorption of cyanide from smoke

inhaled by cigarette smokers is inferred by higher plasma levels of thiocyanate (a metabolite) in smokers compared to nonsmokers. Following absorption, cyanide is rapidly distributed throughout the body via the blood. Cyanide permeates the erythrocytes and is found at low concentrations in normal human blood and other organs, Transplacental transfer of cyanide can also occur. Increased plasma concentrations of thiocyanate were found in the umbilical cord blood of infants born to smokers compared with those born to nonsmokers. After non-lethal exposure, plasma cyanide levels tend to return to normal levels within 4-8 hours. In humans and animals, the major route of cyanide elimination from the body is via urinary excretion of thiocyanate little amounts of thiocyanate

are eliminated via lung and feces.² Some free hydrogen cyanide is excreted unchanged in breath, saliva, sweat, and urine. An increased urinary excretion of thiocyanate was observed in case hardeners exposed to 4-6 ppm cyanide vapor and cyanide salts over a period of several years (NIOSH).³

Neurotoxicity has been observed in humans and animals following ingestion and inhalation of cyanides. Some Cardiac and respiratory effects, possibly CNS-mediated, have also been reported. Ingestion of 50-100 mg sodium or potassium cyanide is followed by almost instantaneous collapse and cessation of breathing. At a much lower dose, the earliest symptoms are weakness, headache, confusion, and occasionally nausea and vomiting. Short-term exposure to high concentrations produces almost immediate collapse, respiratory arrest, and death.⁴ Symptoms resulting from occupational exposure to lower concentrations include breathing difficulties, nervousness, vertigo, headache, nausea, vomiting, precordial pain, and electrocardiogram (EKG) abnormalities.⁵⁻⁷ The most specific symptom in acute cyanide poisoning is the bright red color of venous blood which is evidence of the inability of the tissues to use oxygen.

In 1932, K. Lang described an enzyme that in the presence of a suitable sulfur donor was able to convert cyanide to thiocyanate. As sulfur donors, only thiosulfate and colloidal sulfur were found to be effective. The enzyme was named RHODANESE and found to be present in high amounts in liver tissue from different animals.⁸

The enzyme rhodanese (EC. 2.8.1.1., thiosulfate: cyanide sulfurtransferase) is a ubiquitous enzyme that is known to be responsible for the biotransformation of cyanide to thiocyanate.⁹ This enzyme is believed to be involved in cyanide detoxification in living organisms.¹⁰ The liver has always been considered to be the major source of

rhodanese and is believed to be the major site of cyanide detoxification.¹¹ However, it has recently been shown, those different parts of the stomach in sheep and cattle.¹² and the proventriculus in chickens that contains greater rhodanese activity than liver.

The Presence of high levels of rhodanese in certain human tissues found in other extensive studies performed in the laboratory which shows high specific activity of rhodanese in epithelial layers of different parts of the gastrointestinal tract¹³, respiratory tract¹⁴ and kidney cortex of animals¹¹ indicate that certain physiological roles are performed by this enzyme in these tissues.

Materials and Methods:

Chemicals and Reagents

Distilled water, phosphate buffer and diethyl ether.

Equipment's and Instruments

Animal tapes, weighing balances, dissecting board, surgical scissors, Petri dish, cotton wool, ethylated spirit, syringe and needle, pipettes, conical flask, micro pipettes, refrigerator, test tube, water bath, pH meter, measuring cylinder, high speed centrifuge, funnels, filter paper, foil.

Rat Cage

Wooden cages were used to house the rats. It was constructed in a way that there were access to feed and water. Adequate ventilation was also provided. The size of the cage was about 30cm by 20cm.

Animal Study

Acquisition and Acclimatization of Rats:

Twenty rats were purchased from the department of Physiology, University of Ibadan, Nigeria and each albino rat was kept in a separate cage so as to facilitate correct scientific data acquisition and reducing the chances of systemic error. The cages were well ventilated and this was done to minimize rodent movement and to allow for maximum feeding of standard compounded feed and water to avoid

overcrowding. The cages, drinking and feeding containers were cleaned on regular basis.

Acclimatization of the rats was done for one week, during which the rats were given the standard feed (growers mash) and were allowed to get adapted to the new environment. After acclimatization, the rats were weighed and recorded.

The rats were randomly grouped into three. Group A (six rats) which served as the control were fed growers mash. Group B (six rats) were fed with labeled compounded feed with caesin and group C (eight rats) were fed with compounded feed without caesin for a duration of 6 weeks and all the rats were weighed once in a week, every Wednesday to be precise.

The rats were fed thrice a day: 9am, 1pm and 5pm respectively.

Compounded Feed Composition

A compounded feed of 5kg (5kg=5000g)

Nutrients	Group B (%)	Group B (X% Of 5000g)	Group C (%)	Group C (X% Of 5000g)
Vitamins In The Form Of Vitamin x	1.1	55	1.1	55
Protein In The Form Of Caesin	16	800	0	0
Carbohydrate In Cassava Peel Form	74.9	3745	90.9	4545
Fats And Oils In Groundnut Oil Form	4	200	4	200
Minerals In Mineral Mix Form	4	200	4	200

*MINERALS MIX
4% OF 5000g=200g

2.3 SACRIFICING, BLOOD AND ORGAN

Collection:

After a brief exposure of the rat to diethyl ether (anesthetic) making the rat unconscious, the rat was placed on a dissecting board with the limbs pinned to the board. The rat is dissected starting from the central abdominal region upward to expose the internal region and organs. Using a syringe and needle, the blood was collected from the heart of each rat. The

MINERAL	WEIGHT (Xg)	WEIGHT IN COMPOUNDED FEED (Xg x200/948.24)
Zn	27.00	5.700
KI	1.00	0.210
NAF	0.04	0.008
MnSO ₄	0.20	0.04
Na ₂ H ₂ PO ₄	105.00	22.150
KCl	250	52.73
MgSO ₄	80.00	16.870
Fe(C ₆ H ₅ O ₄)	35.00	7.380
Ca(SO ₄)	400.00	84.370
NaCl	50.00	10.550

blood samples were poured into labeled heparin bottles to avoid coagulation of the blood. The samples

were centrifuged at 4000 x g for 10 minutes to separate plasma from the blood cells. The plasma was then stored in the refrigerator until the analysis was to be carried out.

The brain in each rat were also collected, weighed and prepared for homogenization.

Rhodanese Assay

Principle

Enzyme activity was determined by a modification of Sorbo (15) to detect the concentration of SCN formed by the reaction of CN to Na₂S₂O₃. Rhodanese functions in the detoxification of cyanide through the transfer of sulfur atom from thiosulfate to cyanide by thiosulfate sulfur transferase to give the less toxic product of thiocyanate and sulphide respectively.

Materials and Apparatus

Spectrophotometer, 50mM borate buffer, 0.25M KCN, 0.25M Na₂S₂O₃, 15% formaldehyde, 0.025M ferric nitrate, incubator, pH meter, test tubes, test tubes rack, enzyme solution, water bath, measuring cylinder, micro pipette and beakers with distilled water.

Procedure

The reaction mixture was composed of 0.6ml of 50mM borate buffer (pH 9.4) with 0.2 ml of 0.25 M KCN, 0.2 ml of 0.25 M Na₂S₂O₃ and 10 ul of enzyme preparation with distilled water.

The mixtures were incubated for 10 min at 25°C and stopped by addition of 0.5 ml of 15% formaldehyde. After addition of 1.5 ml of 10% ferric nitrate solution, an absorbance was detected at 460 nm with a spectrophotometer (Beckman. Model DU-50). The standard curve was prepared with potassium thiocyanate by measuring an absorbance at 460nm.

REAGENTS	TEST SAMPLE(ml)	BLANK(ml)
50Mm borate buffer pH 9.4	0.6	0.6
0.25M KCN	0.2	0.2
0.25M Na ₂ S ₂ O ₃	0.2	0.2
Enzyme extract	0.01=10ul	-
Distilled water	0.14	0.15
15& formaldehyde	0.5	0.5
10% ferric nitrate	1.5	1.5

Preparation of Standard Curve

The reaction mixture was composed of 0.6ml of 50mM borate buffer (pH 9.4) with 0.2 ml of 0.25 M KCN and varying ml of distilled water and 0.25 M KSCN.

This was achieved with potassium thiocyanate by measuring an absorbance at 460nm. Plot a graph of OD against concentration.

TUBES	50mM BORATE BUFFER (ml)	0.25M KCN (ml)	0.25M KSCN (ml)	WATER (H ₂ O) (ml)	CONCENTRATION (M)
01	0.6	0.2	0.0	5.2	0.000
02	0.6	0.2	0.5	4.7	0.001
03	0.6	0.2	1.0	4.2	0.002
04	0.6	0.2	1.5	3.7	0.003
05	0.6	0.2	2.0	3.2	0.004
2.7	0.6	0.2	2.5	-	0.005
07	0.6	0.2	3.0	2.2	0.006
08	0.6	0.2	3.5	1.7	0.007
09	0.6	0.2	4.0	1.2	0.008
10	0.6	0.2	4.5	0.7	0.009
11	0.6	0.2	5.0	0.2	0.010

CONCENTRATION DETERMINATION

Density = Mass/Volume

Density of KSCN = 1.886g/cm^3
 $= 0.1886\text{ g/dm}^3$

Mass = Density X Volume

For tube 2 with a volume of 0.5ml of KSCN

Mass = 0.1886×0.5

$= 0.0943$

Molar Mass of KSCN = 97.18g/mol

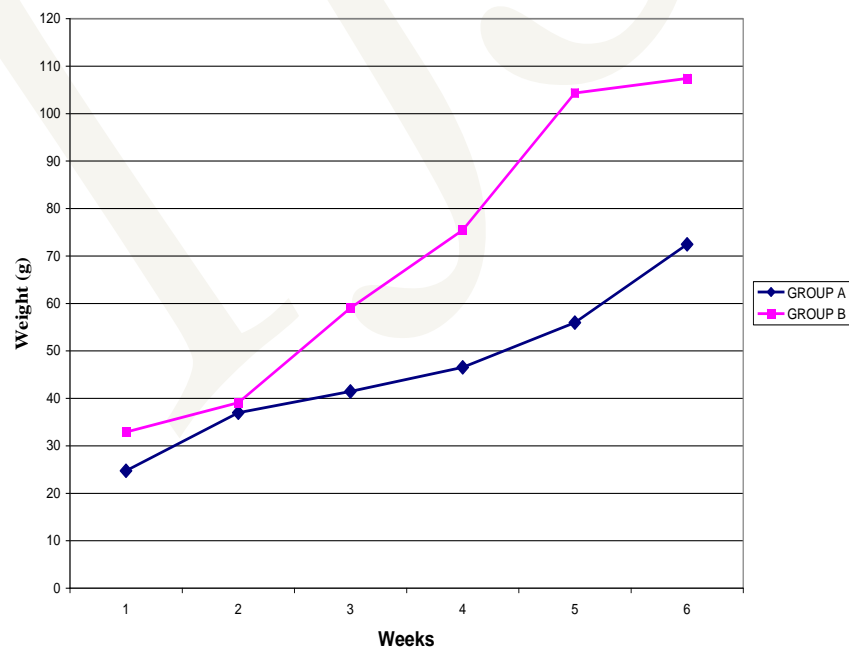
Conc. in mol/dm^3 = conc. In g/dm^3 / Molar mass

$= 0.0943 / 97.18$

$= 0.001\text{ mol/dm}^3$

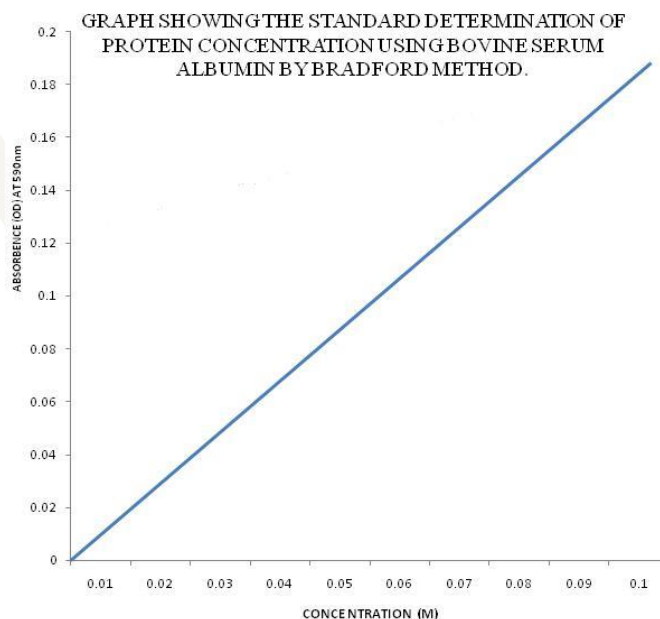
Results:**3.1 WEIGHT GAINED IN RATS FED WITH DIFFERENT FEEDS.**

WEEKS						
	1	2	3	4	5	6
GROUP A	24.72±9.46	36.95±9.62	41.45±14.08	46.53±16.37	55.93±18.62	72.43±2.53
GROUP B	32.89±5.93	39.06±8.22	59.02±10.25	75.44±12.13	104.32 ±6.72	107.41±1.06.0
GROUP C	20.80±2.48	21.65±2.76	22.80±2.41	19.600	0	0

GRAPHICAL REPRESENTATION OF WEIGHT GAINED IN GROUP A AND GROUP B FED WITH DIFFERENT FEEDS FOR SIX WEEKS

DETERMINATION OF STANDARD PROTEIN CONCENTRATION

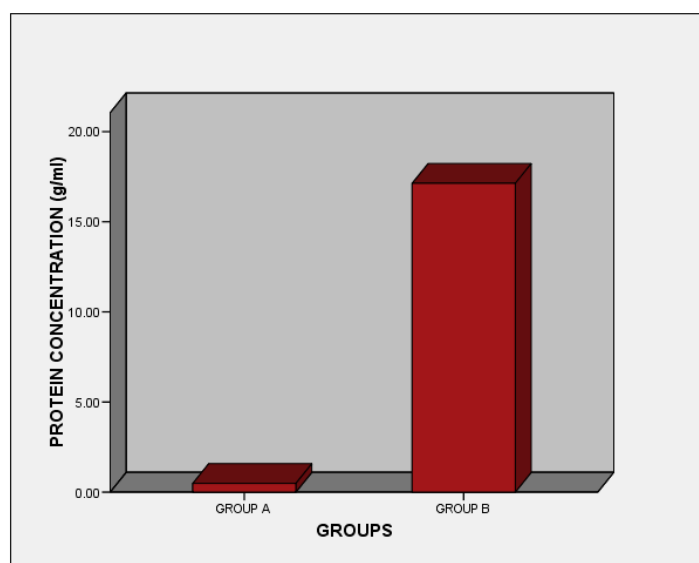
TUBES	CONC.	OD 1	OD 2	OD1+OD2/2 OD
00	0.000	0.000	0.000	0.000
01	0.01	0.125	0.125	0.125
02	0.02	0.136	0.138	0.137
03	0.03	0.141	0.139	0.140
04	0.04	0.145	0.146	0.280
05	0.05	0.155	0.153	0.154
06	0.06	0.160	0.161	0.161
07	0.07	0.162	0.163	0.163
08	0.08	0.175	0.176	0.176
09	0.09	0.182	0.183	0.183
10	0.10	0.185	0.185	0.185

DETERMINATION OF PROTEIN CONCENTRATION IN ENZYME EXTRACT OF THE BRAIN OF RATS FED FOR SIX WEEKS.**ABSORBENCE AT 595nm**

RATS	OD1	OD2	OD(OD1+OD2/2)	CONC. g/ml
01	0.05	0.049	0.050	0.450
02	0.025	0.025	0.025	17.50
05	0.025	0.024	0.025	17.50
08	0.025	0.025	0.025	17.50
11	0.023	0.022	0.023	16.00
12	0.001	0.001	0.001	0.500
BLANK	0.000	0.000	0.000	0.000

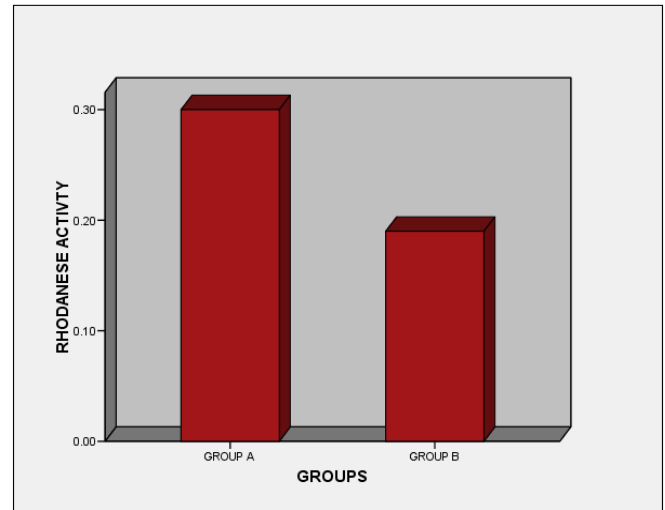
PROTEIN CONCENTRATION OF THE GROUPS

GROUPS	PROTEIN
GROUP A	0.48 ± 0.04
GROUP B	17.13 ± 0.38



RHODANESE CONCENTRATION OF THE GROUPS

GROUPS	RHODANESE
GROUP A	0.30 ± 0.01
GROUP B	0.19 ± 0.03



STATISTICAL ANALYSIS OF RHODANESE ACTIVITY IN WHITE ALBINO RATS FED WITH GROWERS MASH AND RATS FED WITH COMPOUNDED FEED SUPPLEMENTED WITH PROTEIN.

Group	Rat	Weight of organ	Body Weight	Organ/body weight	Rhodanese Activity
	Rat 1	1.14	69.9	$1.14/69.9 = 0.016$	0.31
GROUP A	Rat 12	1.21	74.95	$1.21/74.95 = 0.016$	0.29
MEAN=Σx/n	n=2	1.18 ± 0.04	6.38 ± 2.52	0.016	0.030 ± 0.14
GROUP B	Rat 2	0.97	96.60	$0.97/96 = 0.010$	0.160
	Rat 5	1.55	127.40	$1.55/127.4 = 0.012$	0.168
	Rat 8	1.59	126.50	$1.59/126.5 = 0.013$	0.290
	Rat 11	1.17	92.95	$1.17/92.95 = 0.013$	0.155
MEAN=Σx/n	n=4	1.32 ± 0.52	110.9 ± 16.14	0.012 ± 0.03	0.193 ± 0.11

WITH RESPECT TO PROTEIN CONCENTRATION

GROUP A AND B

Using t-test at 5% level of significance, significance difference ($P < 0.05$) was observed between the control and experimental groups.

WITH RESPECT TO RHODANESE ACTIVITY

GROUP A AND B

Using t-test at 5% level of significance, no significance difference ($P > 0.05$) was observed between the control and experimental groups.

Statistical Analysis:

All results were expressed as Mean \pm SEM for all the groups. All grouped data were statistically evaluated using SPSS 15.0 software. Hypothesis testing methods included the t-test. Statistical significance was set at $P < 0.05$.

Discussion:

There is significant difference in the weight between rats in group B (those that were fed with feed containing cyanide and 16% casein) and group A (control group) that were fed with growers mash (Table 4.2). Group B rats were found to be of higher weight than group A (control) as result of the protein supplement in their feed (Figure 4.1). There were no visible deformities observed in group B rats as opposed to Tewe¹⁶ who opined that even with sufficient protein intake, consumption of cassava flour based ration can result in parakeratosis in pigs attributable to zinc deficiency, aggravated by the cyanide in cassava diet. Other features include paralysis of the hind limbs and muscular weakness. The protein supplement in the feed of group B rats played a vital role in cyanide detoxification as further confirmed by Tewe¹⁶ that the requirement of sulphur-containing amino acid is for use in the rhodanese detoxification pathway.

There is significant difference in weight between the control group (group A) and group C that were fed with cyanide alone without protein supplement. Also, group A were found to be of higher

weight than group C because of inadequate protein in the feed¹⁶ which eventually led to their death after 5th week (Figure 4.2). Death of birds and grazing animals through exposure to cyanide salt or ingestion of cyanogenic plant have being reported.¹⁷

There is no significant difference in the rhodanese activity between rats (group B) control group (group A) that were fed with growers mash (Table 4.11). This is because protein repairs body tissue and increases rhodanese activity.¹⁶ The potential toxicity of a cyanogenic plant depends primarily on the potential that its consumption will produce a concentration of prussic acid, HCN which may be released by enzyme hydrolysis which is toxic to exposed animal and human. It is therefore speculated that for animals to survive the adverse effect of cyanide toxicity, they must have effective cyanide detoxification mechanisms which are basically by enzyme-based reactions catalysed by the sulphurtransferases.^{18, 19, 10}

Conclusion:

The result of this study shows that protein increases the activity of rhodanese in the brain of white albino rat. Therefore consumption of cyanide containing diet such as grains, cereals and other plant product with protein supplement reduces the toxicity of cyanide (CN-) to a less toxic thiocyanate (SCN-)

Aknowledgement:

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Cry Analyser- A Tool for Behaviour Management

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Abstract

Aim & Objectives: To analyse the Type & Frequency of cry in Paediatric endodontic procedure and its variation after Audio analgesia as behaviour guidance.

Materials and Methods: Randomly 60 children in the age group of 4-8 were selected indicated to undergo single sitting pulpectomy procedure. Audio analgesia used along with Why Cry – cry analyser to record the type of cry and Audacity software was used to record frequency of the cry.

Results: Correlation established between Obstinate and Hunger, Frightened and stressed, compensatory with boredom cry. Audio analgesia was successful in 40% of cases.

Conclusion: Positive correlation was established between Cry Analyser and clinical diagnosis of type of cry. Audio analgesia proved to be effective method for behaviour guidance.

Keywords: Audio analgesia, Cry, Cry Analyser.

Introduction:

Crying, like other emotional manifestations of human behaviour is an expression of personality of an individual. Crying is liable to be the result of conflict with the developing ego and with his newly found interests. After the age of one and a half child develops a variety of fears and cries for the security of his mother's company.¹

Previous works have demonstrated that applying signal processing techniques to analyze the sound of these cries, its possible determinate which features carry information about the context that evoked the cry.

Dental environment is a stressful place for most patients because of factors such as fear of injection and fear of unknown. Each dental visit is a new experience often accompanied with a certain degree of fear and anxiety. The most common way a child expresses fear is by crying at the dentist's office.

All dentists who treat children occasionally find themselves faced with a fearful child in his/her first visit to the dentist. The dentist performs a twofold role in managing the child with anxiety. Firstly to

control and treat the problem and secondly educating the child to manage the anxiety.²

Anxious children demand a lot of expertise in child management techniques from the dentist and the dental staff. Previously used management techniques have been successful, but the trend has shifted balance towards non-aversive techniques.³

Dentists have a full spectrum of techniques available to them to assist in management of child with anxiety such as tell-show-do, relaxation, distraction systematic desensitization, modelling, audio analgesia, hypnosis, and behaviour rehearsal.⁴ Since its introduction in 1959 by Gardner and Licklider⁵, audio analgesia, the production of insensitivity to pain by the use of loud sound, has been the subject of much controversy.

The success of audio analgesia technique in medical settings and in adult patients is well documented, but there are very few studies done to evaluate the efficacy of this technique in paediatric dental patient.²

The aim and objective of this study was to evaluate and compare audio analgesia in management

of anxious paediatric dental patient using cry as a parameter.

Materials and Methods:

Sixty children aged between 4 to 8 years, were selected from patients who came to the department of Pedodontics of M.A Rangoonwala Dental College who required single sitting pulpectomy

Inclusion Criteria:

1. Children aged between 4 to 8 years.
2. Children requiring a single sitting pulpectomy procedure.

Exclusion Criteria:

1. Children presenting with mental or physical disability.
2. Children presenting with a dento-alveolar abscess.

Consent was taken from patient's parents along with brief medical and dental history of patient.

Cases were selected based on the signs and symptoms with which the child reported to the department. Radiographs were used to confirm the diagnosis and then the procedure was commenced.

Technique:

Pre-operatively, cry of the patient was recorded using "Why-cry" analyser. Cry analyser is kept near the patient mouth for 20 seconds which is analysis time. It analyses the frequency and temporal parameters of the sound defining the start and finish algorithm; these parameters are: frequency, intensity, form of sweep, repetition rhythm, energy content, pulse/beat duration, wave shape, autocorrelation, magnitude, density of crosses through zero, etc. The crying analyser is based on a digital signal processing that can carry out these tasks in real time using a fraction of the sound, this allows for repeated validation of the prognosis before illuminating the visual display icon. Recording of the cry was also done on the audacity software to record the frequency of the crying.

Crying was also recorded clinically by another examiner based on the Elsbach classification (1963). This was done to establish co-relation between

Elsbach classification and "Why-cry" analyser recording.

Local anaesthesia was administered using 2% lignocaine with adrenaline. Audio analgesia was then used using latest songs. Access cavity was prepared with no.330 carbide bur. Canal orifices were located. The working length was measured using a no. 15 file and radiograph. Pulp extirpation was then carried out. Instrumentation was done with Kerr files till no.30, along with intermittent irrigation with 2.5% sodium hypochlorite and saline solution irrigation. The canal space was then dried using sterile paper points. Obturation was done using ENDOFLAS F.S. carried into the canal space with lentulo spiral.

Post- operatively, cry of the patient was recorded using "Why-cry" analyser. Recording of the cry was also done on the audacity software to record the frequency of the crying. Crying was also recorded clinically by another examiner. Then the results were obtained and were subjected to analytical tests.

Results:

Table 1 shows the co-relation between the cry on "Why-Cry" analyser and the clinical classification of cry. The results showed that most frequently seen cry on "Why-Cry" analyser during paediatric endodontic procedure was stressed followed by hunger and then bored. Positive co-relation was established between stressed and hunger with frightened cry and bored with compensatory cry. The type of cry by analyzer shows significantly higher agreement with the clinical perspective of type of cry.

Table 2 shows the post treatment efficacy of audio analgesia method of behaviour guidance. The success of audio analgesia was based on change in cry of the patient post-operatively. Significantly higher proportion of children had success (no cry) after the audio-analgesia treatment.

TABLE 1: THE AGREEMENT BETWEEN WHY-CRY ANALYZER AND CLINICAL PERSPECTIVE.

		Clinical perspective of type of cry				Total
		Compensatory	Hurt	Frightened	Obstinate	
Analyzer type of cry	Bored	14 (100.0)	0	0	0	14 (100.0)
	Stressed	6 (33.3)	0	12 (66.7)	0	18 (100.0)
	Hunger	0	0	14 (87.5)	2 (12.5)	16 (100.0)
	Total	20 (41.7)	0	26 (54.2)	2 (4.1)	48 (100.0)

Values are n (%). Chi-Square value =33.785, P-value = 0.001 (Significant).

TABLE 2: THE POST TREATMENT EFFICACY OF ANALGESIA METHOD OF BEHAVIOUR GUIDANCE.

		Post-Treatment		Total
		Failure (Cry)	Success (No Cry)	
Pre-Treatment type of cry	Bored	0	4 (100.0)	4 (100.0)
	Stressed	13 (59.1)	9 (40.9)	22 (100.0)
	Hunger	11 (32.4)	23 (67.6)	34 (100.0)
	Total	24 (40.0)	36 (60.0)	60 (100.0)

Values are n (%). Chi-Square value =6.836, P-value = 0.033 (Significant).



Fig.1 Pre-operative Recording of the cry using Why-Cry Analyzer.



Fig. 2 Why Cry Analyzer.



Fig. 3 Audio Analgesia Procedure.

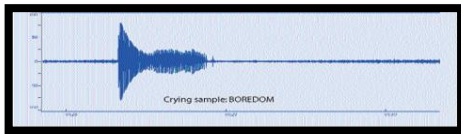


Fig.4 Frequency of boredom cry. uency of cry on Why Cry Analyzer (Boredom)

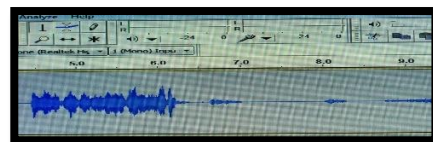


Fig. 5 Frequency of cry on AUDACITY software. (Boredom)

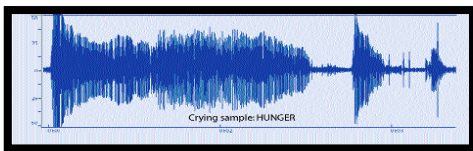


Fig. 6 Frequency of cry on Why Cry Analyzer. (Hunger)



Fig. 7 Frequency of cry on AUDACITY software. (Hunger)

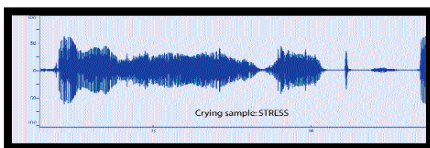


Fig. 8 Frequency of cry on Why Cry Analyzer. (Stress)

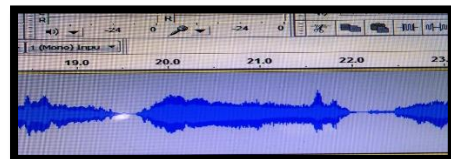


Fig. 9 Frequency of cry on AUDACITY software. (Stress)

Discussion:

This study aimed at to analyse the type & frequency of cry in paediatric endodontic procedure and its variation after audio analgesia as behaviour guidance. The age group selected for this study 4-8 years shows the most disruptive or negative behaviour and are difficult to manage.

The most commonly observed cry during the initial examination was hungry cry accounting for 56.67% cases followed by stressed accounting for 36.67% and bored accounting for 6.66%. This was expected because most of the patients were brought to the department with the chief complaint of pain. The results from the study indicated a positive correlation between Stressed cry and Hunger cry with frightened cry and boredom cry with compensatory cry. Crying is a mode of expression of the personality traits, the crying can be used as an asset in diagnosis.¹

Following types of cries are commonly encountered

- ✓ Pain cry: This cry is characterised by nonstop and uncontrollable crying which is high pitched and loud.
- ✓ Frightened cry: This cry is characterized by a sharp shrilled extremely high pitched cry followed by small breath catching sobs followed by a sharp shrilled extremely high pitched cry.
- ✓ Obstinate cry: it is loud high pitched & characterized as a siren like wail, a pause and repeated over and over again. This forms a belligerent cry, represents the child external response to anxiety. Child throws a temper tantrum to thwart dental treatment.
- ✓ Compensatory cry: Slow monotonous cry, the crying serves to "compensate" for the noise. It's a kind of coping mechanism to unpleasant stimuli.

Dentists have wide variety of behaviour modification techniques available to them. Distraction techniques which are non-aversive in nature are soon becoming popular.

Distraction techniques involve diverting the patients' attention from perceived unpleasant stimuli. Audio analgesia can be used as a distraction technique to alter the child's behaviour in dental setting. In our study audio analgesia was used a behaviour guidance

technique considering cry as a parameter. The choice of music was left to the patients.

According to Klein and Winklestein this will allow the child to gain control over the unpleasant stimulus and give them feeling of being in familiar environment.⁵ Other studies suggest that there is a little impact of whether the patient chooses the music themselves or is chosen for them.⁶

Best et al obtained very favourable results in dentistry by supplying music via earphones built into the headrest.⁷ Brown et al reported the use of "silent music" to soothe surgical patients.⁸ Gardner et al reports that out of 1000 dental patients who previously required nitrous oxide or a local anaesthetic, pain relief was fully effective for 65 percent using audio analgesia.⁹

Gardner and Licklider originally listed seven factors contributing to the audio analgesic effect.^{5,9}

1. The noise appears to directly suppress the pain caused by dental operation.
2. The noise removes a source of anxiety by masking the sound of the dental drill.
3. The music, and the noise, which sounds like a waterfall, has a relaxing effect.
4. When both music and noise are presented, the music can be followed only through concentration which distracts attention away from the dental operation.
5. Active participation gives the patient a feeling of control over a situation which formerly seemed completely out of his hands.
6. The dentist can judge the patient's state of anxiety or discomfort by noting whether the patient is using music or noise, and by observing the intensity of each signal.
7. Suggestion.

Studies of young children (up to age 6 years) undergoing either dental or medical procedures have generally found little or no effect of music on anxiety levels, as manifest in disruptive behaviour or self-report.^{10,11} Aitken et al observed that audio distraction did not have a significant effect on reducing anxiety.¹⁰

The results obtained from our study contradicted these studies.

Music distraction may be helpful as an adjunct along with other behaviour management techniques; hence there is need of more research to be conducted in relation to this study.¹²

Conclusion:

Positive correlation was established between Cry Analyser and clinical diagnosis of type of cry. Audio analgesia proved to be effective method for behaviour guidance. Audio analgesia is not a panacea. While its limitations in use must be recognized, at the same time, its advantages must not be ignored.

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Ultrasonographic Study of Cervical Lymph Nodes

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Abstract

Introduction: Cervical lymph nodes are common in patients with head and neck lumps. Cervical lymph nodes are common sites of involvement in lymphoma; tuberculous lymphadenitis; and other benign & malignant conditions of head and neck region. Sonography is a useful imaging tool in the assessment of cervical lymph nodes, which aids in the assessment of patient prognosis and helps in planning treatment.

Aims & Objective: Aim of this study is to use non-ionising radio- imaging technique (US) to differentiate among various type of cervical lymph node pathologies.

Material & Methods: This study was carried out in eighty patients (44 male, 36 females) of different age group, who attended daily Out Patient Department (OPD) of Teerthanker Mahaveer Medical College, Moradabad. Subjects were selected using convenience sampling. Thorough physical examination of neck region was done and then the ultrasonography of cervical neck lumps was done by using ultrasound system present in Department of Radiology, TMMC& RC, Moradabad.

Results: 10 cases of cervical adenopathy were diagnosed (five males & five females, having mostly tubercular, metastatic and lymphoma nodes with their special ultrasonographic appearances. A classical finding was that necrosis was present in 100% of cases.

Conclusion: Ultrasound is a useful radio-imaging technique in assessment of cervical lymph nodes. Ultrasound is easily available less ionizing and having sensitivity of 95% approximately in cervical lumps diagnosis

Key Words: Ultrasonography, L/T Ratio & Adenopathy.

India.

Introduction:

An enlarged cervical lymph node is the most commonly encountered neck lump. Cervical lymph nodes are also common sites of involvement of lymphoma; tuberculous lymphadenitis; and other benign lymphadenitis.^{1,2} In sonography examinations, cervical lymph nodes are usually classified into eight regions (Figure 1). Normal and reactive lymph nodes are usually found in submandibular fossa, temporal fossa, upper portion of neck, and posterior triangle of neck. High-resolution ultrasound is an ideal initial imaging investigation for most neck lumps.³ The differential

diagnosis of a neck mass depends on age of patient, location of the lesion, and its appearance on ultrasound. Several studies have shown that ultrasonography has higher sensitivity than palpation for the detection of enlarged lymph nodes in patients.⁴⁻⁷

Ultrasonography provides valuable information with a high degree of diagnostic accuracy; and it is easily tolerated by patients and is cheaper and faster to perform than other methods. Because of these factors, ultrasonography is certainly the first radio-imaging modality that is in practice.

Normal cervical lymph nodes are rarely visualized by ultrasonography; however, hyperplastic lymph nodes appear in many pathologies, and they are visualized with high accuracy.⁸⁻¹¹ Benign as well as malignant lymph nodes have typical ultrasonographic morphologic characteristics.^{12,13} Internal architecture can also be useful in the differential diagnosis of cervical lymph nodes. It is thought that a hyperechoic hilum is a good indicator of a benign lymph node³; however, the absence of a hilum is more frequently a sign of malignancy.^{14,15} No single criterion is an absolute indicator for predicting malignant disease, and all known criteria should be applied together. These signs may point to a specific diagnosis/pathology. The basic level of equipment required for head and neck ultrasound is a modern system with a high-frequency transducer (> 7.5 MHz).

Materials and Methods:

This study was carried out in eighty patients of different age group (0- 80 years), caste creed and culture coming to attend daily Out Patients Department of Teerthankar Mahaveer Medical College & Research Centre, Moradabad. After going through thorough physical examination of neck region by concerned specialist, neck lumps were inspected and palpated in Department of Radiology. Ultrasonography of cervical neck lumps was done by using ultrasound system.

A systematic examination protocol was made for the evaluation of the neck. Consent from patient was taken on prescribed format as issued by Research committee of Teerthankar Mahaveer University. Female patients were taken into confidence as per normal routine, keeping one female attendant with them. Ethical approval was taken from ethics committee of Teerthankar Mahaveer University, Moradabad. Subjects were selected using convenience sampling. Sonography of the neck begun with the examination of the thyroid gland where the instrument was adjusted and the frequency and gain were optimized. Then

the vascular sheath, salivary glands and lymph node status were progressively evaluated.

Age group (In years)	Male	Female	Total
0-10	4	2	6
11-20	2	6	8
21-30	8	16	24
31-40	6	6	12
41-50	10	4	14
51-60	6	2	8
61-70	6	-	6
71-80	2	-	2
Total	44	36	80

TABLE 1:- AGE AND SEX DISTRIBUTION OF PATIENTS.

Result:

Longitudinal / Transverse (L/T) ratio.

Lymph nodes were separated into 2 groups according to their L/T ratio: oval (L/T ratio >2) and round (L/T ratio <2). (L/T ratio >2) was present in 83% in tubercular nodes, 33% in metastatic nodes and 33% in lymphoma nodes, while (L/T ratio <2) was maximally present in metastatic lymph nodes. 83% lymph nodes were hypoechoic in tubercular lymph nodes, 100% in metastatic lymph nodes and 33% in lymphoma nodes. No hyperechoic lymph nodes were seen in any kind of cervical lymph nodes under study, while 17% lymph nodes were seen isoechoic in tubercular lymph nodes. 17% lymph nodes were homogenous in tubercular, 67% in metastatic and 33% in lymphoma nodes., while heterogeneity was seen to the extent of 67% in tubercular and 33% in

metastatic lymph nodes. Lymphoma nodes didn't show any heterogeneity.

Calcification was seen to the extent of 17% in tubercular lymph nodes. Necrosis was seen 100% in tubercular lymph nodes and 33% in metastatic lymph nodes. Thick regular rim enhancement to the extent of 100% was seen in tubercular lymph nodes, thin and focal (67%) in metastatic lymph

nodes and thin regular in lymphoma lymph nodes to the extent of 33%. Sharp border was present in lymphoma lymph nodes and sharp border to the extent of 67% in tubercular lymph nodes. Posterior enhancement was seen in 67% of tubercular lymph nodes and 33% in metastatic lymph nodes. Matting was seen in 67% of tubercular lymph nodes.

Table:-2 Ultrasonic finding in 80 Masses in Head and Neck

Nature of lesion	No. of Cases
<u>Inflammatory</u>	
Abscess	14
Adenopathy	10
<u>Benign neoplasm</u>	
Henangioma	10
Parathyroidadenoma	4
Epidermoid inclusion cyst	4
Lymphangioma	4
Plexiformneurofibroma	4
Chemodectoma	2
<u>Malignant Neoplasms</u>	
Poorly differentiated carcinoma	10
Sq. Cell carcinoma	4
Lymphoma	6
<u>Miscellaneous</u>	
Encephalocele	2
Parotitis	2
Normal lymph node	2
Thyroglossal duct remnant	2
Total	80

Adenopathy was noted in 10 cases while in 2 cases lymph node appearance was normal. Along with lymph node enlargement other neck swellings were evaluated and differential diagnosis was made as per features, clinical presentation & routine laboratory and radiological examinations

Table 3:- Age and Sex Distribution of Cases with Lymph Nodes Masses

Age group (In years)	Male	Female
0-10	1	-
11-20	-	1
21-30	1	2
31-40	1	-
41-50	1	1
51-60	1	1
61-70	-	-
Total	5	5

Distribution of adenopathy showed sexual difference and adenopathy was equal in both sexes with most common among 21-30 yrs of age group (table-3)

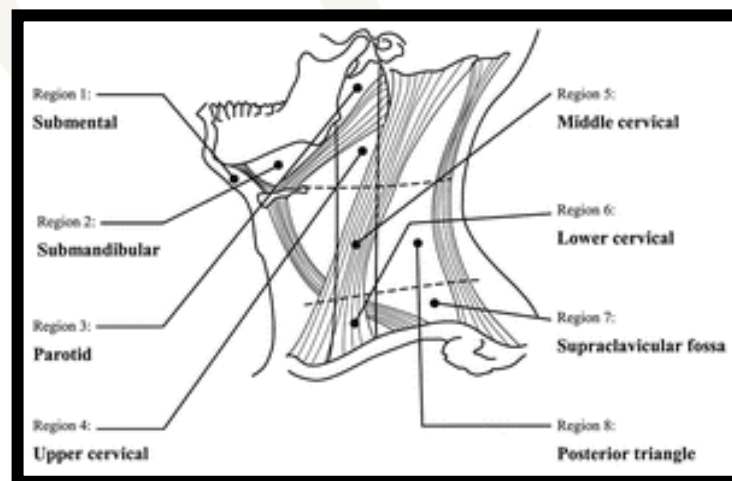


Figure 1: Location of cervical lymph nodes

Table 4:- Distribution of Neck Masses According to the Nature of the Lesion

Nature of the lesion	No. of cases	Percentage of total cases
Inflammatory		20%
Abscess	2	2.5%
Adenopathy	14	17.5%
Developmental		5%
Branchial Cyst	2	2.5%
Lymphangioma	2	2.5%
Thyroid Masses		30%
Benign	16	20%
Malignant	8	10%
Mesenchymal		10%
Lipoma	4	5%
Sarcoma	4	5%
Neural		5%
Schwannoma	2	2.5%
Neurofibroma	2	2.5%
Vascular		5%
Hemangioma	2	2.5%
Carotid body tumor	2	2.5%
Bone		5%
Osteoma	2	2.5%
Metastasis	2	2.5%
Lymphnode Masses (non inflammatory)		10%
Lymphoma	2	2.5%
Metastasis	6	7.5%
Salivary Gland Masses		10%
Benign	4	5%
Malignant	4	5%
Total	80	100%

Table:-5 Ultrasonographic Images of Lymph Nodes in Different Pathologies

Imaging Features	Tubercular Nodes	Metastatic Nodes	Lymphoma Nodes
Shape L/T > 2 L/T < 2	(83%) (17%)	(33%) (67%)	(33%) -
Echogenecity Hypoechoic Hyperechoic Isoechoic	(83%) - (17%)	(100%) - -	(33%) - -
Homogenecity Homogeneous Heterogeneous	(17%) (67%)	(67%) (33%)	(33%) -
Calcification	(17%)	-	-
Necrosis	(100%)	(33%)	-
Rim Enhancement Thick Irregular Thin Regular Thin with Focal nodularity	(100%) - -	- - (67%)	- (33%) -
Nodal border Sharp Not Sharp	(33%) (67%)	(67%) (33%)	1(33%) -
Posterior enhancement on US	(67%)	(33%)	-
Surrounding Tissue Fat plane blurring Capsular spread, Infiltration Adjacent tissues	(33%) -	- (33%)	- -
Matting	(67%)	-	-

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Figure 2: Typical Ultrasonographic Appearance of a Benign Hyperplastic Lymph Node.

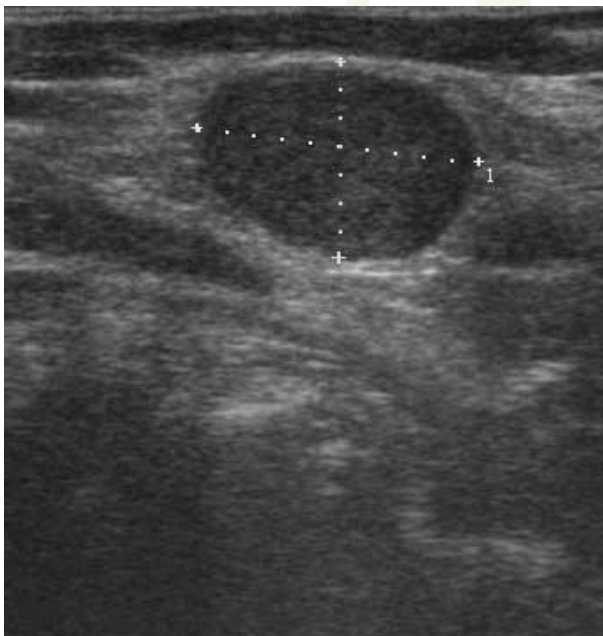


Figure 3: Typical Ultrasonographic Appearance of a Malignant Lymph Node.



Figure 4: Typical Ultrasonographic Appearance of a Metastatic Lymph Node.

Discussion:

Normal lymph nodes are difficult to detect on US because of their high echogenicity which is similar to that of surrounding fatty tissue. Diseased lymph nodes are almost always hypoechoic. (83% tubercular nodes, 100% metastatic lymph nodes, 33% lymphoma nodes as Seen in table-5).

Michael et al 1996¹⁶ performed sonography on 47 patient with proven tubercular adenitis and 22 patient with proven nodal metastasis from NHN carcinomas. Tuberculous lymphadenitis had higher incidence of abnormal surrounding soft tissues (49%), cystic necrosis (60%) and matting 59% and heterogeneity (64%) than did nodal metastases (4%, 8%, 12% and 8%) respectively. Posterior enhancement was more common in tubercular lymphadenitis (32%) than nodal metastases (9%). In our study surrounding soft tissue appearance 33% in tubercular lymph nodes, and 33% in metastatic lymph nodes was found. Heterogeneity was present 67% and 33% respectively in tubercular and metastatic lymph nodes. Posterior enhancement is also more in tubercular lymph nodes than metastatic lymph nodes. In this way our study well correlates with this study

Hajek et al 1986⁴ evaluated, cervical lymph nodes with US and showed that ultrasonography has markedly higher sensitivity than palpation for detection of lymph node metastasis.

54 cervical lymph nodes were included in a study of sonography. Benign nodes had tendency to have L/T 2 (tend to be oval) and malignant nodes L/T2 (tend to be round). Other observer has also reported similar findings. In one such study 291 lymph nodes 62% of metastatic nodes showed L/T < 1.5, L/T was >2 in 79% of reactive nodes.¹⁷ The presence of hilar narrowing accompanied by cortical widening should be viewed with suspicion for malignancy.¹⁸ Similar findings were seen in this study. In benign process the nodal shape is preserved however malignant disease tends to

distort internal, architecture with invasion of hilus and changes may be focal leading to a distorted shape.¹⁷

Nodes of the upper neck tend to be larger than those in lower neck (in jugulo-digastric nodes 1.5 cm size is the upper limit of normal, in the rest 1 cm is the upper limit of normal).¹⁸

Any node with central necrosis irrespective of size should be considered pathologic (Necrosis appears as a central low attenuation area of area of 10-18 HU).¹⁹ Fatty peripheral nodal replacement can occur (0 HU) in post inflammatory, post irradiation nodes.²⁰

Nodal calcification is seen in old granulomatous disease and papillary thyroid carcinoma metastasis. Extranodal spread is correlated with an unsharp poorly defined nodal border with variable enhancement. Ultrasound and CT can be used to corroborate the findings in lymph node disease but a histopathologic confirmation is mandatory.¹⁹

In a study using the size criteria of minimum axial nodal diameter of 11 mm in subdigastric, 10 mm in other regions and heterogeneous enhancement with a rim of enhanced tumor, the metastatic nodal disease could be detected with a sensitivity of 87% and specificity of 94%. The error in palpation to detect cervical lymph node metastasis ranges from 20-28% while CT error rate varies from 7.5 to 19%.²¹

Deborah et al 1985²² studied 12 patients with neck masses and found conglomerate nodal masses with central lucency and thick rim of enhancement and minimally effaced fascial planes highly suggestive of tuberculous adenitis.

24 Patients with cervical lymphadenopathy were evaluated and sensitivity of identification of central nodal necrosis was 91-96%. They found CT to be more accurate than MR imaging in detecting central nodal necrosis and extra nodal spread in metastatic lymph node and was present in 26 of 31 benign nodes.

Michael et al 1996¹⁶ studied 47 patients with abnormal cervical nodes in tubercular

lymphadenitis and metastasis from non head and neck carcinoma. They found that the statistically significant features of differential diagnosis were lymph nodes longest diameter, echogenicity short to long axis ratio, appearance of surrounding soft tissue, intranodal necrosis, matting and posterior enhancement.

US could correctly predict the etiology in 90% cases of lymphadenopathy. Features that helped differentiate between tuberculous lymphadenitis and nodal metastatic from non head and neck carcinoma were L/T ratio more than 2, thin enhancing rims with focal nodularity and normal surrounding tissues or capsule invasion with infiltration into surrounding fat and adjacent structures was associated with metastatic nodes. Our observations were similar to those of.^{16,22}

Conclusion:

Ultrasound is a useful radio-imaging technique in assessment of cervical lymph nodes. Many features like L/T ratio, status of echogenic hilus, echogenicity, micronodular appearance, intranodal necrosis, posterior enhancement and calcification can very easily be assessed without going into radio-imaging techniques (like CT & MRI) which are costlier and also potent source of radiation to the person concerned. They should only be used when there occurs a difficulty in assessing the features of lesions by ultrasonography.

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Contraception and Infertility among Couples in Sagamu Local Government Area, South-West, Nigeria

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Abstract

Background: Most African families are not willing to embrace contraception because it is believed to be a major risk factor for infertility. This results in large family-size and poses grave danger to maternal, child and family health.

Objective: To determine the association between contraception and infertility among married individuals in Sagamu local government area, South-West, Nigeria.

Methods: A descriptive cross-sectional study was carried out among 500 married men and women living in Sagamu Local Government Area, South-West, Nigeria between April 22nd and 13th May, 2013 using the multi-stage sampling technique. Data was collected using validated semi-structured interviewer-administered questionnaires. Data was analysed using the Statistical Package for Social Sciences (SPSS) version 17.0. Frequencies, means and relevant statistics (Chi-square) were calculated and presented as tables.

Results: There were 26% male and 74% female respondents. About 17% of the respondents met the criteria for diagnosis of infertility. Respondents were aged between 19 and 60 years, with a mean of 39.7±9.9 years. 74.6% of the total respondents believe that certain methods of contraception can cause infertility. Among respondents with infertility, 12.2% have a history of using a particular method of contraception. Of infertile persons that had been on a particular kind of contraceptive, 11.3%, 15.2%, 5.7%, 18.6%, 0%, 9.1% had history of use of oral contraceptive pills, injectable, intrauterine contraceptive device, condoms, Norplant and other traditional methods of contraception respectively. However, none of these methods of contraception had significant association ($p>0.05$) with infertility in this study.

Conclusion: There was no association between contraception and infertility among couples in Sagamu. Contraception being a major cause of infertility among couples in Sub-Saharan Africa should be demystified. Public health campaign should be made against this misconception so that contraception is embraced and family health is improved upon.

Key Words: Association, Contraception, Infertility

Introduction:

Infertility is a major source of concern in many families all over the world. The World Health Organization defines infertility as the inability of couples of reproductive age to impregnate or conceive

and carry a pregnancy to live birth within two years of exposure to the risk of pregnancy¹. Most African families are not willing to embrace contraception because it is believed to be a major risk factor for

infertility. This results in large family-size and poses grave danger to maternal, child and family health.

In a study carried out in Nigeria, it was discovered that more than 50% of participants thought that previous use of oral contraceptive pill (OCP) and intra-uterine contraception device (IUCD), leads to infertility. This was a common belief in this region, regardless of the level of socio-economic status and education, that contraceptives themselves cause infertility. Many people believe that the use of exogenous hormones will eventually disrupt the body's natural functions, and lead to infertility. It is unclear where these views developed. However, this may be associated with the belief that one has been 'allotted' a certain number of children, and one can 'use them up' through abortions and contraceptive use, and person find oneself infertile when he decides to have children.²

Family planning protects women from unwanted pregnancies, thereby saving their life from high risk pregnancies or unsafe abortions. If all women could avoid high-risk pregnancies, the total number of maternal deaths could fall by one-quarter. Also, other benefits accruing from family planning methods include prevention from cancers, sexually transmitted infections and HIV/AIDS.³ A woman's health and well-being and those of her family are linked with her first child or how she spaces the birth of her children.⁴ Child-spacing is an essential ingredient in child survival. There is risk of malnutrition, inadequate education and protection of these children, increased incidence of street children and social vices in the community.

Burden of the Problem:

Infertility worldwide remains a major gynaecological problem with devastating psychosocial effect on the couple.⁵ Infertility is today a palpable problem in many families in Nigeria. It is a common reason for routine gynaecological consultations in many out patients clinics as well Ogun State University Teaching Hospital, Sagamu.⁶ Its negative impact on the peace and stability of the affected families is becoming conspicuously increasing every day. Hence, any perceived risk factor

especially, the use of contraceptive is rebuffed by these couples, thereby, resulting in large family size, reduced child survival, sub-optimal maternal and family health.

However, more than 60% of women with unplanned pregnancies were not using contraception.⁷ The consequences of low contraceptive use among Nigerian women leads to an estimated 1.5 million unplanned pregnancies every year, with about half of these resulting in elective abortions. Serious maternal complications from unsafe abortions account for 20%–40% of about 60,000 maternal deaths occurring each year in Nigeria.⁸

Relevance to Public Health:

Worldwide, the prevalence of infertility is said to be 5-15%.⁹ A review of population-based surveys estimated the international prevalence of infertility to be 9% on the average¹⁰. In some parts of Nigeria, community based studies have reported rates of infertility as high as 20%⁹ and 45%¹¹. The prevalence of infertility in Sagamu, South-West, Nigeria has been reported to be 14.8%.¹²

Infertility is stigmatized reproductive health morbidity and a major public health issue in Nigeria and many other under developed and developing nations. This is a result of its high prevalence and especially because of its serious social implications as the African society places a passionate premium on procreation in any family setting.¹³

In a bid to avoid infertility, most couples avoid contraception because they opine that it is a risk factor. Hence, majority of them procreate endlessly and thereby frustrate existing health policies such as child survival strategies and improved maternal health that advocating contraception.

Justification for the Study:

Over the years, certain methods of contraception have been linked with infertility and these have discouraged many from engaging in them. In this study, we tried to find out if this 'so called' association between contraception and infertility is significant enough to discourage people from practising a particular method of contraception.

Objective of the Study:

The objective of this study is to determine the association between contraception and infertility among married individuals in Sagamu local government area (LGA), South-West, Nigeria.

Methodology:

Study Location

The study was carried out in Sagamu LGA of Ogun State, Nigeria. Sagamu LGA, one of the 20 LGAs in Ogun State. Ogun State is one of the six states in South-West geopolitical zone of Nigeria.

Study Design

A descriptive cross-sectional study was carried out among 500 married men and women living in Sagamu Local Government Area, South-West, Nigeria.

Study Population

Respondents were married individuals residing in Sagamu Local Government Area.

Sample Size

The sample size was determined using the statistical formula for descriptive study:

$$N = \frac{Z^2 pq}{d^2}$$

Where,

N = minimum sample size required

Z = constant; a confidence level of 95% = 1.96

p = measure of prevalence or proportion of event in %
= 14.8% = 0.148¹²

q = opposite of p = 1-p = 1- 0.148 = 0.852

d = precision value (95% confidence interval) = 0.05

$$\text{Therefore, } N = \frac{1.96 \times 1.96 \times 0.148 \times 0.852}{0.05 \times 0.05} = 193.76$$

$$20\% \text{ non-respondent value} = \frac{20 \times 193.76}{100} = 38.75$$

$$\text{Add } 20\% \text{ non-respondent value; } 193.75 + 38.75 = 232.51$$

However, a total of **500** respondents were studied from two selected political wards in Sagamu Local Government Area.

Sampling Technique:

The sampling technique used was multi-stage sampling technique. Out of the fifteen (15) wards in Sagamu LGA, two (2) wards were selected by simple random sampling technique with one being urban, and the other being rural. The urban ward was ward 5 (Sabo) while the rural ward was ward 9 (Ode-Lemo). Sabo ward has four (4) enumerations areas. Two (2) enumeration areas were selected by simple random sampling technique. Two (2) streets were selected from each enumeration area by simple random sampling technique. Every house was sampled.

At Ode-Lemo ward, the questionnaires were administered from house to house until the desired sample size was reached. This was done because there was no information available on the number of enumeration areas, streets and houses available even from the palace of the Lisa.

Data Collection Method:

Data was collected using semi-structured interviewer-administered questionnaires which had been pre-tested at Ikenne Local Government Area of Ogun State, South-West, Nigeria.

Data Analysis

Data analysis was carried out using the Statistical Package for Social Sciences (SPSS) version 17.0. Frequencies, means and relevant statistics (Chi-square) were calculated and presented as tables.

Ethical Considerations

Approval was sought from the Local Government Authority through the primary health care department. Permission to carry out the study was also obtained from the traditional ruler prior to commencement of the study. Participation in the study was fully voluntary. Strict confidentiality was ensured. Written informed consent was taken from each participant prior to the interview.

Limitations of the Study

Transportation to Ode-Lemo was a Herculean task which expended much energy and finance due to the

deplorable state of the road. The male respondents were initially uncooperative but they eventually agreed to the study after emphasizing the confidential nature of the study.

Table 1: Association between Methods of Contraception and Infertility

Method of Contraception	Percentage	Chi-square Value	P- Value	
Oral contraceptive pills (OCP)	11.3%	0.159	0.690	>0.05
Injectables	15.2%	0.408	0.523	>0.05
Condoms	18.6%	1.802	0.090	>0.05
Intra-uterine contraceptive device (IUCD)	5.7%	2.871	0.179	>0.05
Norplant	0%	0.584	0.445	>0.05
Other Contraceptive methods	9.1%	0.128	0.720	>0.05

p value > 0.05 is not significant

Results:

A total of 500 married men and women served as respondents for the study. Their mean age was 39.67 ± 9.88 years ranging from 19 to 60 years. Their mean duration of marriage was 13.37 ± 9.72 years. There were 26% male respondents and 74% female respondents. They were made up of 71.2% Christians, 27.2% Muslims and 1.6% traditional worshippers. The Yoruba tribe accounted for 88.6% of the population while Hausas were 1.4%, Igbos were 5.9% and others accounted for 4.1%.

5.3% were not formally educated while the highest educational level of others were primary school, secondary school and tertiary education which was 12.7%, 24.2%, 57.7% respectively. There were 49.4% professionals, 21.0% skilled workers, 9.9% semi-skilled, 25.5% unskilled and 3.2% were unemployed. 82.8% were married in a monogamous setting while 17.2% are polygamous.

74.6% of the total respondents believe that certain family planning methods can cause infertility. However, 46.7% of the total respondents had a history of contraceptive use irrespective of whether they are infertile or not. Among respondents with infertility, 12.2% had a history of contraceptive use.

Of infertile persons that had been on a particular kind of contraceptive, 11.3%, 15.2%, 5.7%, 18.6%, 0%, 9.1% had history of use of oral contraceptive pills, injectable, intrauterine contraceptive device, condoms, Norplant and other traditional methods of contraception respectively. However, none of these methods of contraception had significant association ($p > 0.05$) with infertility in this study as shown in Table 1 above.

Discussion:

74.6% of the total respondents believe that certain family planning methods can cause infertility. In a study in Ghana, respondents feared that contraception

can cause infertility and infertile couples further blamed their infertility on an earlier use of contraceptives¹⁴. Fear of future infertility was the overriding factor in adolescents' decisions to rely on abortion rather than contraception. Many perceived the adverse effect of modern contraceptives on fertility to be continuous and prolonged, while abortion was seen as an immediate solution to an unplanned pregnancy¹⁵. This might be due to the fact that the commonest source of information on contraceptives is from peer group/friends and mass media, not from health facilities, health care providers, or from school health education.¹⁶

46.7% of the total respondents had a history of contraceptive use irrespective of whether they are infertile or not. This is higher than a previous study done in 2004 in which contraceptive prevalence South-West, Nigeria was found to be 23%.¹⁷ This is probably due to increasing efforts in educating the public concerning the benefits of contraception and the proximity of the study location to a tertiary health centre. However, the consistency and correctness of contraception was not ascertained in this study.

Among respondents with infertility, 12.2% had a history of contraceptive use. However, of infertile persons that had been on a particular kind of contraceptive, 11.3%, 15.2%, 5.7%, 18.6%, 0%, 9.1% had history of use of oral contraceptive pills, injectable, intrauterine contraceptive device, condoms, Norplant and other traditional methods of contraception respectively.

11.3% of infertile persons have a history of use of oral contraceptive pills and this did not have a significant association with their infertility. A significant problem in Nigeria is a general lack of adequate information about the oral contraceptive pills. The myth that prolonged use of the oral contraceptive pills leads to permanent sterility has limited its use in Nigeria and may explain why most young females in Nigeria, especially students, prefer to use abortion instead of contraception for unwanted pregnancy.¹⁵

15.2% of infertile persons have a history of use of injectables. Women fear the side effects of hormonal contraceptive injections, probably because of

misinformation. However, amenorrhea, menorrhagia, and metrorrhagia were the major reason for the discontinuation of this method of contraception¹⁸.

5.7% of infertile persons have a history of use of intrauterine contraceptive device. Fear of infertility was a major reason for disapproval or discontinuation of the use of intrauterine contraceptive device among Nigerian women.⁷

18.6% of infertile persons have a history of use of condoms. According to the 2003 Demographic and Health Survey (DHS), the condom is reported to be the main contraceptive method known of and used by Nigerian women of reproductive age.¹⁷ The extensive marketing of condoms in response to the human immunodeficiency virus (HIV) epidemic, with the active involvement of government and nongovernmental organizations, has been equally responsible for this increased awareness and subsequent increase in condom use.¹⁶

There was no respondent with a history of use of Norplant. Norplant is the most commonly used long-acting progestin-only subdermal implant in Nigeria. During its first year of use, Norplant was shown to be highly effective and safe, and is considered an acceptable contraceptive method among Nigerian women of different ethnic groups.¹⁹ The fact that respondents in our study did not use Norplant at all suggests that there might be some prejudice or misinformation concerning its use.

Conclusion and Recommendation:

Infertility is a 'thorn in the flesh' of any family. Hence, it has always been a nightmare dreaded by both married and unmarried individuals. Any factor that would reduce their chance of conception in the future is jettisoned even if there are no claims to substantiate these. It is unfortunate that contraception fall into this category of 'stigmatised' factors and this explains why many Nigerians are not willing to embrace it. Individuals eventually have unplanned pregnancies and resort to unsafe abortion which later results in the infertility they once dreaded. Others that do not abort their pregnancies have large family size, thereby posing a risk to child, maternal and family health.

In this study, no method of contraception had significant association with infertility. This does not attempt to discredit any previous study that links a particular method of contraception with infertility. This study just revealed that the fear of infertility is not enough ground to buttress any argument against contraception.

Health facilities should intensify awareness of contraception and formulate practical follow-up measures that would encourage individuals to engage in contraception. The public should also be educated that apart from prevention of pregnancy, a certain method of contraception, the use of condoms can prevent the transmission of sexually transmitted infections (a major cause of infertility) and HIV/AIDS.

Further research should be done to investigate the awareness and use of Norplant in the study location. Similar studies should be carried out in other parts of Nigeria and Sub-Saharan Africa where the prevalence of contraceptive use has been found to be low due to the fear of its association with infertility.

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Ultrasound Evaluation & Characterization of Lumps & Bumps in Region of Foot & Ankle

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Abstract

Introduction: Musculoskeletal ultrasound is a very dynamic, cost effective & powerful tool for the evaluation of lumps & bumps in the region of foot & ankle. We present a case series of 56 patients with ultrasound findings in various 'lumps & bumps' in the region of foot & ankle.

Aims & objective: In this study we planned to evaluate and characterize 'lumps & bumps' in the region of foot & ankle with USG examination.

Material & method: The present study was conducted in the Department of Radio-diagnosis, TMMC & RC, Teerthanker Mahaveer University, Moradabad. Patients under study were referred from the department of Surgery and Orthopaedics. Patients included for study were evaluated by Clinical and Ultrasound examination.

Result: On examination distribution of lesions was found to be ganglion(36%), bursa related(24%), tendon and ligament related(14%), synovium related(4%), Inflammatory/Infective(4%), bony lesions(6%), vascular(4%), fatty lesions(4%) & foreign body related(4%).

Conclusion: Musculoskeletal ultrasound is a very dynamic and powerful tool for the evaluation of lumps & bumps in the region of foot & ankle. It is easily available & provides the option of real time & dynamic imaging of the joints & tendons as well as it helps in the assessment of vascularity of the lesion. MRI cannot be replaced by Ultrasound. However, USG should be the primary investigation for the evaluation and characterization for the 'lumps & bumps' in the foot & ankle region.

Key Words: Musculoskeletal, Ultrasonography, lumps & bumps, foot and ankle.

Introduction:

Musculoskeletal Ultrasound is used very frequently in evaluation of lumps present in the region of foot & ankle. Foot contains relatively small amount of soft tissue and rich in ligaments, tendons, fasciae, synovial & subcutaneous tissues. Because of the compact anatomy of foot, lumps in the foot & ankle region usually present at earlier stage.¹ Ultrasound is easily available & cheap modality. On the other hand, it provides the real time and dynamic imaging of the ligaments & joints.²⁻⁶ Color & power Doppler are the other tools available to assess vascularity of the lesions simultaneously.⁷ Comparison with the other

ankle & foot is also helps in evaluation & characterization of the swelling.⁸

MRI evaluation & Histopathological confirmation might be needed for further evaluation & can not be replaced by Ultrasound. However, USG should be the primary investigation for the evaluation of lumps in the region of foot & ankle.

Material & Method:

The present study was conducted in the Department of Radio-diagnosis, TMMC & RC, Teerthanker Mahaveer University, Moradabad. Patients under study were referred from the

department of Surgery & Orthopaedics. Patients included for study were evaluated by Clinical and Ultrasound examination.

Patient Evaluation: Patients were evaluated along the following lines.

A. Clinical Examination: A detailed clinical case history was taken from all cases and through general physical and local examination were carried out.

B. Radiological Evaluation:

Ultrasonography: High-resolution real time sonography of the lumps & bumps of foot & ankle

was done in all patients. Scanning done with 7-10 MHz transducers on MEDISON Diagnostic ultrasound system installed in Department of Radio-diagnosis, TMMC & RC, TMU, Moradabad. The sonographic examination of the foot was performed via medial, lateral & dorsal approach with patient in supine position & for posterior ankle & tendo-achilles complex in prone position(2-4,9). Color Doppler(CD) & Power Doppler (PD) also used for assessment of vascularity of the lesion. Joints, ligaments & tendons were evaluated dynamically as well, to assess subluxation, dislocation & tear.

Results:

Table-1: Lesion Detection in 56 Patients on USG Examination in Foot and Ankle Region
(Number of Patients) N = 56

Nature of lesion	No. of Cases
Lesions	50
Indeterminate	02
Normal	04

Table-2: Ultrasonic Characterization of 50 Lesions in Foot and Ankle Region

(Number of Lesions)

N = 50

Nature of lesion	No. of Cases	Percentage
Ganglion	18	36
Bursitis	12	24
Tendon & ligament related		
Tenosynovitis	04	08
Tendon subluxation /Rupture	02	04
Tendinopathy	01	02
Bony lesion	03	06
Synovial	02	04
Abscess/Cellulitis	02	04
Foreign body related	02	04
Fatty lesion	02	04
Vascular malformation	02	04
Total	50	

Discussion:

In our series, 56 patients with complaints of lumps & bumps in foot & ankle region were assessed. Mostly patients presented with clinical features of lumps/swelling, pain, paresthesia, restricted mobility and combination of these complaints.

Out of 56 patients, lesions were detected in 50 patients on ultrasound examination, while 4 patients were normal on clinical & ultrasound examination and two patients were with indetermined lesions on USG. Ganglions were the largest group, representing 36% (18 out of 50) of lesions. On ultrasound it

showed a typical well-defined uni/multilocular anechoic cystic lesion with posterior acoustic enhancement debris within, & closely approximated with tendon sheath and joint. Septations and internal echoes were noted in complex ganglion lesions. On CD & PD, mostly lesions present with increased peripheral vascularity.

Bursitis comprised 24% (12 out of 50) of lesions. On ultrasound it showed anechoic/hypoechoic lesions within normal bursa at typical locations i.e. Inter metatarsal, retrocalcaneal or at friction sites. Related bursal wall thickness were increased or normal in

cases with acute presentations. However, it is increased in chronic Bursitis. Few lesions showed internal septations, echoes & wall calcifications. On CD & PD mostly lesions present with increased peripheral vascularity. Air shadowing was also noted along with inflammatory changes within bursa suggestive of superadded infections.

Tendon & ligament related lesions comprised 14% (7 out of 50) of all lesions. Out of which 4 lesions turned out to be Tenosynovitis, 2 lesions with tendon subluxation/Rupture related with history of trauma and 1 lesion out of 7 showed changes of Tendinopathy. On ultrasound it showed low echogenicity, swelling, fibers disruption and calcifications along with increased or normal vascularity.¹⁰⁻¹²

Three out of fifty lesions(6%) were turned out to be related with bony pathology, comprised of osteophytes, callus due to stress fracture and exostosis ,and were confirmed with X-Ray foot & ankle examination.

Two out of fifty (4%) lesions showed synovial pathology and were present with past history of rheumatoid arthritis. On ultrasound there were presence of joint effusion and heterogeneous synovial proliferation at metatarso-phalangeal and proximal inter-phalangeal joints. These patients were also examined by X-Ray of foot & ankle & confirmed on serological marker examination.

Two out of fifty (4%) lesions turned out to be abscess/cellulitis of inflammatory/infective nature. On ultrasound it showed soft tissue swelling, edema & air shadowing along with increased vascularity on CD & PD.

Two out of fifty lesions (4%) were with suspected foreign body with history of thorn prick in sole of foot, showed echogenic lesion with posterior acoustic shadowing & hypoechoic rim along with associated inflammatory soft tissues changes. Foreign bodies

were detected, marked and were evaluated for the depth from surface.

Two out of fifty (4%) lesions showed fatty nature. On ultrasound showed well-defined echogenic masses and were confirmed on histopathology.

Two out of fifty (4%) lesions turned out to be of vascular nature, showed multiple vascular channels with arterial and venous flow on CD & PD along with associated soft tissue swelling in the region.

Conclusion:

Musculoskeletal Ultrasound is a very dynamic and powerful tool for the evaluation of lumps & bumps in the region foot & ankle. Most of the soft tissues in foot and ankle region can be easily evaluated by ultrasonography. The advantages of USG include good availability, cheaper, fast, with no ionizing radiation, and it provides real-time and dynamic imaging of the ligaments and tendons of the joints. As well as it helps in the assessment of vascularity of the lesion. MRI cannot be replaced by Ultrasound. However, USG should be the primary investigation for the evaluation and characterization for the 'lumps & bumps' in the foot & ankle region.

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The Effectiveness of Oral Health Education Program with and without Involving Self-Maintainable Oral Hygiene Skills among the Visually Impaired Children

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Abstract

Introduction: Vision is the most important sense for interpreting the world around us and when sight is impaired especially in childhood it can have detrimental effects on physical, neurological, cognitive and emotional development and remains the remainder of an individual's life time.

Aim: Evaluating the effectiveness of a Dental Health Education program with and without involving Self Maintainable Oral hygiene skills among the institutionalized visually impaired children in Chittoor and Nellore Districts of Andhra Pradesh, India.

Material & Methods: A single blind, controlled, repeated measure trial to study the effects of health education program involving with and without self-maintainable oral hygiene skills among visually impaired children of two different visually impaired institutes was designed. Statistical analysis was performed using the SPSS version 19.0 software package.

Results: Comparison of mean PCR scores at first evaluation to that of base line indicated that there was an overall mean reduction to about 26 % .After second evaluation the mean reduction of PCR among cases and controls was 68.84% and 21 % respectively .After third evaluation the values were compared between cases and controls and among themselves to find the final effectiveness of the conducted study. Results showed that health education is beneficial in improving oral hygiene of the visually impaired children and are able to perform self-maintainable skills taught to them with relative ease.

Conclusion: Health education is beneficial in improving oral hygiene of the visually impaired children. Health education combined with self-maintainable skill training provides the maximum benefits in terms of improvement in oral hygiene as is evident from this study. Self-maintainable oral hygiene skill training is definitely achievable amongst the visually impaired subjects. The visually impaired subjects are able to perform self-maintainable skills taught to them with relative ease.

Key Words: Visual Impairment, Plaque Control Record (PCR), Oral Health Education, Oral Hygiene Skills.

Introduction:

Vision is the most important sense for interpreting the world around us and when sight is impaired especially in childhood it can have detrimental effects on physical, neurological, cognitive and emotional development and remains the remainder of an

individual's life time. Visual impairment is perhaps the worst form of disability and even a very common one. Most importantly, it makes an affected individual to constantly depend on others for even daily routine tasks, hurting an individual's self-esteem.

However, some neglected subgroups in the society including children with disabilities, have poor oral health. This higher level of oral disease among children with disabilities may be due to the fact that teaching students to manage their disability is of major concern among educators, but oral hygiene is not a priority.¹

In addition, people with visual impairment may have difficulty maintaining oral hygiene since they are less able to detect early symptoms of tooth decay that are typically recognized through vision.² For example, discoloration of teeth suggests tooth decay, and bleeding when brushing is an early sign of gingival inflammation. The observation of these symptoms would remind sighted people to seek dental treatment. However, people with visual impairment can be at a disadvantage as they are not in a position to detect or recognize early disease visually.³

Many studies have reported that people with visual impairment, like those with other disabilities, tended to have a large amount of dental plaque and were at a higher risk for dental diseases than were sighted people.⁴

In addition some children with visual impairment may have limited eye - hand coordination or manual dexterity, which is necessary to execute adequate oral hygiene skills such as brushing and flossing teeth. Consequently, the acquisition and maintenance of oral hygiene skills remain an important and a challenging task for the visually impaired.

Given that students who are visually impaired need to learn oral hygiene skills as do all children, dental instruction programmes targeting these groups must be developed. Despite the urgent need for subjects with visual impairment to learn these skills, little research has been conducted on teaching oral hygiene skills to them. Studies in dental literature on teaching oral hygiene skills to visually impaired are very scarce or practically nil. The dental profession also has paid only a lip service in this regard.

Based on these ground realities this study was thus under taken to find out "The Effectiveness of a Dental Health Education Program with and without involving self-maintainable oral hygiene skills among

the visually impaired children in Nellore and Chittoor districts of Andhra Pradesh, India".

Methods:

A single blind, controlled, repeated measure trial to study the effects of health education program involving with and without self-maintainable oral hygiene skills among visually impaired children of two different visually impaired institutes was designed.

Ethical clearance was obtained by the ethical committee of Narayana Dental College & Hospital, Nellore. Voluntary informed consent was obtained by the parents of the children to participate in the study, permission and cooperation was solicited from the authorities at the institute during the entire period of study.

The study involved 159 children aged 5-17 years of age from two separate institutes in Chittoor and Nellore districts of Andhra Pradesh, India. One institute at Nellore was randomly selected to act as an external control group, the findings of which were compared with the case group at Chittoor district. These two institutes are about 135 kms from each other. This was done to avoid bias resulting from informal contacts between the study and the control group. Internal comparisons were also made within the cases and control groups between baseline, I, II and III evaluations.

The participants, their parents & guardians were informed that they were not liable for any penalty or punishment for non-participation in the study. They were further informed that they can withdraw from the study any time during the period of study. Their continuous collaboration was sought for their own benefit if any.

Inclusion criteria:

- All participants who gave informed consent.
- Participants residing in the institute irrespective of the degree of visual impairment.

Exclusion criteria

- Participants with visual impairment associated with any systemic condition/ associated disability.

The participants attended regular classes for the majority of the school day and received vision related services from teachers in the vision resource room.

Materials:

Basic Health Education

Health education was provided by Socratic Method at a group level. All the participants were classified into three groups based on the traditional school system.

Group I - Lower Primary School Students

Group II - Higher Primary School Students

Group III – Secondary School Children

Separate health education sessions were conducted for different age groups in the study based on their level of comprehension. Written material in the form of pamphlets in Braille were prepared with the help of teachers. These were distributed to individual students for self-learning. The contents of the Pamphlets were based on the level of understanding, and comprehension for each group of participants.

The same procedure of health education was provided for both the study and the control group. Percentage of attendance for health education and skill training programs was recorded for both cases and controls.

Health education provided to both the groups involved basic knowledge about:

- Importance of Oral health
- Functions of teeth.
- Importance of teeth for healthy living
- Functions of a tooth brush
- Naming the parts in the mouth
- Importance of brushing twice a day.
- Basic methods available to maintain oral hygiene.
- Distinguish between beneficial and harmful foods for oral health
- Harmful oral habits
- Emergency self-care when teeth are injured.
- Reasons and the appropriate time to seek professional help.

Skills Training

The case group only was trained in Self maintainable oral hygiene skills. The Skills included

in this study were the most basic and the ones which are specifically important to the visually impaired.

- Identifying tooth brush and paste in the bath rooms on their own
- Maintenance of a tooth brush
- Dispensing the paste on the brush without assistance.
- Training of an appropriate method of Tooth brushing by the investigator so that they could master the method of brushing on their own without depending on others.
- Dental Flossing Technique using indigenous material to subjects for whom flossing was necessary.
- Teaching the participants to feel the surfaces of the teeth that are covered with food debris with tongue and fingers so as to clean the surfaces and to maintain good oral health on their own.
- Enabling them to identify food debris with a toothpick, to touch and smell and to enable them to clean the food debris that is present on the tooth surfaces.
- Feeling a normal tooth and the carious tooth by touch and kinesthetic senses.

The study involved three further evaluations. First evaluation was done following four sessions of health education separately for each group among cases and controls. Second evaluation was performed following eight sessions of group level health education for both the groups while the case group additionally received individual training in performing oral hygiene skills. Third evaluation was performed after the cessation of intervention to both the groups for a period of 4 months. The total duration of the study was thus 11 months.

Each subject was personally trained & supervised in performing skills mainly teeth brushing. Flossing was trained for subjects only where it was necessary. The subjects were further encouraged to feel and detect plaque by running the tongue over their teeth before and after brushing and to recognize the “furred” feeling of unclean teeth, they were further encouraged to brush those areas with more emphasis. The subjects were also trained to use tooth pick on

areas of teeth which may have plaque and to smell it which further aided in plaque identification. In this study the material used for maintaining oral hygiene was the one which was already being used by the subjects in the institutes. The programs were planned keeping in mind the core objective of health education that is to undertake various self-help measures and to improve their own health.

The method of teeth brushing that the children were trained were:

- Group I: Fones technique.
- Group II: Scrub technique.
- Group III: Scrub technique.

Results:

Basic demographic data of all participants was recorded by the investigator himself in a specially designed proforma prior to intervention. Clinical parameters were also recorded in the same proforma. Basic dental treatment was provided for the subjects at both the institutes after baseline data recording. The treatment consisted mainly of oral prophylaxis and basic restorative care.

The studied population comprised of a total of 159 subjects, of which 95 were cases and 64 controls. The subjects were divided into three Groups based on the

traditional educational levels into Group I with 37 subjects of lower primary school aged 5 yrs to 8 yrs, Group II with 69 subjects of higher primary school aged 9 yrs to 12 yrs and Group III secondary school with 53 subjects aged 13-17 yrs. Statistical analysis was performed using the SPSS version 17.0 software package. Descriptive statistics were calculated and Chi Square test was employed to test the significance. The socio demographic characteristics of the studied subjects are as described in table 1. There was no statistical significant difference between various socio demographic parameters studied viz Age, Gender, Degree of Visual Impairment, Duration of stay between cases & controls.

Mean PCR scores among various groups between cases and controls at base line was not statistically significant in any of the 3 groups as shown in table 2. Group related mean PCR scores at base line for cases & controls found to be not statistically significant, as shown in table 3.

Comparison of mean PCR values at Base line, I, II, III evaluations are as shown in table 4. There was a consistent and statistically significant drop in mean PCR values among cases from Base line to III evaluation in all the 3 groups, whereas among the controls initial reduction was followed by an increase in the PCR values.

Table No. 1: Age, Gender and Degree of Visual Impairment and Duration of Stay of the Subjects in the Study

Parameter	Cases			Control			p value
Age	Group I	Group II	Group III	Group I	Group II	Group III	0.73
	22	38	35	15	31	18	
Gender							
Male	12	19	19	9	21	11	0.94
Female	10	22	13	6	10	7	1.52
Degree of Visual Impairment							
Partial	5	9	10	5	9	4	0.62
Complete	17	29	25	10	22	14	0.97
Duration of Stay (in years)	3.7	6.3	10.2	3.1	5.9	9.3	0.6

Table No. 2: Group and Gender Related Mean PCR Values at Base Line

Group	Cases		Controls		p value
	Male	Female	Male	Female	
I	20.16±2.5	18.27±1.67	19.34±1.09	18.11±2.09	0.86
II	13.12±1.9	14.2±1.67	13.39±1.07	13.41±1.74	1
III	26.11±2.9	24.31±2.68	25.11±3.2	27.18±2.74	0.54

Table No. 3: Group Related Comparison of Mean PCR Scores between Cases and Controls at Base Line

Group		Base line
Group I	Cases	19.34±3.6
	Controls	18.12±2.1
Group II	Cases	17.36±1.2
	Controls	18.32±3.2
Group III	Cases	24.21±1.2
	Controls	25.41±3.6

Table 4: Group Related Comparison of Mean PCR Scores between Cases and Controls at Various Stages of the Study

Group		Base line	I st Evaluation	II nd Evaluation	III rd Evaluation	P value
Group I	Cases	19.34±3.6	15.02±1.3	10.23±2.3	7.13±2.1	0.01
	Controls	18.12±2.1	13.60±1.6	12.5±2.4	16.8±1.5	
Group II	Cases	17.36±1.2	13.13±2.1	6.68±1.8	5.28±3.1	0.05
	Controls	18.32±3.2	13.41±3.2	12.8±2.1	15.3±2.6	
Group III	Cases	24.21±1.2	19.14±1.7	12.55±2.4	9.4±2.3	0.01
	Controls	25.41±3.6	18.11±2.8	17.2±2.3	21.4±2.1	

Discussion:

The goal of all planned health education programs is not only to bring about a change in the behavior but also to reinforce the existing health behavior. Hence health education programs should aim at developing favorable attitudes, habits and most importantly skills.⁵ The prevention of most dental diseases became a reality following epidemiologic studies that demonstrated a correlation between dental plaque and dental disease. The dental profession has since then responded to this information by establishing programs that taught dental plaque removal by efficient brushing and flossing.⁶

Schools are thought to be the most suitable environment to provide health information to children in order to achieve the goals of health education programs, as children are relatively accessible and are already in a learning environment. Dental health education programs in schools are thus popular. These programs have resulted in improvements in oral hygiene among school children over the past few decades. However, some significant subgroups of children including children with disabilities traditionally have higher levels of oral disease. This higher level of oral disease among the disabled may be due to the fact that teaching students to manage their disability is of major concern among the educators and oral hygiene is of least priority.¹

Visual impairment is perhaps the worst form of disability affecting everything and anything in human life; it is like leading a life in black. In addition they experience difficulty in all day to day activities yet having a sense of the world around them which they can only feel but not visualize. They have difficulty maintaining oral hygiene as they are less able to detect early symptoms of tooth decay and gingival inflammation which are typically recognized through vision.²

Visually impaired children are more adapt to converting instructions into manual practice and if trained can have same levels if not better oral health than their sighted partners.¹

This study was thus carried out with an aim of evaluating the effects of health education programs with and without involving skill training among the

visually impaired children residing in two separate institutes in the state of Andhra Pradesh, India. The institutes though separated from each other had similar groups of students in terms of age, gender, education, outside interaction, degree of visual impairment, the level of oral health, etc, as evidenced in the demographic data presented in the results section, thus making comparisons by eliminating confounding bias.

Various studies have shown that the kinesthetic and olfactory senses among the visually impaired subjects are more superior compared to the sighted individuals. This fact can be exploited to the betterment of the visually impaired children. This study too employed the use of kinesthetic and olfactory senses of visually impaired subjects to teach self-maintainable oral hygiene skills.

In a nutshell the results of this study indicate that the participants' oral hygiene status improved significantly at the completion of study. The PCR demonstrated the positive benefits over time of class room based instruction with individual skill training, as is evident with a PCR reduction from 20.28 to 13.16 with accounting to about 68% reduction among cases and 20% reduction among controls, these findings are similar to those of Yeng Hung Shi et al.⁷ Further comparative of this study revealed some interesting points which are discussed here as under. At baseline the PCR values for the studied population was 21.25 ± 3.5 , which is significantly above the values for reported for normal sighted subjects.^{2,4}

Gender wise comparison of the mean PCR values revealed that there was no statistically significant difference between males and females of either the case or the control group.^{3,8}

Mean PCR values among the partially impaired were comparatively lesser than those of the totally impaired subjects, proving that the partially blind subjects had a definite advantage compared to their totally impaired counterparts.^{3,9,10}

This study revealed that there was 26% of reduction in mean plaque scores compared to baseline; however the difference in reduction between cases and controls was not significant. However, the findings of this study supported other studies who reported similar

benefits among the visually impaired children following health education.^{3,7,10}

Percentage reduction of PCR values in terms of different groups and gender was found to be statistically insignificant in this study, indicating that the ability to grasp and practice health education message will not be affected by gender.

Percentage reduction of Mean PCR values in relation to the degree of visual impairment was measured in this study; it was found that there was a mean reduction of 17% in plaque scores among subjects with total visual impairment compared to a 24% reduction among subjects with partial impairment.^{3,10}

This study found a mean reduction of plaque scores of about 68.7% among cases compared to 23 % among controls at second evaluation, these findings should be accepted with caution as the evaluation was carried out immediately after the cessation of the intervention programs. These values were found to be slightly better compared to the ones reported by Yeng Hung et al ⁷, who reported an average value of 64% at second evaluation. Nevertheless it should be realized that efficient plaque control was achieved following a combined intervention of health education and skill training compared to health education alone.

Group related comparison of the intervention among cases in this study revealed that a maximum reduction was achieved among Group II subjects with a nearly 70% reduction, this was followed by a 68% reduction among Group III subjects and the least amount of reduction was observed among Group I subjects at 52%, the reasons for this variation in reductions should be further explored.

There was an approximately 52.72% reduction, and 45.12% reduction in mean plaque scores among the males and females respectively of the studied population, this difference was not statistically significant.

Among the cases also gender based comparison of mean reduction of PCR values yielded statistically insignificant results. It can be assumed that irrespective of gender the studied population could understand and implement the health education message.

This study also finds that group wise gender comparison of mean reduction of PCR scores was similar to group wise comparison independent of gender, stressing again that in the studied population gender does not interfere with the understanding and implementing of health education messages and skills.

Percentage of reduction in mean PCR scores was compared in relation to the degree of visual impairment. This study revealed that there was no statistically significant difference in the mean reduction of PCR scores amongst the totally & partially visually impaired subjects contrary to the findings of previous studies ^{4,8,10} who reported a more reduction primarily due to better perceptive and conceptual understanding and a better interaction with environment amongst the partially visually impaired. This study could not find any difference because of the fact that in this studied population the degree of visual impairment among the partially impaired was higher compared to other studies as mentioned. Group wise analysis in relation to the degree of visual impairment also did not find any statistically significant differences.

Third evaluation was conducted after 11 months of the start of study and 3 months after cessation of intervention for both cases and controls. There was rebound of the values both amongst cases and controls by about 7% amongst cases and about 3% amongst controls. However statistically significant reduction of about 68% amongst cases was observed similar to the findings of Yeng- Hung Shih.⁷ The rebound might have occurred due to the fact that the IIIrd evaluation was carried out after the period of vacation during which most of the subjects went home.

Group wise analysis revealed that the percentage reduction continued amongst group I, compared to the other two groups indicating that skills thought younger in life are better retained like any other children.^{6,8,11,12,13,14}

There was no difference in the mean reduction amongst males & females, however there was slight but negligible rebound of values. There was a rebound of 1% among the partially impaired and the same

amount of rebound was seen in the totally impaired children.

The study shows that the main source of oral health information is schools, whether or not visually impaired students because a productive member of society completely depends up on the education they receive. As such, educational opportunities that are provided for children without disabilities should also be provided for children with visual impairment. Intensified focus on educational and preventive programs might help to keep those with the disabilities from having negative dental experiences. It can be concluded from this study that oral health education programmes, nevertheless, are likely to be an important influence on the oral health of disabled children.

Conclusions:

This study was mainly aimed at making the visually impaired subjects to at least perform basic oral hygiene measures independently. The points worth observing at the outset are:

The number of visually impaired children is increasing and have higher levels of oral diseases compared to their sighted counter parts. Teaching to manage their disability alone has become the priority amongst the educators and institutes. Olfactory, kinesthetic and auditory senses among the visually impaired subjects are advanced compared to non visually impaired subjects.

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Effects of Carbonated Drink & Fruit Juice on Salivary pH of Children: An in Vivo Study

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Abstract

Introduction: Urbanization and economic development has resulted in rapid changes in diet and lifestyles. Though people are aware of the deleterious effect of carbonated beverages and fruit juices on the teeth, they do prefer to consume these things. Purpose of the study is to assess the changes in salivary pH at different intervals after consumption of carbonated drink & fruit juice.

Material & Method: Thirty nine children age 8 to 12 years were assessed for changes in salivary pH at different interval after consumption of carbonated drink & fruit juice on two different days. Changes in salivary pH were checked at different interval of immediate, 5 minutes, 10 minutes, 15 minutes & 30 minutes.

Result: Present study shows higher fall in immediate salivary pH after mixed fruit juice when compared to cold drink. Immediate salivary pH value ranged from 3.21 to 6.86 with a mean value of 5.47 ± 0.78 (SD) for cold drink where for mixed fruit juice it was 3.26 to 6.53 with a mean value of 4.89 ± 0.97 (SD).

Conclusion: Present study suggested that there is a decline in the salivary pH after consumption of both types of beverage. There was higher fall in the salivary pH in the case of fruit juice when compared to carbonated drink. Regular consumption of such drinks should be discouraged.

Key Words: Salivary pH, Digital pH Meter, Dental Erosion, Caries.

Introduction:

The concept of health has prevailed for centuries and the dietary habits are apparently changing as well. Urbanization and economic development have resulted in rapid changes in diet and lifestyles. The diet we are consuming has become more refined with increased access to readymade drink.¹ Also there has been a substantial increase in consumption of carbonated beverage & fruit juices.² Now a day's "healthy eating" is considered to be important. Though people are aware of the deleterious effect caused by carbonated beverages and fruit juices on the teeth, they do prefer to consume these things.³ The literature reveals that parent's influence, peer

pressure, diet fallacies, pleasure and taste are the reasons that lead children to consume these drinks.^{2,4} Saliva plays an important role in maintaining the integrity of teeth by way of its buffering action and controlling the demineralisation and promoting remineralization, occurring continuously at the enamel surface.⁵ The pH value, the calcium and phosphate content of a drink or food stuff are important factors responsible for the erosive attack and formation of dental caries.^{2,6} It also is known that the plaque pH goes from acidic to normal (or the resting level) within a few minutes and depends on the presence of saliva. This is primarily due to the carbonate and phosphate pH buffering agents in the

saliva.⁵ The production of acid by bacteria in such close proximity to the tooth surface would mean that on consumption, the enamel demineralization could occur, hence their acidogenic and cariogenic potential.^{7,8} The erosive effect of fruit juices has been recognized for a long time as evident in the studies of Darby (1892)⁹ and W.D. Miller (1907)¹⁰ who reported tooth decalcification due to excessive fruit juice consumption.

The soft drinks are thought to cause damage to the teeth because of two properties – first, the low pH and titrable acidity of some drinks can cause erosion on the enamel surfaces^{11,12} and secondly the fermentable carbohydrate in drinks is metabolized by plaque micro-organisms to generate organic acids in the dental plaque and saliva, resulting in demineralization and leading to dental caries.¹³ Packaged fruit juices are sweeter having higher sugar content to enhance their taste and carbonated beverages have higher acidic content which causes demineralization of enamel tooth surface.¹⁴

There has been a recent growth in the number of carbonated drinks and fruit juices in the Indian market possibly due to new production companies and the expansion of established ones. This, coupled with the rise in consumption of fruit juices especially among children was our chief concern. A grey area still exists with not enough literature on these products on oral health. Hence this study was conducted to assess the acidogenic potential of cold drink & fruit juice.

Material & Method:

The present study was conducted on thirty nine children with age 8 to 12 years. Subjects reporting to the outpatient department of the Teerthankar Mahaveer Dental College & Research Centre, Moradabad was assessed. Ethical clearance was obtained from Teerthankar Mahaveer University, Moradabad & written informed consent was taken from the parent of each patient.

Test drink:-

Two test drink used here

1. Cold-drink (Mirinda)[®]
2. Mixed fruit juice (Tropicana)[®]

An instrument used: - bench type pH meter (HANNA instrument, USA) having an accuracy of \pm pH 0.01

Subject selection: Following were the inclusion & exclusion criteria.

Inclusion criteria:

1. All subjects who were medically fit and healthy.
2. Subjects who had DMFT & dmft less than 2.
3. All subjects who were having a strictly vegetarian diet.

Exclusion criteria:

Exclusion criteria will comprise of any:-

1. Subject having any history of systemic diseases & Infection diseases.
2. Subject suffering from any congenital diseases.
3. Subject with History of any antibiotic 2 months prior to the study.

The children were assessed on the first day for dental caries through dmft/DMFT index & dietary history was taken. The test was started from second appointment, so as to reduce any effects of anxiety that might have had on a child visiting the dentist for the first time. For saliva collection, each child was instructed not to eat or drink anything for up to 2 hours preceding the appointment. Each patient was given a simple explanation as to the nature and reasons for the test before collecting saliva samples. Each subject was asked to come for 3 days regularly for the test, for one of the products on each day.

- ✓ Day1: dietary history, DMFT/ dmft
- ✓ Day2: assessment of salivary pH changes with cold drink (group1)
- ✓ Day3: assessment of salivary pH changes with mixed fruit juice (group2)

The salivary pH was of both unstimulated and stimulated saliva was measured. Unstimulated pH was measured at the same time of the day. The pH meter was calibrated each day prior to measurement for accurate reading. The accuracy of the pH meter was checked at regular intervals to ensure that readings were correct. For the collection of unstimulated saliva, the children were asked to sit

comfortably. After the baseline score was recorded, beverages were tested on all children on two subsequent days. The children were asked to drink the beverages from a glass without using a straw. After intake of different beverages & eatables immediately salivary pH were measured. Salivary pH was measured at the interval of 5, 10, 15 & 30 minutes later.

To measure the pH of saliva, saliva was collected in disposable spoon, to avoid any contamination of sample. The pH-sensitive electrode was dipped in sample for the reading. The digital reading was allowed to stabilize for a few seconds and the pH reading was taken. In between readings, the electrode was cleaned with distilled water and placed in a standard solution of pH 7.0. This ensured stable readings and provided a constant check on the drift. The pH was measured immediately after collection.

Results:

The observations have been discussed in two parts:

- a) **Within group changes**
- b) **Intergroup differences**

i) Group I: Cold Drink

At baseline salivary pH values ranged from 6.18 to 7.65 with a mean value of 6.99 ± 0.36 (SD). Immediately after intake of cold drink, salivary pH values ranged from 3.21 to 6.86 with a mean value of 5.47 ± 0.78 (SD). After 5 minutes of intake of cold drink, salivary pH values ranged from 5.21 to 7.48 with a mean value of 6.52 ± 0.54 (SD). After 10 minutes of intake of cold drink, salivary pH values ranged from 5.18 to 7.57 with a mean value of 6.46 ± 0.53 (SD). After 15 minutes of intake of cold drink, salivary pH values ranged from 5.63 to 7.53 with a mean value of 6.54 ± 0.46 (SD). After 30 minutes of intake of cold drink, salivary pH values ranged from 5.88 to 7.7 with a mean value of 6.86 ± 0.45 (SD). (Table No. 1)

ANOVA was used to evaluate the effect of time on salivary pH after intake of Cold drink. In evaluating the effect of time on the salivary pH levels after intake of cold drink, it was found to be significant statistically ($F=68.404$; $p<0.001$). A maximum mean difference was observed between

baseline and immediately after intake of cold drink while the minimum difference was observed between 5 minutes and 15 minutes after intake of cold drink. (Table No. 2)

ii) Group II: Mixed Fruit Juice

At baseline salivary pH values ranged from 6.27 to 7.76 with a mean value of 6.97 ± 0.39 (SD) immediately after intake of Mixed Fruit Juice, salivary pH values ranged from 3.26 to 6.53 with a mean value of 4.89 ± 0.97 (SD). After 5 minutes of intake of Mixed Fruit Juice, salivary pH values ranged from 0.76 to 7.29 with a mean value of 6.35 ± 1.07 (SD). After 10 minutes of intake of Mixed Fruit Juice, salivary pH values ranged from 5.26 to 7.48 with a mean value of 6.43 ± 0.53 (SD). After 15 minutes of intake of Mixed Fruit Juice, salivary pH values ranged from 5.26 to 7.48 with a mean value of 6.43 ± 0.53 (SD). After 30 minutes of intake of Mixed Fruit Juice, salivary pH values ranged from 5.33 to 7.54 with a mean value of 6.59 ± 0.51 (SD). (Table No. 1)

ANOVA was used to evaluate the effect of time on salivary pH after intake of Mixed Fruit Juice. In evaluating the effect of time on the salivary pH levels after intake of Mixed Fruit Juice, it was found to be significant statistically ($F=59.599$; $p<0.001$). A maximum mean difference was observed between baseline and immediately after intake of Mixed Fruit Juice while the minimum difference was observed between 5 minutes and 10 minutes after intake of Mixed Fruit Juice. (Table No. 3)

Between Group Differences

At the baseline mean salivary pH levels in different groups ranged from 6.99 to 6.97. Immediately after intake of beverages, Groups I and II showed a sharp decline in pH. However, from 5 minutes interval onwards, all the groups showed a tendency to return towards baseline values. This return was early and sharp in Groups I, II. (Graph No. 1)

At baseline, none of the between group comparisons were significant statistically. At immediately & 5 minutes after the intake interval, they were significant statistically. At 10 minutes, 15 minutes & 30 minutes post intake interval no differences were significant statistically. (Table No. 4)

Table No. 1: Shows Mean pH Values of Two Groups at Different Time Intervals

SN	Time Interval	Group I (n=39)		Group II (n=39)	
		Mean	SD	Mean	SD
1	Baseline	6.99	0.36	6.97	0.39
2	Immediate	5.47	0.78	4.89	0.97
3	5 min	6.52	0.54	6.35	1.07
4	10 min	6.46	0.53	6.43	0.53
5	15 min	6.54	0.46	6.59	0.51
6	30 min	6.86	0.45	6.87	0.46

Table No. 2: Shows Pairwise Comparison of Mean pH Levels at Different Time Intervals for Cold Drink

Comparison	Mean Difference	SE	Significance	95% Confidence Interval for Difference	
				Lower bound	Upper bound
Baseline vs Immediate	1.518	0.129	<0.001	1.257	1.779
Baseline vs 5 min	0.471	0.078	<0.001	0.312	0.629
Baseline vs 10 min	0.534	0.065	<0.001	0.401	0.666
Baseline vs 15 min	0.455	0.051	<0.001	0.352	0.557
Baseline vs 30 min	0.126	0.046	0.009	0.033	0.219
Immediate vs 5 min	-1.047	0.118	<0.001	-1.286	-0.808
Immediate vs 10 min	-0.984	0.126	<0.001	-1.239	-0.729
Immediate vs 15 min	-1.063	0.125	<0.001	-1.317	-0.809
Immediate vs 30 min	-1.391	0.141	<0.001	-1.678	-1.105
5 min vs 10 min	0.063	0.065	0.340	-0.069	0.195
5 min vs 15 min	-0.016	0.080	0.843	-0.177	0.145
5 min vs 30 min	-0.344	0.092	0.001	-0.530	-0.158
10 min vs 15 min	-0.079	0.053	0.145	-0.187	0.029
10 min vs 30 min	-0.407	0.067	<0.001	-0.542	-0.272
15 min vs 30 min	-0.328	0.040	<0.001	-0.409	-0.247

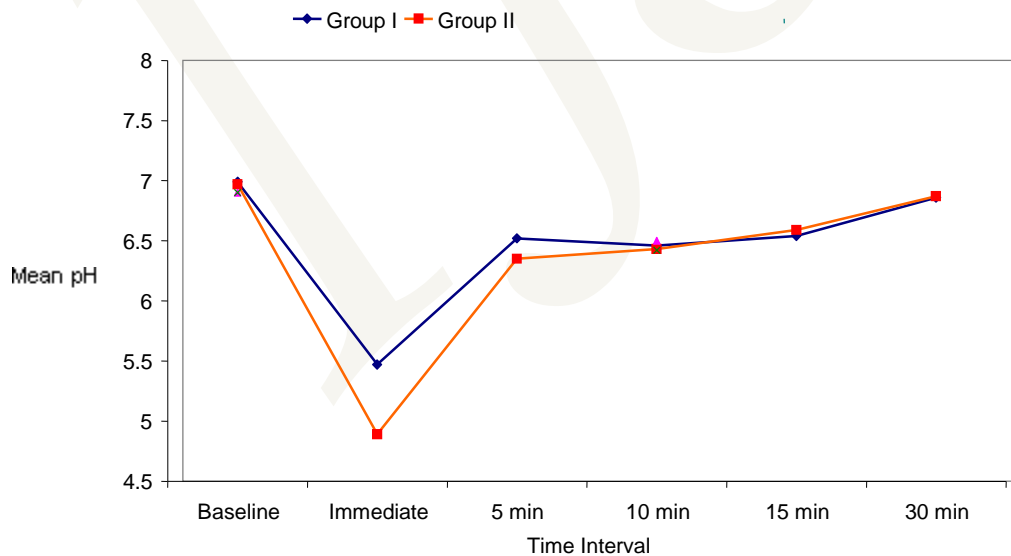
Table No. 3: Shows Pairwise Comparison of Mean pH Levels at Different Time Intervals

Comparison	Mean Difference	SE	Significance	95% Confidence Interval for Difference	
				Lower bound	Upper bound
Baseline vs Immediate	2.077	0.170	<0.001	1.733	2.421
Baseline vs 5 min	0.624	0.169	0.001	0.281	0.967
Baseline vs 10 min	0.541	0.063	<0.001	0.414	0.668
Baseline vs 15 min	0.376	0.059	<0.001	0.256	0.496
Baseline vs 30 min	0.095	0.060	0.119	-0.026	0.216
Immediate vs 5 min	-1.453	0.216	<0.001	-1.891	-1.016
Immediate vs 10 min	-1.536	0.183	<0.001	-1.907	-1.165
Immediate vs 15 min	-1.701	0.173	<0.001	-2.052	-1.350
Immediate vs 30 min	-1.982	0.174	<0.001	-2.334	-1.630
5 min vs 10 min	-0.083	0.163	0.613	-0.413	0.247
5 min vs 15 min	-0.248	0.160	0.129	-0.571	0.075
5 min vs 30 min	-0.529	0.131	<0.001	-0.795	-0.263
10 min vs 15 min	-0.165	0.034	<0.001	-0.233	-0.096
10 min vs 30 min	-0.446	0.065	<0.001	-0.578	-0.314
15 min vs 30 min	-0.281	0.054	<0.001	-0.391	-0.171

Table No. 4: Between Group Comparison of Mean Salivary pH Levels at Different Time Intervals (Tukey HSD test)

Group	Mean Difference	SE	"p" Value
Baseline			
I vs II	0.020	0.084	0.999
Immediate			
I vs II	0.579	0.136	<0.001
5 min			
I vs II	0.174	0.146	0.757
10 min			
I vs II	0.027	0.119	0.999
15 min			
I vs II	-0.058	0.117	0.987
30 min			
I vs II	-0.011	0.108	1.000

Graph No. 1: Shows Changes in Salivary pH After Cold Drink & Fruit Juice



Discussion:

A vast amount of laboratory research has been carried out on the effects of carbonated beverages in relation to dental caries and erosion,¹⁵ but very much less has been done on humans and there is a paucity of data. Hence, a randomized comparative clinical trial was done to know the salivary pH changes and buffering capacity of saliva after consumption of cold drink, mixed fruit juice in children.

In the present study glass combination electrode was used for assessing salivary pH as it is an established, sensitive and accurate methodology. Usually various colorimetric methods have been employed to determine the pH of saliva. The electronic method with the glass electrode is preferable because of its accuracy.¹⁶ In the present study there were two groups, cold drink & fruit juice. Our study showed a drop in salivary pH after consuming cold drink and fruit juice with more drop in pH in juice group when compared to cold drink users.

In the present study, there was a drop in mean salivary pH immediately after consuming cold drinks to 5.47 ± 0.78 from baseline pH 6.99 ± 0.36 . There was a slight increase in the pH after 5 minutes (6.52 ± 0.54) and decrease in pH after 10 minutes (6.46 ± 0.53). After 20 minutes the pH started to rise (6.54 ± 0.46) and a sustained rise was seen after 30 minutes (6.86 ± 0.45) trying to bring back to baseline pH. The time variations with salivary pH were found to statistically significant. When pairwise comparisons were done there was a significant difference obtained in between all the timings except between 5 and 10, 15 minutes as well as between 10 minutes and 15 minutes.

In present study results of drop in pH immediately after consuming carbonated beverage and after 5 minutes are similar to the study reports of Lehl G et al 1993¹⁷, R. Moazzez et al 2000¹⁸, Sánchez and M. V. Fernandez in 2003¹⁹, and Sardana V et al 2012.²⁰ The carbonated beverages contain phosphoric acid, citric acid and maleic acid²¹ which may be the reason for decreased salivary pH as shown in this study and enamel demineralization resulting in dental erosion. Presence of acids in the carbonated beverage

would have caused the immediate decrease in salivary pH which may have rendered the buffering capacity of saliva to be slow.

The present study showed a drastic drop (4.89 ± 0.97) in salivary pH from baseline (6.97 ± 0.39) immediately after consumption of mixed fruit juice. After 5 minutes the pH recovered (6.35 ± 1.07) and this recovery was sustained throughout from 10, 20 and 30 min (6.43 ± 0.53 , 6.59 ± 0.51 and 6.87 ± 0.46 respectively). The time variations with salivary pH showed a significant difference ($df = 5$, $F = 59.599$, $p = < 0.001$, S). Pair wise comparisons showed a significant variation in between all-time intervals except baseline to 30 minutes and 5 minutes to 10, 15 minutes.

This results are in concurrence with the study results of Sabyasachi Saha et al (2001), were in Apple and guava packed juices were used for the study and showed pH changes from baseline to 30 min ranging from 7.17 to 6.58, 7.08, 7.31, 7.31.²² Birgül Azrak et al (2003) in Germany among children with mean age of 4.4 years showed results similar to our study by detecting the pH difference from baseline to 25 minutes ($\Delta \text{pH} = -0.20$ at baseline, -0.50 at 5 minutes, -0.24 at 10 minutes, -0.16 after 15 minutes, and -0.01 after 25 minutes bringing back the pH to baseline value) after consuming packaged apple juice.²³ Similarly, Lata Kiran Banan and Amitha M Hegde in 2005 conducted a study on 10-12 year old children in Mangalore using fresh fruit juices (Grape, Orange and Pineapple) which showed a maximum percentage reduction in salivary pH within 5 minutes of consumption of these fruit juices and a multivariate analysis of various fresh fruit juices, at different time intervals showed significant difference ($p < 0.05$).² Another study showed median ΔpH of whole saliva at baseline (-0.56) and after consumption of orange juice at 5 minutes (-0.41), 10 minutes (-0.26), 15 minutes (-0.13), 25 minutes (-0.04).²¹ It was also reported that fruit juices were 10 times more destructive than the whole fruit.²⁴

Maximum pH decrease after intake of different beverages is an important consideration in dental erosion, as apatite dissolution increases in the lower pH range.²⁵ The probable reason for the immediate

drop in salivary pH in our study could be that the intrinsic acidity of packed fruit juices rendered it more able to combat salivary buffers. The greater the pH fall can also be attributed to prolonged period of consumption of these fruit juices (approximately 5 minutes), which could expose the teeth to dangerously low levels of pH as the acid and sugar is held for a prolonged period in contact with the teeth.¹ There may be a prolonged fall in the oral cavity pH due to the increased buffering capacity of fruit juices & fruit based drinks. Though the amounts of acid beverages normally consumed by children may be insignificant, the presence of immature enamel, inadequate neuromuscular coordination and inability to clear the retentive substrate, along with the deleterious methods of consumption, makes them susceptible to dental erosion.²⁶

Acidified sugar containing drinks has shown to be cariogenic and erosive in rats. Beverages, especially fruit juices, can contain a variety of acids that are likely to damage the teeth.¹⁴ Juices for example contain several sugars and non-volatile organic acids.²⁸ Fructose and glucose are considered to be less cariogenic than sucrose, but the dental plaque, formed in the presence of a mixture of these two sugars also leads to a decrease in the micro-hardness of the enamel. Packaged juices contain high amount of added sugar i.e., sucrose, which is highly cariogenic.²⁹

Theoretically, the erosive potential of a soft drink (carbonated beverage or fruit juice) must be dependent upon the immediate effect of the drink & time taken for its clearance on the tooth, the drinking method, the protective effect of saliva, the amount of residual drink after swallowing, the actual amount of beverage consumed and the frequency of consumption (that is, if small sips are taken at frequent intervals or the entire bottle is consumed quickly). A single acidic attack is of minor importance but if repeated, the ability of saliva to deal with the acid attack may decrease. Hence, the main concern is about the frequent use of soft drinks over time. If the challenge is frequent enough and there are few or no protective factors this may be aggressive as in caries susceptible people.

Between group comparison:

In the present study the group consuming commercially available packed mixed fruit juices showed a maximum drop in salivary pH (4.89), immediately after consumption when compared to the carbonated beverage (5.47), followed by a gradual recovery within 30 minutes of study. This greater drop could be attributed to the relatively lower intrinsic pH of commercially available fruit juices. Similar results have been shown by Lata Kiran *et al*, 2005¹, Birgül Azrak *et al* (2003),²³ G. A. Sánchez and M. V. Fernandez¹⁹ in 2003 and Birgül Azrak *et al* (2008).²¹ The type of acid used may possibly explain the ability of the fruit juices to resist pH change as observed in a study where phosphoric acid was the only acid in the carbonated beverages while citric acid and ascorbic acid predominated in the fruit juices along with high sugar content in fruit juices leading to high titrable acidity. Surprisingly a study by West, N.X., *et al* 2008 has shown that citric acid caused far more erosion than phosphoric acid. Other important contributors were possibly the concentration of the acids and additive ingredients.³⁰

In the present study, clinical trial was carried out using only one type. However more studies with larger sample sizes with the above products and individual ingredients of these products with control group should be conducted. We have known there was a lesser pH drop when straw is used for consumption. Beverage intake cannot be standardized. Although the erosion and caries process have contrasting histological appearance, these conditions occurring simultaneous can have undesirable effects on dental hard tissue. As dental professionals we need to educate our patients about the consequences of consumption of such drinks and provide solutions to minimize the risk.

Conclusion:

Present study suggested that there is a decline in the salivary pH after consumption of both types of beverage. There was higher fall in the salivary pH in the case of fruit juice when compared to carbonated drink. Regular consumption of such drinks should be discouraged.

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Prevalence of Psychiatric Disorders in Western U.P. Region- A School Based Study

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Abstract

Background: Psychiatric epidemiology has contributed a lot in the etiology of mental disorders. It deals with important aspects like disease, distribution of disease, determinants of disease, human population and methods employed to control the occurrence of illness. Children and adolescents are at high risk of developing mental disorders. Epidemiological studies conducted in India on mental and behavioral disorders report varying prevalence rates, ranging from 9.5 - 10.2 percent.

Aims & Objective: The basic aim of this study was to know the overall prevalence rate of psychiatric disorders of children and adolescents in a school based study and to evaluate how the false reporting due improper knowledge can be avoided.

Material & Method: This study was conducted on 1100 students with male to female ratio 1: 0.9. The sample was collected by Stratified sampling technique. ICD- 10 criteria tools was used. Statistical Analysis was done using appropriate test like “t” test and Chi-Square test

Result: Total prevalence of psychiatric disorder was found to be 11.48%. Chi-Square analysis indicated no significant difference in prevalence between the number of male and female children. There were no significant differences among the prevalence rates among the children who belonged to middle-class urban, and the rural areas ($p > 0.5$).

Conclusion: Psychiatric epidemiologists need to move beyond their current opinion and policies to develop collaborations with their colleagues involved in preventing mental illness as well as with social policy analysts, who are currently at the forefront of developing, implementing, and evaluating intervention.

Key Words: Psychiatric Epidemiology, Mental Disorders Screening Tools

Introduction:

Psychiatric epidemiology is the study of the distribution and determinants of mental illness frequency in humans, with the aim of understanding and controlling the occurrence of mental illness. Prevalence of mental disorders among children has been reported to be 14-20% in various studies.^{1,2} According to World Health Report (2000), 20% of children and adolescents suffer from a disabling mental illness worldwide.³ The issue of childhood psychiatric morbidity is more serious in middle and

low income countries because these countries have a much larger proportion of child and adolescent population; much lower levels of health indices; poorer infrastructure and resources to deal with problems. Child welfare agencies are increasingly being encouraged to screen all children for mental health concerns. The Child Welfare League of America (CWLA) asserts that, “A standardized, screening and assessment protocol, used by all systems, to identify at-risk children and accurately assess their mental health. For this purpose

instruments that are designed to identify children and adolescents who are at-risk of having mental health problems or concerns and would most benefit from more in-depth assessment.”

Psychiatric disorders are known to vary across time within the same population and also vary across populations. Most of the community-based Indian epidemiological studies are on point prevalence. These community-based epidemiological studies conducted in India on mental and behavioral disorders report varying prevalence rates, ranging from 9.5⁴ to 102⁵ per 1000 population.

The adult epidemiological finding that mental disorders have early ages of onset has created interest in the minds of psychiatrist. Children and adolescents are at high risk of developing mental disorders. The majority of available Indian psychiatric epidemiological studies have not utilized specific tools for addressing the disorders in children and adolescents. Most of the researchers formulated their own screening instruments in which they have missed out mental apathy in children and adolescents.

Hence this article attempts to critically evaluate the (overall) prevalence rate of psychiatric disorders in India. Epidemiological data from western Uttar Pradesh would be critical in outlining needs for mental health services

Material & Methods:

The sample was selected by stratified sampling. (Different groups in demographic area). All children (except a few) below 16 year from a school were included in the study after obtaining informed consent from Principal, and guardians. Ethical Clearance was taken from ethical committee of the Teerthanker Mahaveer University, Moradabad.

Tools

Psychiatric diagnosis was made as per ICD-10 criteria.

1. **Socio demographic proforma (SDP):** This is 17-item proforma .It shows details like type of area, informant, name of the head of the household, address, caste/religion, family income, family size and number of children below the age of 16 years.
2. **Screening checklist (SCL):** This 33 item checklist covers a range of behaviour problems usually present among children aged 0-3 years, but can be used for age above 3years.
3. **Child behaviour checklist (CBCL):** The 113-item behaviour problems section of the CBCL is used as a screening tool for 4-16 years old.
4. **Additional module (AM):** An additional module with 12 items in a yes/no format is added to screen for developmental disorders, scholastic problems, epilepsy, mental retardation, enuresis and phobias.
5. **Children's behaviour questionnaire (CBQ):** The Children's Behaviour Questionnaire rated by teachers.
6. **Felt treatment needs (FTN):** This 8-item questionnaire in a yes/no format is prepared to assess parental awareness of their child's problems.
7. **Diagnostic interview schedule for children (DISC):** The DISC is a structured diagnostic interview schedule, with two parallel versions. One with the parent as informant (DISC-P) for children aged 6 year and above and the other with the child as informant (DISC-C), for children aged 12 year and above.
8. **Structured interview schedule (SIS):** The SIS is compiled from the DISC – P to evaluate children aged 4-6 year.
9. **Parent interview schedule (PIS):** A shortened version of this semi-structured interview schedule is used to assess disturbance in the child's family and environment.
10. **Vineland social maturity scale (VSMS):** An Indian adaptation of the Vineland Social Maturity Scale.
11. **Binet kamat test (BKT):** This Indian adaptation has items at each age level and yields intelligence quotient.
12. **Specific learning disability (SLD) battery:** A battery of tests to assess attention, reading, writing, spelling, comprehension, arithmetic,

visuo-motor skills and auditory and visual memory.

- 13. Children's global assessment scale (C-GAS):** It reflects the lowest level of functioning of the child during a specified period of time and measures the degree of functional impairment.
- 14. Physical examination proforma (PE):** This includes a general physical examination and a systems review.

Procedure:

The main study commenced with the screening followed by the detailed evaluation stage. All children aged 4-16 year were screened using age appropriate screening instruments. Children selected as positive were taken for a detailed evaluation. A doctor placed in community center was requested to physically examine all children. Clinician's judgment was used to combine the information and make the final diagnosis. Statistical analysis was done using appropriate tests.

Results:

Table No.1: Psychiatric Disorders Present in Children 4-16 Years

Name of disorder	Number of cases	Percent
Mild depressive episode	1	0.09
Social phobia	2	0.18
Separation anxiety disorder	1	0.09
General anxiety disorder	2	0.18
Simple phobia	18	1.63
Agro phobia	1	0.09
Panic	2	0.18
Enuresis	38	3.45
Stammering	12	1.09
Pica	4	0.36
Behavior disorder NOS	5	0.45
Sleep disorder	2	0.18
Non organic encopresis	1	0.09
OCD	3	0.27
Conduct disorder	1	0.09
CD (NOS)	1	0.09
Oppositional defiant disorder	6	0.54
Trans tic	1	0.09
Chro tic	1	0.09
Feeding disorder	2	0.18
ADHD	8	0.72
Hyperkinetic .cd	1	0.09
Other psychiatric disorders	3	0.27
Mild mental retardation	7	0.63
Moderate mental retardation	3	0.27
Severe mental retardation	1	0.09
Total	127	11.48

Out of 1285 Students 1100 students could be examined due to many factors like absence from the school and lack of co-operation by some students. Out of 1100 students whom we put under study 127 students showed some sort of psychiatric disorders mentioned in Table No. 1. Out of 1100 students 25.6% students were in the range of (4-6 years) and remaining 74.4% were in the age range of (7-16 years). Response to information was poor from children below 6 years of age and sufficiently good among 7-16 years of age. Response to different assessment tools for different age groups was also significantly different. The response to Child behavior checklist (CBCL) was the best followed by PIS & CBQ. Mothers was found to be the best informants followed by grandparents, father and local guardians. (CI: 9.8-12.6%) indicated a 93 per cent certainty. Chi-square test showed that there is considerable difference in prevalence of psychiatric disorders between 4-6 and 7-16 years of age in which former being the more susceptible (Chi Square=5.86)

Total prevalence of psychiatric disorder was found to be 11.48%. Chi-Square analysis indicated no

significant difference in prevalence between the number of male and female children. There were no significant differences among the prevalence rates among the children who belonged to middle-class urban, and the rural areas ($p>0.5$).

The most common findings of interest were enuresis (3.45%), simple phobia (1.68%) & stammering (1.09%). This school is located in urban area, for the sake of confidentiality name of the school cannot be mentioned here.

Discussion:

Psychiatric epidemiology has been defined as 'the study of the distribution of mental illnesses in a population⁶ and psychiatric disorders represent a substantial and pervasive health burden.⁷⁻⁹ The ultimate goal of epidemiology is to contribute to the understanding of the onset and course of disease and thereby to its prevention and control.¹⁰ Studies on childhood mental disorders are scarcely available in literature. Some of the studies conducted on mental disorders are tabulated in Table No. 2.

Table No. 2: Studies of Psychiatric Epidemiology in Different Parts of World

S.N.	Place	Prevalence (%)	Authors
1	Ethopia	17.7	Tadesse et al, 1999 ¹¹
2	Bangladesh	15	Mullick & Goodman 2005 ¹²
3	Brazil	12.7	Flietlich & Goodman 2004 ¹³
4	Canada	18.1	Offord & Ontario 1987 ¹⁴
5	Germany	20.7	Weyerer et al, 1988 ¹⁵
6	Switzerland	22.5	Steinhausen et al, 1998 ¹⁶
7	USA	21	United States Department of Health and Human Services, 1999 ¹⁷
8	Bangalore	12.5	Srinath et al, 2005 ¹⁸
9	Kerala	9.4	Hackett et al, 1999 ¹⁹
10	Chandigarh	6.3	Malhotra et al, 2002 ²⁰
11	Present study Hapur	11.48	Sarda et al, 2013

Two community-based Indian studies^{21,22} reported surprisingly low prevalence rates School going children, 0.6 and 0.0 per cent respectively. This strengthens the issue of using appropriate assessment tools to identify childhood psychiatric disorders. Studies from other countries²³ reported a prevalence rate of 17.5 per cent in two-stage studies. The rate of 12.4 per cent for the entire sample (0-16 yr) validates the conclusion that prevalence rates in India are definitely lower.

There are only a few epidemiological studies which were exclusively conducted to assess the prevalence rate in the children. The first study in this regard reported a prevalence rate of 94 per 1000 in a sample of 1403 rural children aged 8-12 years.²⁴ Another methodologically strong ICMR-sponsored study conducted by¹⁸, has reported a prevalence rate of 12.5% among children aged 0-16 years.¹⁹

It has been reported that most of the childhood onset disorders have higher incidence in males, whereas, most of adolescent disorders are more in females.²⁵ This difference was not found in our study which may be due to any factor which limits the specificity and sensitivity of present study. The epidemiological finding that mental disorders have early ages of onset has promoted interest in the mental health of children and adolescents. Two reasonable factors limit studies of younger generation: Childhood disorders poses special challenges for their assessment; and it is very difficult to carry out direct interviews with children, making it necessary to rely on parents and teachers as informants.

Even when children are old enough to be interviewed, questions arise about their integrity to understand questions.²⁶ How so ever, there is a problem in this; that informant reports often diverge.²⁷ This creates problems in knowing how to combine the different reports into overall prevalence estimates.²⁸ There are reports that ethnicity is one of the factors in prevalence of psychiatric disorders in children. In a report of a survey of mental health of children and adolescents in Great Britain,²⁹ it was shown that the overall psychiatric disorder, among 5-15 years, as per ICD-10, was 10%.

Costello et al³⁰ in their review of epidemiology of childhood psychiatric disorders have opined "that onset before adulthood may be a characteristic of the majority of adult mental disorders". The present study showed lower prevalence rate of psychiatric disorders, this might be due to the reasons that we have excluded children with severe psychopathology and mental dysfunctions.

In addition to addressing above barriers, we recommend that researchers should keep in mind the following assessments prior to adopting mental health screening in schools: availability of trained staff and other resources to conduct screening, selection of age-appropriate screening measures, confidentiality and information-sharing between schools and collaborating community agencies & availability of mental health providers.

Conclusion:

Psychiatric epidemiology lags behind other branches of epidemiology due to difficulties encountered in conceptualizing, defining a case, sampling technique, and lack of trained manpower. Descriptive epidemiological studies are often used by community based agencies to estimate the magnitude of untreated disorders and to study barriers to receiving treatment for purposes of planning future changes in outreach and treatment activities. We need some other approaches to increase the usefulness of such surveys for resource allocation planning purposes. A good deal of work along these lines is currently in progress. A number of short fully structured measures of psychopathology have been developed to screen for clinically significant mental disorders. These instruments can be self-administered in very less time and yield fairly accurate assessments of overall psychopathology. These characteristics make such instruments much more feasible. A number of encouraging advances have occurred in psychiatric epidemiology over the past twenty years. However, uncertainty regarding diagnostic categories and criteria and underreporting due to respondent reluctance to admit symptoms continue to be major sources of difficulty. Psychiatric epidemiologists need to move beyond their current

opinion and policies to develop collaborations with their colleagues involved in preventing mental illness.

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Role of Dentscan V/S Radiography in the Evaluation of Tumours of the Jaw

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Abstract

Introduction: The Dental CT programs have been successfully used to evaluate tumours of the jaw and planning surgical procedures.

Aim: To compare efficacy of dental CT with dental radiography in studying jaw tumours.

Material and methods: We evaluated patients with jaw lesions undergoing both Radiography and Dental CT and then compared the findings of both the modalities.

Results: We obtained only fair agreement between radiographs and CT with respect to relation with the adjacent tooth & with the alveolar crest, no to slight agreement between radiographs and CT with respect to relation with the nasal floor & only slight agreement between radiographs and CT with respect to relation with the adjacent tooth.

Conclusion: Dental CT being a multiplanar modality has proved to be better than dental radiographs for assessing jaw bone lesions since it can clearly depict the actual extent of the lesion, without magnification, geometric distortion or superimposition of anatomical structures.

Key Words: Dentscan, Dental CT, Jaw lesions.

Introduction:

Radiography has been widely used for obtaining a comprehensive overview of the maxillofacial complex. The clinical use of Radiography is limited by the uncertainty regarding the actual dimensions of structures.¹ Dental CT is one of the most valuable modalities for assessment of jaw lesions because of the clear depiction of the soft and hard tissues without any superimposition of anatomical structures.²⁻⁴ Additionally, CT exhibits no magnification or geometric distortion. Within the limits of its spatial resolution, CT is considered more to be reliable than conventional projection radiography as a morphometric tool.⁵⁻⁸ Dental CT is able to display the jaw in three planes without any artifacts from dental amalgam or filling and can hence, provide detailed information about the jaw tumour including lesion extent, cortical margins and relation with and

involvement of surrounding structures. It not only helps in the treatment planning of the lesions, but also in diagnosis of the lesion and differentiation between benign and malignant. In our study, we intend to compare the findings of Radiographs and Dental CT and also establish the role of Dental CT in evaluation of patients with tumours of the jaw.

Aims and objectives:

To compare the efficacy of dental CT with dental radiography in studying jaw tumours.

Material and Methods:

We evaluated patients with jaw lesions undergoing both Radiography and Dental CT. The findings of both the modalities were compared. Dental radiography was performed in the Oral Medicine and Radiology Department - Orthopantomogram or Intraoral Periapical view. CT

scan was done using Phillips - Brilliance multislice slice CT scanner. The reconstructions were performed at the Philips workstation using Dentascan software. The nature of the tumours were confirmed on histopathology. All the relevant data was entered into SPSS 11.5 data sheet for statistical calculation. Weighted Kappa values (which are a measure of observer agreement – overall measure of agreement that is corrected for agreement by chance) were calculated using the Stata 10 and SPSS 11.5 software. The statistical significance of the results was determined by using p value, generated by SPSS 11.5 software.

Observation and Results:

There were 20 patients with tumours of the jaw in our study.

Table No. 1

Spectrum of lesions	Number of cases
Ameloblastoma	14
Juvenile ossifying fibroma	3
Cementoblastoma	2
Pleomorphic adenoma	1

The relation of the lesion with the adjacent tooth was not visualized on Radiograph in 14 cases, 9 of which showed no contact on CT, 3 showed direct contact and 2 showed resorption of the adjacent tooth. 2 of the cases showed resorption on Radiograph which was confirmed on CT. A kappa value of 35 % with p value 0.02 indicated only fair agreement between radiographs and CT with respect to relation with the adjacent tooth.

The relation of all 6 central maxillary lesions with the nasal floor could not be visualized on Radiograph – 2 of these showed no contact on CT, 1 showed direct contact and 3 showed encroachment. A kappa value of 0 indicated no to slight agreement between radiographs and CT with respect to relation with the nasal floor.

The relation of the lesion with the floor of the maxillary sinus was not visualized in 5 out of 7 cases.

2 of these 5 cases showed no contact on CT and 3 showed encroachment. 1 case showed direct contact on Radiograph which was found to be encroachment on CT. A kappa value of 17 % indicated only slight agreement between radiographs and CT with respect to relation with the adjacent tooth.

The relation of the lesion with the mandibular canal could not be visualized in 5 out of 7 cases. 3 of these showed no contact on CT and 1 showed encroachment. Rest of the 3 cases showed no contact and encroachment on Radiograph respectively which was confirmed on CT. A kappa value of 40 % was obtained which indicated only fair agreement between radiographs and CT with respect to relation with the adjacent tooth.

The relation with the alveolar crest was not visualized in 12 out of 20 cases on Radiograph, 7 of which showed erosion and 5 did not show erosion on CT. 4 cases which showed erosion on Radiograph also showed erosion on CT. A kappa value of 29 % with $p < 0.001$ indicated only fair agreement between radiographs and CT with respect to relation with the alveolar crest.

Discussion:

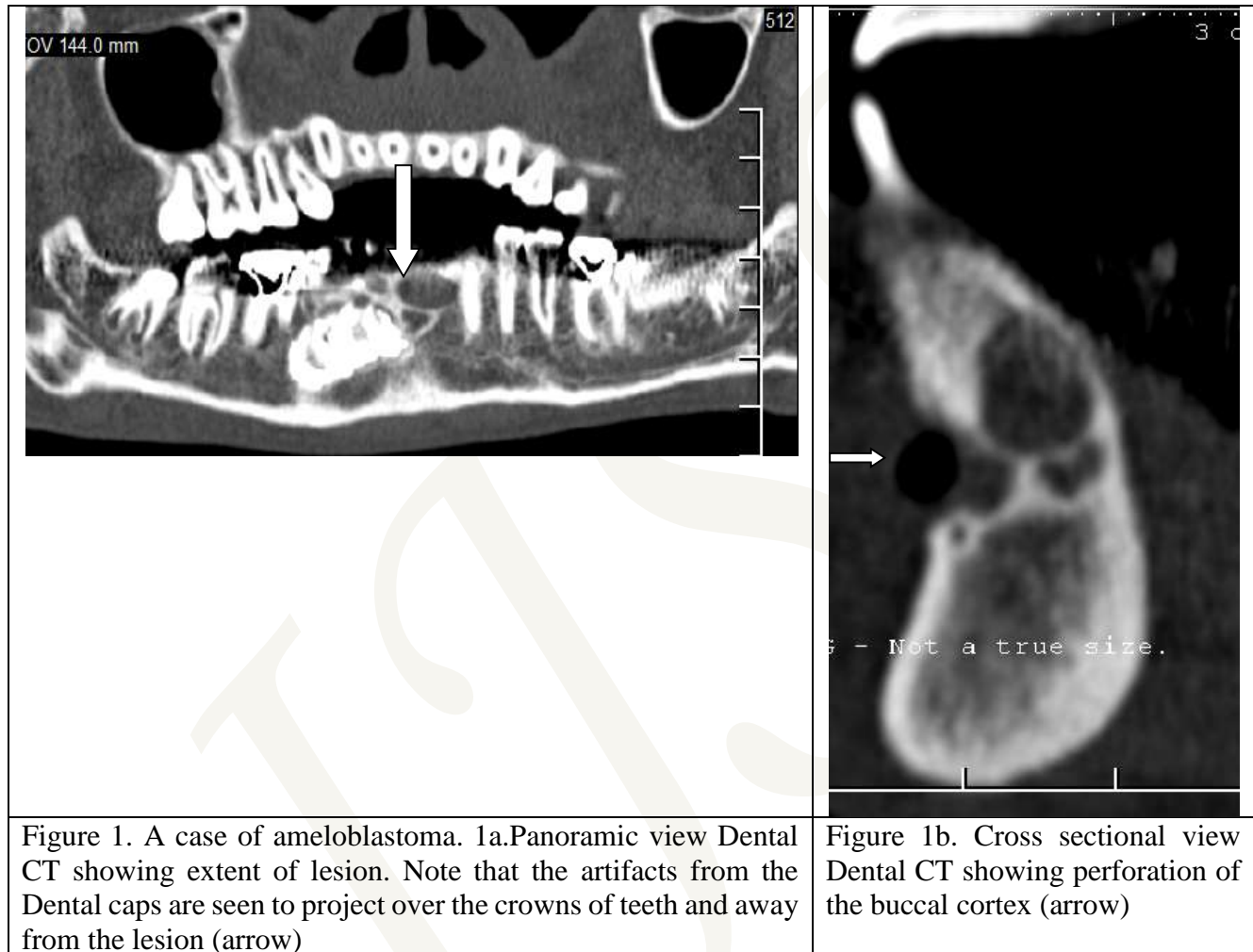
The Dental CT programs have been successfully used to evaluate tumours of the jaw and planning surgical procedures. Dental CT is an excellent new modality for viewing the jaw. It is also a new partnership between radiologists and dentists. The dental radiographs do not answer all the questions in the dentist's clinic and these answers are found in radiology departments with dental CT scans⁹.

In case of assessment of tumours of the jaw, it is very important to obtain accurate information about the height and width of the jaw, as well as information about the location of vital structures, such as the mandibular canal, nasal floor and maxillary sinuses and detailed information about internal anatomy and the relationship between lesions and the cortical margins and roots of the teeth.

In our study, the relation of the lesion with the adjacent tooth was not visualized on Radiograph in 14 cases. Two cases showed resorption on Radiograph which was confirmed on CT. We got a kappa value of

35 % with p value 0.02 indicating only fair agreement between radiographs and CT with respect to relation with the adjacent tooth. This implied that CT was significantly better than Radiographs in regards to relation of the lesion with the adjacent tooth. Plain

film Radiography could not detect the relation of the lesion with the adjacent tooth, whereas CT was found to be very precise for this purpose due to assessment done in multiple reformatted planes.



The relation of all 6 central maxillary lesions with the nasal floor could not be visualized on Radiograph in our study. Dental CT was better than Radiograph in determining the relation of the lesions with the nasal floor as shown by a kappa value of 0 (slight agreement). The reason for this could be that superimposition of structures in Radiographs in maxillary teeth makes it difficult to see their relation with the nasal floor.

The relation of the lesion with the floor of the maxillary sinus was not visualized in 5 out of 7 cases. Dental CT was found to be considerably better than Radiographs for assessment of relation of the adjacent tooth as denoted by a kappa value of 17 % (only slight agreement between radiographs and CT).

The relation of the lesion with the mandibular canal could not be visualized in 5 out of 7 cases. A kappa value of 40 % was obtained which indicated

only fair agreement between radiographs and CT with respect to relation with the adjacent tooth.

The relation of the lesion with the alveolar crest was not visualized in 12 out of 20 cases on Radiograph. We thus concluded that Dental CT was far better than Radiographs in evaluating the relation of the lesion with the adjacent tooth as determined by a kappa value of 29 % with $p < 0.001$ (fair agreement). CT was able to give us information in three planes whereas Radiographs give a two dimensional view only.

Conclusion:

Dental CT being a multiplanar modality has proved to be better than dental radiographs for assessing jaw bone lesions since it can clearly depict the actual extent of the lesion, without magnification, geometric distortion or superimposition of anatomical structures. Another advantage of Dental CT is that it eliminates the streak artifact from dental fillings or amalgams in coronal CT scans. This is because the CT is acquired axially and then these axial images are then used for coronal, sagittal, panoramic and cross sectional reconstructions. Hence, the artifacts are seen at the level of crowns of teeth. Thus Dental CT has become an indispensable tool for the evaluation of jaw tumours.

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Tooth Size in Crowded and Spaced Dentition among Western Uttar Pradesh Population: A Biometric Study

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Abstract

Introduction: No cause effect relation is established for any malocclusion with 100 percent certainty for any patient but mesiodistal tooth dimension or tooth morphology has been suggested as an important contributing factor. Orthodontic examination is invariably incorrect without tooth size assessment.

Aims and objectives: The present study was performed to co-relate the relationship of mesiodistal tooth size and the total tooth material among crowded and spaced dentition in western Uttar Pradesh population.

Material and methods: One hundred and twenty subjects, consisting of 62 females and 58 males were selected having Angle's Class I dental occlusion. The dental study models were divided into crowded and spaced dentition. Mesiodistal width of individual teeth from left first molar to right 1st molar and combined Mesiodistal width were measured and compared.

Results: The values for mesiodistal tooth size and total tooth material were more for males as compared to females. Individual mesiodistal tooth size and total tooth material was more in crowded dentition group than spaced dentition group.

Conclusion: Tooth size plays an important role in the malocclusion that is crowding and spacing. The crown diameter is more in crowded dentitions and less in spaced dentitions. The tooth size should be an important criterion while diagnosing and formulating a treatment plan for the patient.

Key Words: Mesiodistal tooth size, Arch length

Introduction:

Some authors^{1, 2} have suggested directly or indirectly that crowding is usually associated with presence of large teeth size and spacing with presence of smaller teeth size. Such discrepancies in tooth size could have important effects in the application of diagnostic criteria.

The orthodontic examination is incomplete without a careful analysis of the mesiodistal crown size, which is a decisive variables among the factors associated with the development of occlusal and facial irregularities. These discrepancies effects the inter-

digitation during and after orthodontic treatment. Considering the above fact, there seems to be relationship between the tooth size, dental crowding, and spacing. Human variability is so large that it is not justified to apply the same norms for the entire population. Hence this study was done on western Uttar Pradesh population to evaluate the relationship, if any, between tooth size, dental crowding and spacing and to correlate them with each other.

Material and Methods:

A total of one hundred and twenty pretreatment dental casts (62 females and 58 males) with Angle's Class I occlusion were selected from the OPD (outpatient department) of Department Of

Orthodontics And Dentofacial Orthopaedics, Subharti Dental College, Meerut (Table No. 1). Dental casts having spacing more than 3mm were placed in spaced dentition group and those having crowding more than 3 mm were placed in crowded dentition.

Table No. 1: Overview of Sample Distribution

Group	Arch	Casts (n)	Sex (n)		Mean age (years)	S.D.
			Male	Female		
Crowded n = 60	Maxillary	30	14	16	17.8823	4.0137
	Mandibular	30	15	15	17.8823	4.0137
Spaced n = 60	Maxillary	30	13	17	17.5294	3.4299
	Mandibular	30	16	14	17.5294	3.4299
Total n = 120	Maxillary	60	27	33	17.3725	3.4148
	Mandibular	60	31	29	17.3725	3.4148

The dental casts met the following:

Inclusion criteria:

1. Western Uttar Pradesh origin – patient residing in the region for three generations and more were selected,
2. All permanent teeth erupted till 1st molars,
3. Age 12-25 years,
4. Angle's class I dental occlusion

Exclusion criteria:

1. Undergone any prior orthodontic treatment,
2. Proximal restorations,
3. Casts with anomalies or mutilated dentitions,
4. Casts with attrited teeth below the contact point,
5. Angle's class II and III

Alginate impressions were taken on standard stock trays and the cast were immediately poured after the impressin making. The maximum mesiodistal width was measured on non soaped models using digital read out sliding caliper (Aerospace Digital vernier caliper - China) with the caliper tips kept parallel to occlusal and vestibular surface³. For establishing the occlusal plane three points were

selected, the posterior end of the plane is set by the centres of the retromolar pads, and the anterior end of the plane is at the upper lip line. These three points establish the plane of occlusion (According to Mamootil JA in Autralian dental journal 1994). The MD width was taken as the distance between anatomic contact points. The mesiodistal width of central incisor, lateral incisor, canine, first premolar, second premolar and first molar were measured on each side and in both the dental arches. All the measurements were repeated after 15 days by the same operator.

To determine measurement error, Dahlberg's formula was used -:

$$\text{Standard error} = \sqrt{\sum sd^2 / 2n}$$

The total tooth material (TTM) for both the arches was calculated by adding the M-D width of all the teeth including incisors, canine, premolars and 1st molar. Unpaired t- test was used to evaluate the difference of mean values of MD width and TTM between males and females in both the groups. The results were then statistically evaluated. A level of significance ($P \leq 0.05$) was used for the statistical tests.

Results:

The mean values of MD width of each measured tooth and TTM values in both maxillary and mandibular arches were more for males than females. In both the sexes the crowded dentition group

demonstrated the maximum values for MD width of each measured tooth, than spaced dentition group. The result was statistically significant except for maxillary incisors in males and maxillary lateral incisor in females.

Table No. 2: Comparison of Total Tooth Material (TTM) between Crowded and Spaced Dentition in Males and Females

Variables	Sex	Arch	Crowded		Spaced		T-test P - value	Significance
			Mean	S.D.	Mean	S.D.		
Total tooth material (TTM)	M	Maxillary	98.8492 9	4.63281	94.3179	5.5846 62	0.031669	S
		Mandibular	90.196	2.53328 1	84.4381 25	6.1439 6638	0.002506 9	S
	F	Maxillary	96.2193 3	2.40948 4	92.1026 7	2.8461 04	0.001289	S
		Mandibular	88.7486 7	2.65270 7	81.676	3.9206 373	5.26088E .06	S

TTM between crowded and spaced dentition groups was compared in males as well as females for both the maxillary and the mandibular arch (Table No. 2). In males, as well as females, the mean values of TTM in the crowded dentition group were significantly greater than that of the spaced dentition group in both the maxillary and mandibular arch.

The mean values of MD width of each measured tooth between crowded and spaced dentition groups were compared in males as well as females (Table No. 3, 4). In the males the mean values of each measured tooth in the crowded dentition group were more than that of the spaced dentition group in both the arches. On statistical evaluation, in the maxillary arch, there was a statistically significant difference in the M-D width of each measured teeth except central incisor between crowded and spaced dentition groups. In mandibular arch there was a statistically significant

difference in the MD width of each measured teeth except second premolar between crowded and spaced dentition groups (Table No. 3).

In females also the mean values of MD tooth width of each measured teeth in the crowded dentition group were more than that of spaced group in both the arches. In the maxillary arch, except lateral incisor all other measured teeth showed significant difference in the MD width while in the mandibular arch, all the measured teeth showed statistically significant difference in the MD width between crowded and spaced dentition groups (Table No. 4).

The statistical assessment of error by Dahlberg's method showed that the maxillary first premolar in the average dentition group had the highest error (0.0045 mm), and the maxillary canine in the spaced dentition group had the lowest error (0.000). This was statistically not significant.

Table No. 3: Comparison of Mean Values of MD Crown Dimensions of Teeth between Crowded and Spaced Dentitions in Males

Arch	Tooth type	Crowded		Spaced		T-test	significance
		Mean	S.D.	Mean	S.D.	P-value	
Maxillary	I1	9.011071	0.470385	8.660769	0.774638	0.053328	NS
	I2	7.338571	0.547044	6.946538	0.725484	0.030692	S
	C	8.140357	0.523397	7.802308	0.382542	0.008918	S*
	P1	7.456071	0.560101	7.064615	0.392981	0.004376	S*
	P2	6.984286	0.403195	6.655385	0.576508	0.020049	S
Mandibular	I1	6.054	0.920826	5.274063	0.535735	0.0002	S*
	I2	6.424333	0.315121	5.7040625	0.401825	0.001	S*
	C	7.250333	0.36392	6.766563	0.625035	0.000454	S*
	P1	7.370667	0.556943	6.836875	0.607844	0.00063	S*
	P2	7.107667	0.472219	6.93	0.654892	0.223492	NS

Table No. 4: Comparison of Mean Values of MD Crown Dimensions of Teeth between Crowded and Spaced Dentitions in Females

Arch	Tooth type	Crowded		Spaced		T-test P-value	Significance
		Mean	S.D.	Mean	S.D.		
Maxillary	I1	8.829	0.3909 97	8.35166 6667	0.244612 055	7.68846E -07	S*
	I2	6.92466 7	0.5720 91	6.74166 6667	0.322266 578	0.133770 698	NS
	C	7.80666 7	0.4732 45	7.45133 3333	0.370570 235	0.002045 379	S*
	P1	7.19033 3	0.3583 05	6.85	0.463561 922	0.002417 811	S*
	P2	6.86066 7	0.3182 92	6.60066 6667	0.362785 52	0.004593 244	S*
Mandibular	I1	5.69633 3	0.3197 16	5.13233 3333	0.319716 289	4.18069E -09	S*
	I2	6.30133 3	0.3840 5	5.672	0.373689 895	2.61778E -08	S*
	C	6.93233 3	0.4105 98	6.42066 6667	0.266483 27	5.91599E -07	S*
	P1	7.34033 3	0.4076 55	6.678	0.408448 705	4.57275E -08	S*
	P2	7.23866 7	0.3970 65	6.72266 6667	0.503607 218	4.90061E -05	S*

Discussion:

Tooth size arch length discrepancy or Bolton's ratio which is also considered as seventh key⁴ to normal occlusion is an important factor while planning for ideal arch alignment. It would appear from the literature^{1, 5-8} that conflicting evidence exists

regarding the role of tooth size in crowding. Thus the present study was conducted to evaluate the correlation between tooth size in crowded and spaced dentition groups having Angle's Class I dental occlusion.

In most of the previous studies^{1,5-8} on tooth size the sample selection has been done irrespective of dental malocclusion type. But the type of malocclusion and associated soft tissue aberrations can also affect the amount of crowding and spacing present in the arch, this can lead to inappropriate conclusions.

The study conducted by Fattahi et al⁹ concludes that subjects with Angle class III malocclusion had significantly greater prevalence of tooth size discrepancy than those with Angle's class I and class II malocclusion. Thus, to eliminate all these problems which may confound the result, in the current study all the samples having Angle's class I dental occlusion were selected so the effect of tooth size on crowding and spacing can be studied separately.

In the current study all the measurements were taken on non-soaped dental casts as soaped models may affect the tooth size measurements. This was in accordance with a study conducted by Hunter and Priest et al¹⁰, which concluded that soaped models were slightly larger in overall dimension.

Many investigators related sex with the mesio distal crown dimensions of teeth and hence the relationship with crowding. According to Garn¹¹, Bishara¹², Lavelle¹³, Claudia et al¹⁴, and Schwartz¹⁵ tooth sizes differ according to sex i.e. male teeth are somewhat larger than female teeth. Findings of our study are in accordance with the above mentioned studies as mesio distal width of each measured tooth in both the groups considered (crowded and spaced) in the current study had showed that males have significantly larger tooth size as compared to females. The age group of the subjects in the study was between 12 to 25 years. As early adulthood dentition has less mutilation and less attrition in most of the subjects. Thus effect of these factors on mesio distal tooth width would be negligible. This was in accordance to the studies of Doris et al⁷ and N. Puri et al⁸ who indicated that early permanent dentitions provide the best sample for tooth size measurements. Earlier studies on tooth morphology have been conducted by using either direct intraoral measurements or measurements on the cast. Direct intraoral measurements cannot be taken easily and

accurately particularly for the posterior teeth. The accuracy of plaster cast made from alginate impression was investigated by Hunter and Priest¹⁰ who in his study concluded that alginate impression produce the most accurate dental cast when poured immediately. Thus in our study we have obtained measurements of tooth dimensions from the plaster casts poured from alginate impressions immediately after taking the impressions and stock traus were used. Mean values of mesio distal width of all the measured teeth and TTM were significantly greater in the crowded dentition group as compared to spaced dentition group in both males and females. These findings were in accordance with the earlier studies^{2,3,16} which found that the groups with crowded arches had consistently larger teeth than those with less or no crowding. In contrast, other studies^{17, 18} have been unable to distinguish between crowded and non-crowded dentition on the basis of mesio-distal tooth dimensions. The study by Tsai et al¹⁹ showed that there is no difference in the tooth size between crowded and spaced groups in primary anterior teeth.

This study validates that there is a statistically significant correlation between tooth size and dental crowding. Large teeth were found to be associated (not always) with crowding and smaller teeth were found to be associated with spacing (not always). Because the results are consistent and widespread across all the tooth types, it can be inferred that tooth size is an important risk factor for malocclusion.

Conclusions:

The purpose of the current study was to determine the influence of tooth size in crowded and spaced dentition and whether people with bigger tooth crown dimensions were at a greater risk of having malocclusions assessed as tooth-size arch-size discrepancies (TSASD).

Major findings are:

MD crown dimensions of all the measured teeth and TTM were greater in crowding dentition groups than in spaced dentition, and the difference was statistically significant.

In males, mandibular central incisor displayed the maximum component of variability, while mandibular second premolar exhibited the least variability among the two groups.

Both mesiodistal width and Total tooth material, of all the measured teeth in both the sample group, were significantly greater for males than females, thereby confirming the sexual dimorphism in tooth size.

In females, mandibular first premolar showed the maximum component of variability while maxillary lateral incisor exhibited the least variability among the two groups.

Clinical relevance:

1. While evaluating malocclusion tooth size should be measured and considered an important etiological factor.
2. As tooth crown size is a risk factor for tooth size arch size discrepancy, the clinical solution is to reduce tooth mass by extraction or reproximation and also we can increase the arch dimensions where options are limited.

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Efficacy of Tramadol V/s Diclofenac in Management of Post Laparoscopic Cholecystectomy Pain

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Abstract

Introduction: Early post operative pain is the most common complain after elective laparoscopic cholecystectomy. The aim of this study is to determine the efficacy of intravenous tramadol compared to intravenous diclofenac for post operative pain relief.

Materials and methods: A randomized doubled blinded study with a cohort of 50 patients was carried out at Teerthankar Mahaveer Medical Hospital, Moradabad between August 2012 and September 2013. Intravenous tramadol 50 mg or intravenous diclofenac 75 mg were eight hourly given to randomly allocated groups after laparoscopic cholecystectomy by draw of chits. VAS score was taken at 4, 12, 20 and 28 hours. Data was analysed using SPSS version 16.

Results: A significant difference in VAS scores was found at 12 hour post operative ($p= 0.0007$) with tramadol being more efficacious but having increased incidence of nausea and vomiting.

Conclusion: Tramadol an analgesic acting on opioid receptor appears to be more efficacious in providing pain relief post laparoscopic cholecystectomy over diclofenac.

Key Words: Laparoscopic Cholecystectomy, Tramadol, Diclofenac

Introduction:

Pain is thought to be inadequately treated in one-half of all surgical procedures¹. Early postoperative pain is the most common complaint after elective laparoscopic cholecystectomy². Postoperative pain is the dominating complaint and the primary reason for prolonged convalescence after laparoscopic cholecystectomy^{3,4}.

Tramadol is a synthetic analogue of codeine. It is an analgesic with a low affinity for opioid receptors. Its much of action is due to inhibition of the neuronal uptake of norepinephrine and serotonin at synapses in the descending inhibitory pain pathways. It was seen that the side effect profile of tramadol appears to be more acceptable to ambulatory surgical patients compared with the traditional opioids⁵.

The diclofenac is an inhibitor of key enzyme cyclo oxygenase, involved in the metabolism of arachidonic acid into various prostaglandin mediators of inflammation and pain⁶. Diclofenac is a phenyl acetic acid derivative belonging to the carboxylic acid class of NSAIDs. The present study was performed to compare the analgesic efficacy of intravenous tramadol versus diclofenac in preventing postoperative pain following laparoscopic cholecystectomy.

Materials and Methods:

The study was conducted after approval by the Institutional Ethical Committee. Patients aged 18–60 years, scheduled for laparoscopic cholecystectomy and with ASA physical status I or

II, were eligible. Patients were excluded if they had any history of allergy to NSAIDs (non steroidal anti inflammatory drugs) or opioids, if they had a history of severe renal, hepatic, gastric or coagulative diseases, or if they had received analgesic drugs within 2 weeks before surgery. Patients were explained the use of visual analogue scale (VAS) to monitor post operative pain before surgery and written consent was obtained. Patients were blinded to the use of either of the two analgesics in post operative period.

Patients received premedication and anesthetic induction was done using standard anesthesia protocols. All patients included in the study received uniform pre operative and intra operative medication. Laparoscopy was performed after intra peritoneal insufflation of carbon dioxide and intra peritoneal pressure was maintained at 14 mmHg.

A total of fifty patients were recruited in the study between August 2012 to September 2013. Patients were randomly assigned to one of the study groups before surgery by drawing of chits. Hence two groups were formed, one was tramadol and the other diclofenac group. Post operative analgesia with either tramadol 50 mg or diclofenac 75 mg was prepared in identical syringes diluted with 2 ml normal saline by a single investigator. The analgesic was administered intravenously at 0, 8, 16, 24 hours post operative and pain score recorded at 4, 12, 20 and 28 hours by separate investigators who were blinded to the analgesic used. Additional dose of analgesia was given if VAS score was more than 30 or on demand. At the same time, patient sedation was assessed using a sedation scale (wide awake=0; mildly sleepy and responsive to verbal command=1; moderately sleepy and responsive to nociceptive stimulation=2, extremely sleepy and unrousable to nociceptive stimulation=3). The patients were asked about nausea and vomiting (yes or no).

Two efficacy variables, VAS score and demand for additional analgesia in the first twenty four hours following surgery were used to determine whether the two groups had significant difference with respect to post operative pain relief. Tolerability

was decided based on reporting nausea, vomiting or any other adverse reaction.

Data was analyzed using SPSS (Statistical Package for Social Sciences) version 16. P value was calculated by using Student's t test. A value of $p < 0.05$ was considered to be statistically significant.

Result:

A total of 52 patients in the period between August 2012 to September 2013 who were undergoing laparoscopic cholecystectomy were recruited in the study. 2 patients were later dropped out because of conversion to laparotomy. With random assignment two groups were formed, 'T' group of 25 patients who received intravenous tramadol and 'D' group of 25 patients who received intravenous diclofenac. The two groups 'T' and 'D' were matched with respect to age, weight and surgical time. The average age of subjects in group T was 44.12 years and in group D was 43.76 years. The average weight of patients in group T was 69.36 kg and in group D was 68.8 kg. An average of 79.92 minutes were taken for surgery in group T and 79.28 minutes in group D. The demographic data are compared and shown in (Table 1).

No significant difference was found in the sedation score between the two groups, $p < 0.05$ (Table 2).

The mean pain score on visual analogue scale (VAS) in mm when measured from 0 mm to 100 mm was calculated for each group at 4, 12, 20 and 24 hours after surgery. At 4 hours post surgery the mean VAS score for group T was 20.56 mm as against D group mean of 22.96 mm ($p = 0.014$). The difference in VAS score was found to be highly significant at 12 hours post surgery with $p = 0.00071$. At 12 hours mean VAS scores were found to be higher in both groups with score exceeding 30 for 2 patients in group D. Thereafter the VAS score were seen to be significantly declining in both groups and the analgesia was comparable in groups T and D with p being more than 0.05. (Chart 1).

More patients complained of nausea and vomiting in group T compared to group D. However the overall acceptability of tramadol as analgesia was more (Table 2).

Table:-1 Demographic profile of patients included in the study.

Variable	*Group T (n=25)	#Group D (n=25)
Mean age (years)	44.12	43.76
Mean weight (kg)	69.36	68.8
Male/Female	16/9	15/10
Mean surgical time (mins)	79.92	79.28
Mean anesthesia time (mins)	104.33	104.28

*Group T: Group Receiving Intravenous Tramadol Post Operatively

#Group D: Group Receiving Intravenous Diclofenac Post Operatively

Table 2:- Post operative sedation profile and reporting of nausea vomiting in the two groups:

Variable	Group T (n=25)	Group D (n=25)
Sedation score 1 or 2	21	23
Sedation score 3	4	2
Nausea vomiting present	9	4

No significant difference was found in the sedation score among the two groups. More number of patients reported presence of nausea and vomiting after administering tramadol.

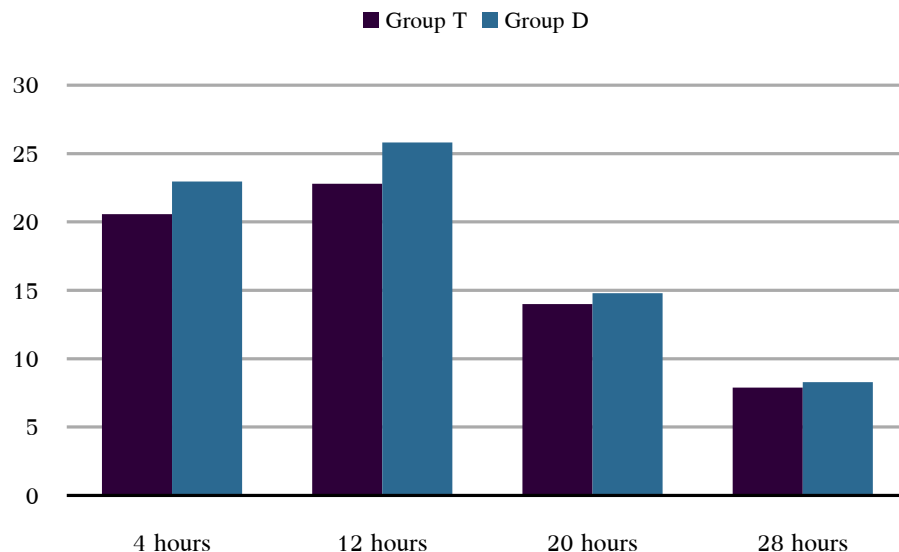


Chart 1: Pain scores on VAS. There is significant difference between the two scores at 12 hours with $p = 0.00071$. $P < 0.05$ for 4, 20 and 28 hours.

Discussion:

Good postoperative analgesia is an important component of adequate and perioperative care. This is associated with improved outcome, improved patient satisfaction, reduction in perioperative stress, and coupled with a reduction in opioid consumption, fewer adverse side effects^{7,8}. The present study suggests that tramadol reduces pain more effectively than diclofenac following elective laparoscopic cholecystectomy. Intravenous tramadol and intravenous diclofenac are both popular drugs for post operative pain relief following laparoscopic pain relief. The choice of one over the other was hitherto more dependent on the surgeon than clear cut evidence. To our knowledge we did not identify any study comparing the two analgesics tramadol and diclofenac for management of post laparoscopic cholecystectomy pain.

The greater efficacy of tramadol over diclofenac in managing post operative pain is found to be consistent with previous studies that show greater efficacy of opioid analgesics over NSAIDs⁹. In a study comparing tramadol with diclofenac in post cesarean patients it was found that the mean time to rescue dose of diclofenac was much shorter at 55 minutes compared to tramadol at 113 minutes¹⁰. In our study also we found that specially at 12 hours post surgery the patients in tramadol group reported lesser pain compared to diclofenac group. No patient in the tramadol group required additional dose of analgesia while three patients in diclofenac group had to be given an additional dose of analgesia as the VAS score exceeded 30 mm. In a study comparing diclofenac with tramadol in oral surgery it was however found that diclofenac was more effective with better tolerability profile¹¹. Agarwal et al have

however suggested that oral preoperative single dose of pregabalin 150 mg is an effective method for reducing postoperative pain and fentanyl consumption in patients undergoing laparoscopic cholecystectomy. Boccara et al also in their study showed that the preoperative administration of ketoprofen was accompanied by a lower incidence of nausea and vomiting and better pain control following laparoscopic cholecystectomy¹².

An interesting finding we noted was the increase of VAS scores at 12 hours after surgery compared to 4 hours after surgery. This increase may be attributed to the waning of anesthesia and intra operative analgesia.

A shortcoming in this study was that we did not have additional arms comparing the use of preemptive and preventive analgesia or a combination of drugs. Preemptive analgesia involves giving analgesia before surgery, with the aim of blocking the central sensitization of the nervous system as a result of the surgical incision and inflammatory damage¹³. Preventive analgesia, which may be confused with pre-emptive analgesia, is the commencement of analgesia before completion of surgery¹⁴ or during the early post operative period¹⁵.

In a study comparing post cesarean analgesia it was found that the use of tramadol and diclofenac together may result in better relief of pain¹⁰. Therefore a study of such combination in post cholecystectomy may be the subject of future study.

Conclusion:

In this study we found that even though intravenous tramadol may cause higher chance of nausea and vomiting it is better in relieving pain compared to intravenous diclofenac after laparoscopic cholecystectomy.

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Hemolytic Disease of the Newborn: A study of 50 cases

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Abstract

Background: Hemolytic disease of the Newborn (HDN) is characterized by the presence of IgG antibodies in maternal circulation, which causes hemolysis in the fetus by crossing the placenta and sensitizing red cells for destruction by macrophages in the fetal spleen with consequent hyperbilirubinemia.

Aim: The present study was carried out to evaluate the importance of various etiologies of Hemolytic Disease of Newborn in our hospital, to study the effect of sex, birth weight, gravidity of the mother and blood group in the outcome of disease and also to study the efficacy of Direct Antiglobulin test on predicting the outcome of alloimmune HDN.

Methods: Infants with indirect hyperbilirubinemia were taken as subjects and were compared with a control group of healthy infants. Patients were divided into two groups. Patients with indirect bilirubin less than 12 mg/dl and having mild disease were classified into Group A and patients having indirect bilirubin more than 12 mg/dl were labeled as Group B.

Result: Out of the 50 patients studied, 23 belonged to group A and remaining 27 to group B. Group C (control group) comprised of 50 healthy infants. ABO incompatibility was the leading cause of hemolysis (in 48%) followed by Rh incompatibility (in 22%), septicemia in 26% and G6PD deficiency in 4%.

Conclusions: In our study, we concluded that alloimmune hemolytic anemia due to ABO incompatibility is the most common cause of HDN. Gender of the baby and gravidity of the mother does not affect the outcome of disease process. However HDN due to Rh antibodies is uncommon in primigravida. Direct Antiglobulin test of baby has a strong predictive value determining the outcome of alloimmune hemolytic disease of newborn but it does not predict the severity of disease.

Key Words: Hemolytic Disease of newborn (HDN), Direct Antiglobulin Test, ABO Incompatibility, Rh Incompatibility

Introduction:

Hemolysis due to alloimmune antibodies is seen with acute and delayed RBC transfusion reactions, following stem cell transplantation where there is an antigenic blood type difference between the donor and stem cell recipient, and during the neonatal period as a result of differences in maternal and fetal RBC antigens¹. The spectrum of clinical problems in hemolysis occurring in the

fetus ranges from minimal hyperbilirubinemia to severe anemia with hydrops fetalis and/or kernicterus. HDN is characterized by hemolysis as a consequence of maternal sensitization to fetal RBC antigens inherited from the father resulting in the presence of IgG antibodies in maternal circulation which causes hemolysis in the fetus by crossing the placenta². Early detection and treatment of neonatal hyperbilirubinemia is important in prevention of bilirubin-induced

encephalopathy³. It is classified as RhD HDN, ABO HDN and HDN due to other blood group antibodies (non-ABO, non-RhD) according to the specificity of causative IgG antibodies. RhD incompatibility is still one of the most common cause of HDN, although other RBC incompatibilities are increasing in incidence⁴. The role of Rh (D) antibody in classic erythroblastosis fetalis was first elucidated by Levine and Katzin in 1941⁵. In this study, we studied 50 cases of Hemolytic Disease of Newborn for their etiology. We also studied the effect of gender of the baby, birth weight, blood group and gravidity of mother on outcome of disease. We also performed Indirect Antiglobulin test on mothers' sera and Direct Antiglobulin test on babies' RBCs for predicting the outcome of alloimmune hemolytic disease of newborn.

Materials and Methods:

In this study, infants with indirect hyperbilirubinemia were taken as subjects. These were divided into two groups. Patients with indirect bilirubin less than 12 mg/dl and having mild disease were classified into Group A and patients having indirect bilirubin more than 12 mg/dl were labeled as Group B. The control group was chosen from normal infants born in our institute who did not have evidence of jaundice. Infants in these three groups were compared for their sex, birth weight, gravidity and blood group of mother and baby. Also recorded was etiology of hemolysis in these patients. Bilirubin was measured by Van den bergh reaction⁶. Direct and Indirect antiglobulin tests were performed using the standard operating procedure of the blood bank using gel card method on three times cell washed sample for Direct Antiglobulin Test⁷ and pooled O cell prepared fresh. The gel system is based on the principle that the Sephadex gel matrix which serves as a filter thorough which large erythrocyte agglutinates get entrapped in the gel. When a clear pellet of cells settle at the bottom of the microtube, it indicates a negative reaction. The reactions are graded according to the allocation of erythrocytes at the

bottom of the gel. This technique is simpler to carry out and hence overcomes the practical problems of performing DCT by tube method. Other laboratory investigations carried out were hemoglobin (Hb), hematocrit, peripheral smear, reticulocyte count in neonates and ABO and RhD status of father if not done during pregnancy.

Result:

Out of 50 patients studied 23 belonged to group A and remaining 27 to group B. group C (control group) comprised of 50 healthy infants. On evaluating the cause of hemolysis, we found that Alloimmune HDN due to ABO incompatibility was the leading cause of hemolysis (48%). Alloimmune HDN due to Rh incompatibility accounted for hemolysis in 22% patients. Of the remaining cases septicemia was responsible for hemolysis in 26% and G6PD deficiency in 4%.

There were 65 % males in group A, 66 % in group B and 64% in group C. However, we found that the χ^2 value of this table to be 0.055 with $P > 0.1$ which was highly insignificant which indicated that gender of the baby is insignificant as an etiological factor for HDN. Similarly we also found that the gravidity of the mother is also is insignificant as an etiological factor for HDN.

In patients with ABO incompatibility, 37.5% of patients were primigravida, 42 % were second gravid and rests were multigravida. However, in patients with Rh incompatibility, the maximum patients were multigravida (54%), followed by second gravid (36%) and only 9% patients were primigravida.

In the case of relation of HDN to birth weight & blood group of the patient, we found that their etiological implications were insignificant. The maximum number of patients in the test groups, 70% in group A and 63% in group B, had a positive Direct Antiglobulin Test. Whereas only 1% of patients in the control group had a positive Direct Antiglobulin Test. Blood cultures in case of septicemic patients revealed Klebsiella, Staphylococcus aureus, Streptococcus pneumonia, and Clostridium perfringens.

Table 1: Summary of HDN due to ABO incompatibility

	ABO HDN present	ABO HDN Absent
Mother of blood group O	22	24
Mother of blood group other than O	2	10

Table 2: Causes of HDN other than ABO incompatibility

Due to Rh anti D	11
Rh antigen other than anti D	Nil
Other than ABO or Rh antigen	Nil
Non immune etiology of hemolysis	15

Table 3: Result of Direct antiglobulin test on various groups

Group	Positive Direct Antiglobulin Test	Negative Direct Antiglobulin Test
A	16	7
B	17	10
C	2	48

Discussion:

In this study ABO incompatibility was the commonest cause of HDN in contrast to the study conducted by Dharmesh Chandra Sharma et al⁸ in whose study Rh incompatibility was the commonest cause of HDN. It is more common in "O" blood group mothers because "O" blood group mothers have been shown to have high titers of IgG than "A" or "B" group mothers. In type A and B individuals, naturally occurring anti-B and anti-A isoantibodies which are largely IgM molecules; that do not cross placenta. In comparison, the alloantibodies present in type O patients are mainly of IgG antibodies. For this reason, ABO incompatibility is largely limited to type O mothers having fetal blood group A or B. The occurrence of IgG anti-A or anti-B antibodies in type O mothers also explains why hemolysis caused by ABO incompatibility frequently occurs during the first pregnancy without prior "sensitization". The pathophysiology of alloimmune hemolysis resulting from Rh incompatibility includes an Rh-negative mother, an Rh-positive fetus, leakage of fetal RBCs into the maternal circulation, and maternal sensitization to D antigen on fetal RBCs. The D antigen is the most immunogenic of the Rh antigens and there are no naturally occurring antibodies to Rh antigens. Immunization occurs almost exclusively during pregnancy. Small volumes of fetal RBCs enter the maternal circulation throughout the pregnancy. However, the main fetomaternal transfusion responsible for sensitization occurs during delivery. Rh hemolytic disease rarely ever occurs during the first pregnancy. However, once sensitization occurs, re exposure to Rh (D) RBCs in subsequent pregnancies leads to an anamnestic response and there is a rise in the maternal anti-D titer and an increased incidence of affected infants. We also deduced that for HDN of the newborn due to ABO incompatibility, gravidity does not appear to be a major criterion. Primigravida are affected as seriously as multigravida as sensitization does not occur in ABO HDN. However in Rh HDN out of 11 suspects 1 was born to primigravida and 10 were

born to multigravida since Rh antibodies are uncommon in first pregnancy and tend to occur in later pregnancy after fetomaternal bleed. On further evaluating one primigravida it was revealed that she had previous history of accident for which she had blood transfusion in a local hospital. Antibodies are seen in 0.3% after first pregnancy and 6.6% after two. Sex of the patient also did not seem to influence outcome of the patients in our study. However both patients of G6PD deficiency were males as this disorder is X-linked. Birth weight and Blood group of the baby also did not affect the outcome of disease in our series. Antiglobulin test performed on the infants' sample correlates well with the occurrence of disease. We got P value for the Table – 9 is $P < 0.001$ which shows high predictive value of Antiglobulin test for occurrence of disease but for patients affected by disease, P value > 0.1 which is highly insignificant. Direct Antiglobulin test is thus highly nonspecific in predicting severity of disease.

Conclusion:

All immune hemolytic anemia due to ABO incompatibility is the most common cause of hemolytic disease of newborn. Gender of the baby does not have significant effect on the outcome of disease saving G6PD deficiency which is more common in males as disease is X-linked. Gravidity of mother does not affect the outcome of disease process. However HDN due to Rh antibodies is uncommon in primigravida. Blood group of patient does not affect the disease outcome. Birth weight of the patient also does not have any effect on the outcome of disease. Direct Antiglobulin test of baby has a strong predictive value determining the outcome of alloimmune hemolytic disease of newborn but it does not predict the severity of disease.

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Mesh V/s Non Mesh Hernia Repair: Comparison of Cost Effectiveness and Return to Work Among Agricultural Labourers

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Abstract

Introduction: Hernia repair is by large the most common operative procedure carried out by Surgeons all over the world. While conventional suture repairs like Modified Bassini's remain the main method used, they are associated with considerable pain and tension on the suture line. Tension free mesh repair has been touted to be superior to conventional repair, however the cost effectiveness in low socio economic strata remains to be evaluated.

Materials and Methods: A comparative single blinded study was carried out in a teaching hospital. Demographic profile including the socio economic status of patients evaluated. Patients were randomized to undergo either mesh or non mesh repair and followed up for post operative complications, duration of hospital stay, interval between surgery and return to work and loss of work days due to post operative complication.

Results: There were 16 patients each in the mesh and non mesh repair groups. The groups were matched for age, BMI, daily average income, size of dependent family. The time taken for surgery was significantly higher in non mesh group (average 60.3 minutes) compared to mesh repair group (45.6 minutes) with $p = 0.000003$. The duration of hospital stay after non mesh repair (5.4 days) was significantly higher than after mesh repair (3.8 days; $p = 0.003$). The post operative complication rates were comparable in the two groups, however the economic loss due to days lost at work was higher in the non mesh group.

Conclusion: Mesh repair appears to offer long term benefits in terms of lower operative time, duration of post operative hospital stay, recurrence rate as well as cost effectiveness

Key Words: Bassini's repair, Linchtenstein reapiir, Cost effectiveness

Introduction:

Hernia has plagued humans throughout recorded history and descriptions of hernia reduction date back to Hammurabi of Babylon and the Egyptian papyrus. Much of modern surgical technique results from the contributions of early surgeons, but it was not until the late 19th century that hernia surgeon Edoardo Bassini (who is considered the father of modern day hernia surgery) experienced any measurable degree of success in repairing hernias. Bassini's aggressive approach was to perform "a radical cure of inguinal hernia," and his operation epitomized the essential

steps of an ideal tissue repair¹. There have been numerous modifications of Bassini's original technique. However, suture repair is associated with a considerable tension on the suture line. This is likely to cause ischemia of the tissues and ultimate failure of repair leading to recurrence²⁻⁴. The concept of tension free hernia repair by using a synthetic proline mesh was first proposed by Lichtenstein and Schulman⁵. A number of studies claimed improved results of tension free mesh repair in terms of rate of recurrence compared to conventional suture repairs⁶⁻¹¹. This decreased recurrence is highly desirable as the failure of

surgery imposes a great economical burden. The duration of hospital stay and post operative pain is also reported to be low with mesh repair¹². It becomes more important for the daily wage agricultural workers to return to work early as also to have low post operative problem rate. In this study we have tried to compare the interval from surgery to return to work and cost effectiveness of hernia repair with or without mesh in this class of patients.

Materials and Methods:

This is a comparative single blinded study carried out with approval of Institutional Ethical Committee. Thirty two patients were included in the study from January 2012 to October 2013. Only male patients who were agricultural labourers by profession, with inguinal hernia were included in this study. A written informed consent was obtained from each patient participating in the study. Patients who having bilateral hernias, recurrent hernias and with serious comorbidity were excluded from the study. A detailed proforma was filled for each patient documenting the patients age, site of hernia, BMI (body mass index), duration and type of hernia, daily income from working on agricultural farm, size of family, alternate source of income. Then the patients were randomly allocated to one of the two surgical groups; one group of those undergoing modified Bassini's repair (Group B) and the second group of those undergoing Lichtenstein repair (with mesh) (Group L). All the patients received standard pre operative preparation and care. During surgery, anaesthesia was given according to protocols. Surgery was performed by consultants with adequate experience of performing hernia repair. For group B, hernia repair was carried out by the standard Modified Bassini procedure using proline suture. For the group L, hernia repair was done using synthetic proline mesh fixed by proline suture. Then duration of surgery was noted for each of the surgery. The cost of surgery including anesthesia, surgical materials and one day of antibiotic doses were documented for each patient.

Post operative evaluation of patient was done by another investigator who was blinded to the type of repair the patient had undergone. Early and late post operative complications, duration of hospital stay, interval between surgery and return to normal work, days lost due to post operative pain and/or complications were documented for each patient. The patients were followed up to one year post surgery to record incidence of recurrence.

Data was analyzed using SPSS (Statistical Package for Social Sciences) version 16. P value was calculated for demographic data by using Student's t test. For comparison of complication rate among the two groups Fisher's exact test was used. A value of $p < 0.05$ was considered to be statistically significant.

Result:

A total of 32 patients were included in the study. This cohort was randomly allocated to Group B (modified Bassini repair) and Group L (mesh repair) with 16 patients in each group. The demographic analysis of both the groups is depicted in table 1.

The patient age ranged between 29 years to 45 years with average of 36.62 years in Group B which was comparable with average age of 37 years (range 30 years to 48 years) in Group L. The average BMI (body mass index) of patients in Group B was 23.4 kg/m² closely compared to an average of 23.9 kg/m² in Group L (table 1).

Socio economic evaluation of the two groups revealed that the daily income per patient in Group B was an average of Rupees 253 and that in Group L was Rupees 246; the difference was not significant with a p value of 0.24. In group B, 6 out of 16 had an alternate source of income (vegetable vending). In group L, 7 out of 16 patients had an alternate source of income. The size of dependent family on the patient per head was an average of 6.1 members in group B and 5.8 members average per head in group L, with a p value of 0.25 hence not significant (Table 1). Hence the two groups were matched in demographic and socio economic profile.

A comparison of the characteristics of hernia in the two groups is depicted in (Table 2).

The operative time in mesh repair was significantly lower than in non mesh repair group. It was observed that the average duration of surgery in group B was 60.6 minutes compared to 45.6 minutes in group L with a highly significant p value of 0.000003. (Table 3)

Table 3 shows the occurrence of post operative complications both early and late in the two groups. The overall incidence of complication rate was low in this study and the p value by Fisher's exact test was not significant at 0.21 for the comparison of complications between the two groups.

We also evaluated the cost of surgical procedure and hospital stay required post operatively in the two groups. The average duration of hospital stay

after non mesh repair was 5.4 days compared with 3.8 days after mesh repair yielding a significant p value of 0.003. The higher average hospital stay after surgery after modified Bassini repair was probably because of higher incidence of post operative pain in this group. The average cost of surgery in mesh hernia repair was Rupees 3500 which was significantly higher than that of non mesh repair in which the patient incurred a cost of Rupees 2000 on an average for the surgery. However when it is compared with the number of days lost post surgery due to persistent pain and inability to get back to normal work, we observed that the patients in non mesh repair group B lost about 20 days more, amounting to approximately Rupees 5000 of extra economic burden (Table 4).

Table 1: Demographic profile of study groups

Character	Non Mesh repair (Bassini's) Group B (n=16)	Mesh Repair (Lichtensteins') Group L (n=16)	p Value
Age in years	29 - 45 (average 36.6)	30 - 48 (average 37)	>0.05
BMI kg/m ²	20 - 28 (average 23.4)	21 - 30 (average 23.93)	>0.05
Daily income in Indian Rupees	253.12	246	0.24
Alternate source of income present	6	7	>0.05
Size of dependent family	6.1 (average)	5.8 (average)	0.25

Table 2: Comparison of characteristics of hernia

Character of hernia	Non Mesh repair (Bassini's) Group B (n=16(%))	Mesh Repair (Lichtensteins') Group L (n=16(%))
Site: Right Left	13 (81.25%) 3 (18.75%)	11 (68.75%) 5 (31.25%)
Duration of hernia 4 weeks to 1 year > 1 year	8 (50%) 8 (50%)	9 (56.25%) 7 (43.75%)
Direct Indirect Irreducible	11 (68.75%) 4 (25%) 1 (6.25%)	12 (75%) 4 (25%) 0

Table 3: Comparison of operative time and post operative complications

Character	Non Mesh repair (Bassini's) Group B (n=16)	Mesh Repair (Lichtensteins') Group L (n=16)
Time taken for surgery in minutes	60.6 (average)	45.6 (average)*
**Early complications: Retention of urine Wound infection Hematoma	1 1 2	1 2 1
**Late complications: Persistent pain Recurrence of hernia	6 2	2 0

* $p = 0.000003$ (Student's t test)

** $p = 0.21$ (Fisher's exact test) for comparison of complication rates between the two group

Table 4: Comparison of economic burden

Character	Non Mesh repair (Bassini's) Group B (n=16)	Mesh Repair (Lichtensteins') Group L (n=16)
Cost of surgery in Indian Rupees	2000 (average)	3500 (average)
*Duration of hospital stay in days	5.4 (average)	3.8 (average)
**Return to work in days	42 (average)	30 (average)
**Days lost to pain/ discomfort	12 (average)	4 (average)

* $p = 0.003$

** overall 20 days more lost in non mesh repair group on an average. Taking into account the average wage per day it would amount to Rs 5000/- extra economic burden.

Discussion:

Repair of inguinal hernia remains the oldest and commonest operations performed by general surgeons all over the world. Various conventional methods like Bassini's and Shouldice repair using suture material are in practice¹². Tissue based suture repair by different techniques (Bassini's, Shouldice etc.) has remained the most conventional surgical treatment of inguinal hernia. These techniques had in common excessive tension on the suture line as well as the neighbouring tissues, a lot of dissection, trauma and undue operative time. These factors were found to be responsible for a number of recurrences, persistent pain after surgery and

morbidity leading to an undue economical Burdon on the patient¹³. This led to the introduction of mesh repair in the late 1980's with the concept of tension free repair of hernias¹⁴. Despite promising results in mesh repair claimed by many authors', the non-mesh repair still continues and the best method of repair is yet to be decided¹⁵. This study compares and demonstrates the efficacy and cost effectiveness of mesh repair (Lichtenstein) over non mesh repair (Modified Bassini). The operative time is significantly less in mesh repair compared to non mesh repair ($p = 0.000003$) thereby saving on surgeon cost as well as anesthesia cost. The average duration of hospital stay after mesh repair was also significantly lower at 3.8 days than after non mesh repair at 5.4 days ($p=0.003$). These findings are consistent with other similar studies¹⁶⁻²⁰. Recurrence rate of hernia following mesh repair was nil in this study with only two cases reported after non mesh repair. This may be because of lesser number of cases recruited for this study and a follow up period limited to about 20 months at the maximum. Further follow up of these patients is required to note any new recurrence. Bisgaar T et al²¹ and Butters²² claimed a recurrence rate of 2% with Lichtenstein repair

and found mesh repair superior to suture repair for inguinal hernia. Though the complication rates were comparable in the two groups, complications worthy of note were chronic pain, numbness along medial side of thigh and discomfort which were more in non mesh repair group. These observations in our study have also been reported by Arshad et al¹². A strength of this study was the evaluation of economic burden of hernia on the patient. For the agricultural labourer class that almost wholly depends on daily wages for their livelihood, coupled with low per capita income, it was imperative that we know which type of hernia repair serves them best. At the outset it may appear that mesh repair incurs higher cost to patient, largely due to cost of synthetic proline mesh at the time of surgery. However when we further evaluated the cost incurred due to loss of days at work owing to post operative pain and discomfort, we found that those who had undergone non mesh repair incurred higher economic loss.

Conclusion:

Mesh repair appears to offer long term benefits in terms of lower operative time, duration of post operative hospital stay, recurrence rate as well as cost effectiveness.

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Lasers in Root Canal Sterilization - A Review

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Abstract

Sterilization of root canal is an important step in the treatment to prevent the development of or to resolve any periapical pathology. Conventionally, chemo mechanical means have been used to clean the root canal systems. The most recent development in endodontic treatment is the use of lasers. The laser is an effective tool as it has the ability to kill the bacteria, remove debris and smear layer from the root canal walls following biomechanical instrumentation by the use of energy and wavelength characteristics. This article review goes on to explain, the effects of laser on tissue, bacteria, types of laser, delivery systems, emission modes and about the use of lasers in root canal sterilization.

Key Words: Laser, Root Canal, Sterilization, Endodontics

Introduction:

Since bacteria are the most important cause of periapical infections, the main objective in endodontic therapy is the disinfection of the root canal and the three-dimensional network of dentinal tubules. From the infected pulp tissue, bacteria can penetrate into the deeper layers of root dentine and propagate a periapical inflammation with subsequent destruction of the adjacent connective tissue¹⁻³. The local microenvironment favors the selection of relatively few bacterial species, which can survive and proliferate, being out of reach of the host's immune response⁴⁻⁸. The conventional chemo mechanical treatment for canal preparation and enlargement does not result in complete bacteria removal. The pathogenic microorganisms are able to penetrate the root dentine up to a depth of more than 1 mm, whereas disinfecting solutions reach a depth of only approximately 100 µm. Very often the apical third of root canal remains insufficiently prepared, meaning that a smear layer made of dentin debris, pulp residue and bacteria may be found in it. Irrigation of smear layer from the dentinal tubules may be impossible, so the need for a new method to make endodontic treatment

easier and more successful has become increasingly important⁹.

The most recent development in endodontic treatment is the use of lasers. Since the development of the ruby laser by Maiman in 1960 and the application of the laser for endodontics by Weichman in 1971, a variety of papers on potential applications for lasers in endodontics have been published¹⁰.

The first laser use in endodontics was reported by Weichman & Johnson (1971)¹¹⁻¹² who attempted to seal the apical foramen invitro by means of a high power-infrared (CO₂) laser. Subsequently, attempts were made to seal the apical foramen using the Nd:YAG laser¹². Although more information regarding this laser's interaction with dentine was obtained, the use of the laser in endodontics was not feasible at that time. Since then, many papers on laser applications in dentistry have been published with growing interest in this topic in the last 5 years.

Lasers -penetration depth in Root Canal

Most currently use of irrigants and intra canal medicaments have limited anti-bacterial spectrum and a limited ability to diffuse into the dentinal

tubules (100 μ m) therefore newer treatment strategies should be considered to eliminate microbes from the root canal system which penetrate upto 1,110 μ m. Laser light which penetrates up to > 1000 μ m into the dentin thus has scope for complete canal sterilization¹³.

The laser is an effective tool for killing microorganisms because of the energy and wavelength characteristics. Infected root canals are an indication for this laser treatment, but its application in extremely curved and narrow infected root canals appears difficult¹⁴.

Numerous studies have documented that CO₂, Nd:YAG, Argon, Xe-Cl (308nm), Er,Cr:YSGG and Er:YAG laser irradiation has the ability to kill the bacteria, remove debris and smear layer from the root canal walls following biomechanical instrumentation. But lasers which can be delivered through extremely fine flexible fiber optic systems and which can penetrate dentin to a depth that can eliminate bacteria are applicable. This particularly includes lasers in the near infrared region¹³.

Propagation of light in tubular network

The impact of the laser light depends on the interaction of the light quanta and the molecules and the molecular formations in the target material. Dentin has a complex tissue architecture composed of organic and inorganic material. The incident light is partly reflected and refracted but its main propagation is scattering, i.e. the splitting of the light by repeated directional diversion. Thus the original parallel beam of light loses its parallelism, the illuminating volume changes its form, and it becomes larger. The light emitted by the laser creates a "light fog" in the dentin, and does not have the characteristic of a concentrated beam anymore. This scattering is caused mainly by the tubules.

Laser light in near infra-red region is absorbed by dentin only to a small extent. For complete elimination of bacteria within the tubules, light should penetrate deep without interaction with the superficial dentin. Nd:YAG and diode laser

wavelengths are not absorbed in hard dental tissue and are thus able to be effective in deep layers. The Er:YAG laser acquires its efficiency by photoablative effect. The antibacterial effect of Er:YAG is effective but restricted to a small area surrounding the root canal.

Reaction of bacteria to laser light

The laser light that attacks the bacteria may differ strongly from the light emitted by the fiber tip. This is because the light may have had an interaction with the dentin. Bactericidal effect of laser is attained by causing changes in bacterial cell wall. Because of the complex three layer membrane, gram negative bacteria are very sensitive to irradiation, and only very small densities of energy result in severe damage to the cell membrane of bacteria.

An indirect irradiation with 1W causes obvious changes to the cell membrane of bacteria. A number of large, vesicle formations of different sizes can be observed (so called membrane blebbing) which covers the bacteria totally or partly. The blebbing phenomenon is the result of the inner layer of the membrane splitting from the two outer layers. This change of the cell membrane impacts upon the barrier function and since the cell coat is also the site of a most diverse enzyme system; one can also assume that a slight restructuring of the membrane disturbs the cell's metabolism substantially. In *E. coli* the changes of the murine – lipoproteins increase the sensitivity against EDTA and various other detergents, and changes also caused the loss, through the membrane, of periplasmatic enzymes like ribonuclease (this enzyme is involved in the reduplication and repair synthesis of the DNA). In comparison, the gram positive micro-organisms showed a higher resistance against irradiation. The reason seems to be the simple structure of the cell membrane. The cell wall of the gram positive *E. faecalis* shows an astonishingly high resistance against the laser irradiation. Low energies (1W)

show almost no changes to these problematic bacteria.

With the application of multiple irradiations, visible damage of the bacteria can be detected, but there can still be a few unaltered cells. However, the quantitative bacterial death increases steadily, and the damage seems to depend on a cumulative effect. A cellular stress factor leads to sublethal, reversible changes, but when the cell is hit again by the irradiation it dies. This mechanism is called the “knock on” effect.

Different types of lasers and role in root canal sterilization

Numerous studies into the sterilization of root canals have been performed using CO₂ and Nd:YAG lasers. Many other lasers such as the XeCl laser emitting at 308 nm, the Er:YAG laser emitted at 2.64 μ m, a diode laser emitting at 810 nm, and the Nd:YAP laser emitting at 1.34 μ m have also been used for this purpose.

Nd:YAG

The Nd:YAG laser is more popular that is because a thin fibre-optic delivery system for entering narrow root canals is available with this device and the ease with which the laser energy and laser fiber can be controlled¹⁴.

Midda and Renton-Harper were the first to refer to the bactericidal effect of the Nd:YAG laser and recommended its use in endodontics. The first studies in this field were made in 1995 by Rooney et al. and Hardee et al.

Rooney et al. assessed the impacts of the Nd:YAG laser at different settings between 0.3W and 3W in vitro. For their evaluation, a 350 μ m fiber was used and excellent bactericidal effect was achieved. By adding black photo absorber, bacterial reduction could be reached at lower energies¹⁵.

Hardee M.W. et al in their study on evaluation of the antibacterial effects of intra-canal Nd:YAG laser irradiation, concluded that there was no

significant difference between groups exposed to pulsed Nd:YAG laser radiation or 0.5% NaOCl alone and in combination¹⁶.

Thermal effects and antibacterial properties of an Nd: YAG laser was studied by Ramskold (1997) to establish clinically safe levels of energy to be delivered into the root canal and to determine the energy level needed to sterilize infected root canals¹⁷. The results indicated that lasing cycles of 3 J-s for 15 s followed by a 15-s recovery interval can be continued for prolonged periods without risk of thermal damage to surrounding tissues.

The antibacterial effects of the Nd: YAG laser on contaminated root canals and dentinal tubules were observed by Berkiten M. et al (2000)¹⁶. The samples were inoculated with *Streptococcus sanguis* (NCTC 7853) and *Prevotellaintermedia* (NCTC 93336), and the effects of Nd: YAG laser was tested on these teeth. The specimens were lased with 1.8 W and 2.4 W Nd: YAG laser for 30 s, and the presence of bacteria in tubules was observed under light microscopy. The 1.8 W lasers sterilized the tubules in 86.3% of sections inoculated with *S. sanguis*, whereas 2.4 W lasers sterilized in 98.5% of the sections. Both laser powers sterilized all samples inoculated with *P. inter media*. The scanning electron microscopic observations supported the light microscopic findings.

Diode Laser

It has unquestionable bactericidal effect, similar to the Nd:YAG laser. The sterilization effect of the diode laser resembles that of Nd:YAG laser¹³.

The penetration depth of the diode laser, which is lower in the case of endodontics than that of the Nd:YAG laser, also lowers the risk of an unwanted temperature rise¹⁸. At the same time, however, this means less efficiency in the case of very deep infections. 980-nm diode laser can eliminate bacteria that has immigrated deep into the dentin¹⁹. Since most diode lasers are chopped lasers, no pulse noise is to be heard and thus during application the valuable answer regarding

the condition of the canal (damp or dry) is missing. Diode laser stimulates cell proliferation and shows inhibiting effect on inflammation propagating enzymes. In addition, Diode lasers have broad application spectrum. Diode lasers in addition to these qualities are having reasonable price, thus increasing their use in general practice.

Er:YAG and Er,Cr:YSGG Laser

For solitary root canal sterilization, the Er:YAG laser is not really suitable. It has a bactericidal effect through the removal of the smear layer in the root canal and is therefore comparable with the chemical rinsing solutions, described as “physical rinsing”. However, the bactericidal effect in the depth of the dentin is not as good as achieved with the Nd:YAG or diode laser. It can only penetrate the areas closer to the canal lumen because of its wavelength and surface absorption by the dentin, and develop an effect on the bacteria¹³.

A bactericidal effect in the depth of the dentin is hardly conceivable for physical reasons and could only be achieved through an unwanted temperature rise.

Excimer Laser

It is possible to demonstrate the bactericidal effects with irradiation with the 308nm excimer laser at an energy density below the threshold of ablation. A complete eradication of bacteria was achieved by applying 250 pulses. As the energy is increased upto $1.8\text{J}/\text{cm}^2$ ¹⁶ the number of pulses required to kill 90% of the bacteria decreases.

Because 308nm excimer laser ablates organic material much more easily than inorganic material the entrance of the root canals (orifice) can be easily found. With continuous saline rinsing and use of fiber with a core diameter of about $200\mu\text{m}$, the lower third of the root canal is easy to reach. By varying the size of the optical fiber all of the root canals can be prepared with excimer lasers only. Studies have shown the most suitable energy density for root canal preparation

to be $6-9\text{J}/\text{cm}^2$ at a repetition rate of 20-30Hz. With these parameters smooth root canals were possible.

Risk of Laser during Endodontic Therapy

McKinley I.B. (1994) evaluated the potential for spreading bacterial contamination from the root canal to the patient and the dental team via the smoke formed by the laser. Extracted teeth were purposely inoculated with a definite strain of *Escherichia coli*. Argon laser was used in the canal. The smoke plume was captured and cultured. The cultures produced were positive for growth of the *E. coli* used. The authors concluded that the Laser smoke does present a hazard of bacterial dissemination and precautions must be taken to protect against spreading infections when using lasers in the root canal¹⁹.

Conclusion:

Development of laser technology at this point of time is at a high state of refinement, having had several decades of researches. With the introduction of thinner, more flexible and durable laser fibers, its application in endodontics has tremendously increased. Newer laser systems are also focusing to improve the existing delivery systems, develop new fiber types, combine wavelengths into a single package, hence resulting into smaller and cost effective laser units.

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Role of Herbs and Their Uses in Dentistry

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Abstract

The value of chewing sticks is believed to be in their mechanical cleansing action, they are also found to be effective in reducing plaque and gingival inflammation. However, gingival recession may be a consequence of their usage. They also possess antimicrobial activity, the bacteria which seems to be affected are streptococci, staphylococcus aureus, bacteroides gingivalis and bacteroides melanogenicus. The *Salvadora persica* mouth rinse has a significant antiplaque effect, however mouth rinse containing herbal extracts *Juniperus communis*, *Urtica dioica* and *Achillaea millifolium* does not have any effect on plaque growth and gingival health. The *Sanguinaria* containing dentifrice, herbal based tooth paste *Paradontox* and tooth paste containing neem seems to be effective in the control of plaque and gingivitis. The *Sanguinaria* extract tooth paste and oral rinse when used together has shown to control and reduce plaque and gingivitis. The *Acacia* gum has an inhibitory effect on early plaque formation and also exhibits antimicrobial property on *P.gingivalis* and *P.intermedia*. Future studies should be focused on chemical nature and mode of action of active constituents of these plants. This paper is aimed at reviewing, various herbal extracts and their effects on periodontal diseases.

Key Words: Herbs, Dentistry, Ayurveda, Chewing Stick

Introduction:

As we approach in the era of 21st century, it is appropriate to have a glance on advances made in personal oral hygiene. Dental caries, gingivitis & periodontal disease are the three most common chronic human diseases. Their prevalence is undoubtedly higher than in prehistoric times. Is this a "tribute" to progress in oral hygiene products? Realistically, the diseases are kept at bay by personal and professional oral hygiene - in spite of a pathogenic diet and lifestyles and numerous iatrogenic factors.¹

The history of dental sciences in ancient India takes us back to remote antiquity. Dental sciences in India are as old as the Vedas and Puranas. Ayurveda is the name which the ancient Indians gave to their sciences of medicine. Ayur means life and Veda is to know or attain. Hence, Ayurveda is the science by the

knowledge of which life expectancy can be prolonged or its nature is understood.

Diseases of the oral cavity were known to the Indians since ancient times and much was written about them by Sushruta, Charaka and Vagbhatta. Even in ancient times, Indians never liked to use the brushes made of animal hairs. They considered such brushes rather barbaric and unhygienic. They used to use wooden twigs called "datun". The wood of the twig always varied according to the time of the year and of course, the users temperament. Similarly, the length of the twig ideally about 6 inches but also varied according to the users choice. One end of the twig, crushed, liberating an extract being bitter but having astringent quality. The crushed end resembling like a brush was being used for cleaning the teeth. Aromatic herbs and spices were used for rinsing the mouth.

Both medical and religious beliefs have done much to focus the attention of the Indian on his teeth. Maintenance of oral hygiene as part of daily ritual for Indians who considered the mouth to be the gateway to the body and therefore insisted that it should be kept scrupulously clean.

Relation between plaque and periodontal disease is an established fact. The mechanical plaque removal is undoubtedly the best approach for its elimination.

In recent years, attempts have been rightly made to test the plants and plant products for their effectiveness. Various time tested Japanese and Chinese plants have been evaluated for their specific antiplaque properties. Extensive studies have also been conducted on blood root plant (*Sanguinaria*) for its effect on bacterial plaque.

Use of plants and herbs for dental care is very common in indigenous systems of medicine and plants like *Acacia* and *Azadirachta indica* have been demonstrated to possess antiplaque properties.²⁻³

In many African countries the ready availability of plant materials has led to the use of chewing sticks. Also these chewing sticks are widely used in Nigeria, and Asia, and in many Asian societies chewing sticks still remain the only method used to clean the teeth. Among the various tree twigs, African chewing sticks have been suggested to have an antiseptic activity, may control the formation and activity of dental plaque and therefore reduce the incidence of gingivitis.⁴ Also, the aqueous extracts of Nigerian chewing sticks showed significant in vitro anti-plaque activity.⁵ Nigerian chewing sticks derived from African plants were found to play an important role in restricting plaque accumulations and caries incidence.⁶

Both the twigs and oil of *Azadirachta indica* have been reported to contain substances with broad-spectrum antimicrobial activity and when incorporated into a dentifrice reduces gingival irritation. *Bridelia ferruginea* split-stem with lime juice is used in the topical treatment of acute necrotizing ulcerative gingivitis in children.⁷

The combined use of the sanguinarine-containing tooth paste and oral rinse has resulted in

controlling and reducing plaque and gingival inflammation in an orthodontic population.⁸

The gum of *Acacia Arabica* has been studied for its effect on plaque and gingivitis and has been found to have the potential to inhibit early plaque inhibition⁹ and its action on suspected periodontal pathogens like *P.gingivalis* and *p.intermedia* has been suggested to be of clinical value.¹⁰

Herbal based tooth paste composed of Camomile, Echinacea, Sage, Myrrh, Rhatany and Peppermint oil has been found to be as effective as the conventionally formulated dentifrice in the control of plaque and gingivitis.¹¹

Neem extract incorporated into toothpaste was beneficial in improving the oral health of population who were otherwise using natural products like mango leaf, cashew leaf, wood ash, charcoal powder.¹²

Neem tooth paste and Nimodent tooth powder uses *Azadirachta indica* (Neem) as an active ingredient and has been reported to exert anti-inflammatory and wound healing properties.¹³

Action of Various Herbal Extracts On Plaque:

Chewing Sticks:

Wolinsky LE, Sote EO (1983)⁵ studied eight varieties of commonly used chewing sticks from Nigeria, among which *serindeia Warnecki* inhibited the growth and adherence of *streptococcus mutans* comparable to that of 10⁻⁴M Chlorhexidine. *Anoigeissus Schimper* was also a strong inhibitor of bacterial growth (26%) when added at a concentration of 1%. *Fagara Xanthoxyloides*, on the other hand showed no significant reduction in bacterial growth or adherence. The remaining plant extracts showed varying degrees of inhibition to growth and adherence. The extract of *prosopsis Africana*, *garcina kola* and *pseudocedrela Kotschy* caused a large reduction in the in vitro binding of *streptococcus mutans* to the glass surface without greatly affecting the growth of the organism as determined by pH and total growth. Because of the inhibition noted with *Serindeia Warnecki*, experiments varying the

concentration of this plant extract from 0 to 10% (w/v) were undertaken. These experiments revealed a dramatic reduction in growth inhibition at levels below 1%. They concluded that, several of these aqueous extracts of Nigerian chewing sticks showed significant in vitro anti-plaque activity.

Wolinsky LE, Sote EO (1984)⁶ conducted a study to determine the chemical nature of the active chewing sticks components and to examine the effects of these compounds on in vitro plaque development. Aqueous extracts, 1% (w/v) of Nigerian chewing sticks derived from African plants was found to effectively inhibit the attachment of streptococcus mutans to glass or saliva-coated hydroxyl-apatite beads. It was shown that the active compounds in these extracts interfere with binding of the bacteria, resulting in reduced adherence. Chemical and spectral analysis of the active constituent from *Serindeia Warnecki* showed this material to have the characteristics of a high molecular weight polyphenolic tannin. 1% aqueous solutions of tannic acid was also shown to promote similar invitro adherence inhibition as the tannin-like substance from *serindeia warnecki*. The results concluded that chewing stick constituents appear to play an important role in restricting plaque accumulations and caries incidence.

Wolinsky LE, Mania S, Nachnani S, Ling S (1996)¹⁴ investigated the inhibitory effects of aqueous extracts derived from the bark-containing sticks (Neem stick) upon bacterial growth, adhesion to hydroxyapatite crystals and production of insoluble glucan, which may affect invitro formation of plaque. Neem stick extracts were screened for minimal bacterial growth inhibition (MIC) against a panel of streptococci. No inhibition of bacterial growth was observed among the streptococcal strains tested in the presence of ≤ 320 mg/ml of the neem stick extract. The pre-treatment of streptococcus sanguis with the neem stick extract or the gallotannin enriched extract from *Mellaphis chinensis* at 250 mg/ml resulted in a significant inhibition of the bacterial adhesion to saliva-conditioned hydroxyapatite. Prior treatment of saliva conditioned hydroxyapatite with neem stick or galatannin rich extract prior to exposure to bacteria

yielded significant reductions in bacterial adhesion. Incubation of oral streptococci with the neem extract resulted in a microscopically observable bacterial aggregation. The data suggest that neem stick extract can reduce the ability of some streptococci to colonize tooth surfaces.

Paste:

Gazi MI, Lambourne A, Chagla AH (1987)¹⁵ conducted a single blind crossover study and measured the effect of mouthrinse made from tooth paste containing *Salvadora Persica* on plaque formation and gingivitis and compared the results with the known antiplaque agent chlorhexidine. Gingival index, bleeding point index, patient hygiene performance index and modified Quigley-Hein plaque index were recorded. Both treatments reduced the gingival and bleeding point indices and the plaque scores. The only significant difference between the two treatments was a lower modified Quigley-Hein plaque index shown by chlorhexidine. Both treatments showed a quantitative reduction in plaque bacterial growth but *Salvadora Persica* showed a significant reduction of the gram negative rods. When *Salvadora persica* toothpaste, was used as a mouthrinse without a toothbrush exhibited some features comparable to those of chlorhexidine, it was concluded that general public would accept it for daily use with a toothbrush would prove atleast as effective as chlorhexidine in reducing plaque and gingivitis.

Gingivitis:

Chewing Stick:

Cyril OE, Rosemary CA (1985)⁷ examined some of the properties of chewing sticks in relation to oral hygiene, with special reference to conditions in Africa. They reported that both the twigs and oil of *Azadirachta indica* contain substances with broad-spectrum antimicrobial activity and when incorporated into a dentifrice reduces gingival irritation. The cooled liquid obtained from boiling the bark *Bridelia Ferruginea* with lime juice is used in the topical treatment of acute necrotizing ulcerative

gingivitis in children. They also stated that the main advantage of chewing sticks in developing countries is their low price and in poor countries tooth brushes are often incorrectly used, usually with contaminated water.

Plaque and Gingivitis:

Paste:

Mallatt ME, Beiswanger BB, Drook CA, Stookey GK, Jackson RD, Bricker SL (1989)¹⁶ this study was conducted to evaluate the effects of a Sanguinaria – containing dentifrice on the prevention of dental plaque formation and gingivitis. A total of 59 young adults, either performed supervised brushing with a 0.075% Sanguinaria – 0.05% Zinc chloride (Via-dent) a 0.24% sodium fluoride dentifrice, or rinsed daily with a 0.05% sodium fluoride solution. Clinical evaluations for plaque and gingivitis were performed after 7, 14 and 21 days. Results showed that after 7, 14 and 21 days both groups using dentifrices had significantly less plaque and gingivitis than the group using the rinse, and there were no significant differences between the two groups using either Sanguinaria –ZnCl₂ or the NaF dentifrices.

Mullaly BH, James JA, Coulter WA, Lindne GJ (1995)¹¹ compared the efficacy of a herbal based product, paradontax to an accepted conventionally formulated toothpaste in the control of plaque and gingivitis. 70 subjects with gingivitis completed the 6 week study. At baseline, both groups were balanced for the parameters: plaque index, gingival index, bleeding on probing and gingival crevicular flow. At the end of the trial, results showed that there were reductions within both groups but no significant difference noted. It was concluded that the herbal based toothpaste was as effective as the conventionally formulated dentifrice in the control of plaque and gingivitis.

Subraya B. et al (2000)¹² evaluated whether the oral health of natural product users improved, primarily in terms of reduction in plaque formation and secondarily in terms of gingivitis. Three month clinical studies were conducted on a population of

natural product users, to determine the effect of brushing with two low cost chalk based toothpastes containing Neem extracts, on plaque and gingivitis.

The fluoridate and non-fluoridated toothpastes were tested in two phases. In the first phase, the experimental tooth paste contained 1000 ppm fluoride and in the second phase the same formulation was used. A control or no treatment population who used non-conventional dentifrices like Mango and Cashew leaf, Charcoal and Ash as routine method of oral hygiene, was used in both the phases of the study. Subjects underwent a baseline assessment for plaque and gingivitis and were assigned to either experimental group which received the test tooth paste and a soft toothbrush and instructions on brushing technique, or the control group. At the end of 3 months, there was a significant reduction in plaque and gingivitis for subjects using both the experimental tooth pastes without fluoride and with fluoride. Results concluded that the use of low cost tooth pastes containing Neem extract proved to be beneficial in improving the oral health of population, otherwise using natural products.

Oral Rinse:

Vander Weijden GA, Timmer CJ, Timmerman MF, Reijerse E, Mantel MS, Van der Velden U (1998)¹⁷ conducted a invitro study to establish the inhibiting effect of a herbal extract mixture on a selected number of micro-organisms and to test in vivo the effect of a mouth wash containing 6.3 mg/ml herbal extract mixture on plaque and gingivitis. The herbal extract was a mixture of : Juniperus Communis (Juniper), Urtica dioca (nettle), Achillaea millefolium (Yarrow) ; 1:1:1. The invitro effect of pure herbal extract mixture on acid production of streptococcus mutans was tested and the minimum inhibitory concentration (MIC) of S.mutans, S.mitis, A.viscosus, A.naelslundii, A.actinomycescomitans, P.intermedia, C.rectus, F.nucleatum and Veillonella parvula were tested. The MIC-values for A.viscosus and P.gingivalis were 100 mg/ml. The MIC-values for A.naelslundii and A.actinomycescomitans were considerably lower (10 mg/ml). s.mitis was the most

susceptible of the tested organisms to the extract with a MIC value of 1 mg/ml. *S.mutans*, *C.rectus*, *V.parvula* and *F.nucleatum* were not influenced by the extracts. There was no difference observed when the two test groups and one control group were asked to rinse with 10 ml of mouth wash twice a day for 3 months. They concluded that the mixture when used in a mouth rinse has no effect on plaque growth and gingival health.

Paste and Oral Rinse:

Robert AM, James EM, John CG (1988)¹⁸ conducted a double blind clinical trial to test the effectiveness of Sanguinaria – extract mouthrinse and tooth paste in maintaining gingival health and controlling plaque for patients with fixed appliances. 50 subjects fully banded or bonded in both arches were randomly assigned to either an active or placebo product. Plaque and gingivitis were scored on the Ramfjord teeth. Active group showed a 41% decrease in plaque and a 52% decrease in gingivitis. The control group showed an 18% increase in plaque and a 16% decrease in gingivitis. They concluded that the best results appear to be associated with the combined use of mouthrinse and tooth paste – combined with good brushing, flossing, and oral irrigation can help patients maintain better gingival health throughout fixed appliance therapy.

Hannah FF, Johnson FD, Kuftinec MM (1989)⁸ This study was conducted to evaluate over a 6 month period the effectiveness of Sanguinaria-containing tooth paste and oral rinse in controlling plaque accumulation, inflammation of gingiva and sulcular bleeding. 24 subjects were randomly assigned to the active treatment (Viadent tooth paste and oral rinse) or the placebo treatment. The Sanguinaria regimen reduced plaque by 57%, gingival inflammation by 60% and sulcular bleeding by 45% from baseline compared with placebo group reductions of 27% (Plaque) and 21% (gingival inflammation) and an increase of 30% in bleeding index. Results demonstrated that the combined use of the Sanguinaria-containing tooth paste and oral rinse

controls and reduces plaque and gingival inflammation in an orthodontic population.

Gum:

Gazi MI (1990)⁹ conducted a 2 blind crossover trials to evaluate the antiplaque potential of Acacia gum compared with sugar free gum. In trial 1, the mean gingival and plaque scores were lower after 7 days of using Acacia. Compared with sugar free gum but the differences were insignificant. In trial 2, daily photographic assessment of erythrocin-stained plaque showed lower scores after Acacia gum compared with sugar-free gum. The total differences in scores for each day from each individual between the 2 treatments was highly significant. He concluded that Acacia gum appeared to have the potential to inhibit early plaque formation.

Periodontal Status:

Chewing Sticks:

Mohamed AE, Hassan AS, Abdullah R, (1991)¹⁹ examined the relationship between chewing sticks (Miswak) and gingival recession. Gingival recession was measured on the midfacial surfaces of the incisors, canines and premolars in 238 patients. All patients were interviewed previously regarding their oral hygiene habits and use of Miswak. Patients were divided into 3 groups, namely Miswak group, toothbrush group and Miswak / tooth brush group. The Miswak users had significantly more sites with gingival recession than did the toothbrush users. It was concluded that the Miswak should be considered as a possible factor in gingival recession.

Darout IA, Albandar JM, Skaug N. (2000)²⁰ assessed and compared the periodontal status of adult Sudanese habitual Arak and toothbrush users. Community Periodontal Index (CPI) was used to score the gingival bleeding, supragingival dental calculus and probing pocket depth of index teeth of each sextant. In addition, the attachment level also was measured. Study population comprised Arak users (109) and tooth brush users (104). The results concluded that the periodontal status of Arak users in

this Sudanese population is better than that of toothbrush users, suggesting that the efficacy of Arak use for oral hygiene in this group is comparable or slightly better than a toothbrush. Given the availability and low cost of Arak, it should be recommended for use in motivated persons in developing countries.

Almas K. (2001)²¹ studied the effect of aqueous extracts of Arak on healthy and periodontally involved human dentin with scanning electron microscopy invitro. 25% aqueous extract of freshly prepared Arak solution was used for the study. Soaking the healthy and periodontally diseased root dentin in Arak extract resulted in partially removal of smear layer and occlusion of dentinal tubules was observed in specimens burnished with Arak solution. This study concluded that further research is needed to evaluate the effect of aqueous Arak extract on human dentin at higher concentrations.

Plaque, Gingivitis and Periodontal Status: Chewing Sticks:

Mohamed AE, Abdullah R, Hassan AS (1990)²² examined the relationship between Miswak and Periodontal health. 23 patients were examined and plaque, gingival inflammation, pocket depths, attachment loss and gingival recession were recorded. Patients were divided into 3 groups – a Mishwak group, a tooth brush group and a Miswak tooth brush group. Results revealed no differences in plaque scores between Miswak and toothbrush users. This demonstrated that Miswak users were able to control plaque as effectively as those subjects who used a toothbrush, and it was concluded that chemical effect of Miswak combined with the mechanical action of its fibres may have beneficial action.

Periodontal Pathogens: Chewing Sticks:

Akpata ES and Akinrimisi EO (1977)⁴ in this study the antibacterial activity of aqueous, isobutanol and benzene extracts of five popular African chewing sticks namely *Fagara Zanthoxyloides* Cam,

Massularia acuminata Bullock Hoyle, *Vernonia amygdalina*, *Garcinia Kola* Heckel El. *Guttiferae* and *Anogeissus Schimperi* Hochst extracts and Dalz was studied. The isobutanol extract produced the greatest antimicrobial activity and the benzene extract the least. Streptococci were the most sensitive to the extracts, while E.coli was the most resistant. It was suggested that the regular use of the African chewing stick, acting as an antiseptic, may control the formation and activity of dental plaque and therefore reduce the incidence of gingivitis.

Asuquo BI, Montefiore D. (1977)²³ investigated the possible antibacterial properties of chewing sticks like *pseudocedreal kotschyi*, *Mezoneuron benthamianum*, *Fagara zanthoxyloides*, *Terminalia glaucescens*. *Anogeissus leiocarpus*, *Prosopis Africana*, *Vernonia amygdalina*, *Nauclea latifolia* commonly used in the Western states of Nigeria and considered whether there is any evidence that such activity if present could be of significance in the prevention of caries or periodontal disease. Results showed that only *Terminalia glaucescens* had marked antibacterial activity and was limited to *staphylococcus aureus* only. It was concluded that chewing sticks are of value for their mechanical cleansing action, their ready availability and low price, rather than a consequence of any special antibacterial activity of them.

Rotimi VO, Laughon Be, Bartlett JG, Mosadomi HA (1988)²⁴ conducted an in vitro study to find out the activities of extracts of 9 different Nigerian chewing sticks (NCS) against *Bacteroides gingivalis* and *Bacteroides melaninogenicus*. There was remarkable reduction in the growth of both organisms in the first 6 hours of incubation by all the extracts. All the extracts, except *A leiocarpus* and *N.latifolia* were effective in killing the organisms after 24 hours of exposure. Results demonstrated that eight of the nine Nigerian chewing sticks possess significant antimicrobial action against *B. gingivalis* and *B. melaninogenicus*. All the extracts, except that of *A. leiocarpus*, showed no evidence of acute toxicity to adult mice. Results of acute toxicity testing showed that most of the NCS were nontoxic. The *A. leiocarpus* extract was very toxic parentally, but this

may not be relevant since it was not acutely toxic by oral administration. They hypothesized that the ingredients in these chewing sticks produce the antimicrobial action and the toxic effect of *A.leiocarpus* extract.

Taha AL, Hani A (1995)²⁵ tested the antibacterial activity of Arak chewing sticks on some oral aerobic and anaerobic bacteria. 3 methods of antibacterial activity were carried out – streaked plate method, ditch plate method and tube dilution test for minimum inhibitory concentration. Results noted a considerable antibacterial effect of the extract of different bacteria. The most sensitive microorganisms were staphylococcus aureus and streptococcus mutans. The most resistant microorganisms were candida and enterobacteria. Extract had a drastic effect on the growth of staphylococcus aureus with minimum inhibitory concentration values of 69 mg/100 cc. It was concluded that using chewing sticks twice a day on a regular basis reduced the incidence of gingivitis and possibly dental caries.

Almas K. (1999)²¹ conducted a study in Saudi Arabia to compare the effectiveness of antibacterial activity of Neem (*Azadirachta indica*) and Arak (*Salvadora Persica*) chewing sticks aqueous extracts at various concentrations of 1%, 5%, 10% and 50%. The microbial inhibition was measured using blood agar and ditch method. Data suggested that both chewing stick extracts are effective at 50% concentration on *S. mutans* and *S. faecalis*. It was concluded that chewing sticks are recommended as oral hygiene tools for health promotion in developing countries.

Gum:

Clark DT, Gazi MI, Cox SW, Eley BM, Tinsley GF (1993)¹⁰ conducted an invitro study to assess the antibacterial activity of acacia gum on *Actinobacillus actinomycetem comitans*, *Capnocytophaga* spp, *P. gingivalis*, *P. intermedia* and *T. denticola*. Growth of *P.gingivalis* and *P.intermedia* cultures on the agar was inhibited by whole gum sonicate at concentrations of 0.5 – 1.0% w/v. Enzyme activities were determined

and found to be reduced in the presence of 0.5% w/v gum sonicate, with trypsin like activities of *P.gingivalis* and *P.intermedia* proving most sensitive. There was no growth inhibition of *A. actinomycetemcomitans* or *capnocytophaga* spp by acacia. They concluded that the action of acacia gum against suspected periodontal pathogens and their enzymes may be of clinical value.

Conclusion:

Most commonly used herbal extracts are from herbal plants like *Salvadora Persica*, *Azadirachta indica*, *Acacia* gum, *Sanguinaria* etc, in form of chewing sticks, tooth pastes, mouth rinses and chewing gums which have demonstrated antiplaque, anticariogenic and antibacterial actions.

The use of these herbal extracts in the form of chewing sticks, tooth pastes, mouth rinses and gum is entirely consistent with the primary health care approach principles and in particular that of a focus on prevention, community participation and the use of appropriate technology. By using this the notion of self reliance can be encouraged in poor and developing countries. They are available locally in most rural areas of poor countries and it does not need technology or expertise or extra resources to manufacture it. It can be used by both children and adults. Thus it is appropriate for many societies. There is a need to develop an effective cleaning technique and to motivate individuals to take the responsibility for their health themselves. The use or rather reuse of these products as a tool for oral hygiene in any dental health programme or on a wide scale public programme is essential. Future studies should be focused on chemical nature and mode of action of active constituents of these plants.

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Classification & Molecular Biology of Orofaciodigital Syndrome Type I

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Abstract

Orofaciodigital syndrome (OFDS) is an umbrella term for the apparently distinctive morphogenetic disorders, affecting invariably the mouth, face and digits. Polycystic kidney disease has been shown to be one of the distinct feature of this syndrome. It has x-linked dominant inheritance with lethality in males. Orofaciodigital syndrome type 1 (OFD1) was mapped to Xp22.3-22.2 and the gene for OFD1 i.e. *cxorf5* was identified some years back where several mutations have been reported. Appertaining to different prognosis and mode of inheritance, thirteen specific types of OFDS are distinguished Oral-facial-digital syndrome 1 (OFD1) which being the most usual of the thirteen, is symbolized by its X linked dominant mode of inheritance with lethality in males. Keeping this in view, a tr5gbphamended data of OFDS types and the genetics and molecular data of OFD1 are reviewed. Selected pathological variants of OFD1 are also tabularized.

Keywords: OFD Syndrome/Orofaciodigital Syndrome, Syndromes, OFD1 Gene, Autosomal Dominant, Autosomal Recessive, X-Linked Dominant.

Introduction:

The orofacioidigital syndrome (OFDS) is a generic name for the morphogenetic impairment that leads to congenital condition virtually limited to females. Its classical features include deformities of oral cavity, face and limbs like hamartomatous lobulated tongue, cleft lip, cleft palate, hypertelorism, hyperplastic alar cartilage, polydactyly, syndactyly, frontal bossing, hydroencephaly to name a few.^{1,2}

Mohr gave the first description of OFDS in 1941 when he reported a family with significant OFD findings, including highly arched palate, lobate tongue with papilliform outgrowths, a broad nasal root, and hypertelorism.¹ In 1954, Papillon-Leage and Psaume reported a hereditary malformation of the buccal mucous membrane and abnormal frena and suggested that the syndrome was inherited as a complete recessive trait.² Other French and German authors have since published full accounts of this condition, and Gorlin and Pindborg (1964) have

summarized their knowledge of the syndrome in textbook in the 60's. They described it under the heading of orodigitofacial dystosis, but as there was involvement of other tissues than bone, the term oral-facial-digital (OFD) syndrome was preferred.^{3,4} Apart from a single case report by Nesbitt (1965), British authors were unaware of the syndrome, but then Smithells (1964) drew attention to it in a British journal without adding any further examples.⁵⁻⁷ This paucity of references is surprising, as the first account of the syndrome was probably given by Murray in 1860. He described a Scottish female infant with characteristic features in a footnote to an account of a somewhat similar familial disorder.^{4,7}

Classification: Thirteen different types of OFD have been described in the literature; of these OFDI has the highest incidence. All the thirteen types have been summarized and a proposed classification have been tabularized (Table 1).^{1, 2, 8-22}

Table No. 1: Classification of Orofaciodigital Syndrome

OFD Subtype	MIM	Inheritance pattern/Cause	Clinical features	Reference
OFD I (Papillon-Leage Psaume Syndrome)	311200	X linked dominant inheritance Mutations in OFD1 gene	Facial dysmorphism with oral, tooth, and distal abnormalities, polycystic kidney disease, and central nervous system malformations.	Papillon-Leage, Psaume (1954)(2)
OFD II (Mohr Syndrome)	252100	Autosomal recessive inheritance Mutations in an as yet unidentified gene.	Milia of the face, the absence of deafness, and bilateral preaxial polydactyly.	Mohr (1941)(1)
OFD III (Sugarman Syndrome)	258850	Autosomal recessive inheritance	Mental retardation, eye abnormalities, lobulated hamartomatous tongue, dental abnormalities, bifid uvula, postaxial hexadactyly of hands and feet, pectus excavatum, short sternum, and kyphosis.	Sugarman et al. (1971)(8)
OFD IV (Baraitser-Burn Syndrome)	258860	Autosomal recessive inheritance	Severe tibial dysplasia differentiate type IV from type I	Baraitser (1986)(9)
OFD V (Thurston Syndrome)	174300	Autosomal recessive inheritance	Polydactyly, postaxial, with median cleft of upper lip.	Thurston (1909)(10)
OFD VI (Varadi-Papp Syndrome)	277170	Autosomal recessive inheritance	Polydactyly, cleft lip/palate or lingual lump, and psychomotor retardation.	Varadi et al. (1980)(11), Papp and Varadi (1985)(12)
OFD VII (Whelan Syndrome)	608518	X-linked dominant inheritance	Oral (tongue nodules, bifid tongue, midline cleft of the lip), facial (hypertelorism, alar hypoplasia), and digital abnormalities	Whelan et al. (1975)(13), Nowaczyk et al. (2003)(14)

			(clinodactyly), hydronephrosis and facial asymmetry.	
OFD VIII (Edwards Syndrome)	300484	X-linked recessive inheritance	Hypertelorism or telecanthus, broad, bifid nasal tip, median cleft lip, tongue lobulation and/or hamartomas, oral frenula, high-arched or cleft palate, bilateral polydactyly, and duplicated halluces,	Edwards et al. (1988)(15), Toriello (1993)(16)
OFD IX (Gurrieri Syndrome)	258865	Autosomal recessive inheritance	Retinal colobomata in addition to core oral, facial and digital findings.	Gurrieri et al. (1992)(17)
OFD X (Figuera Syndrome)	165590	-	Mesomelic limb shortening due to radial hypoplasia and fibular agenesis apart from oral, facial and digital findings.	Figuera et al. (1993)(18), Taybi and Lachman (1996)(19)
OFD XI (Gabreilli Syndrome)	-	-	Presence of craniovertebral anomalies in association with the oral, facial, and digital anomalies.	Gabrielli et al. (1994)(20)
OFD XII (Moran Barroso Syndrome)	-	-	Myelomeningocele, stenosis of the aqueduct of Sylvius, and cardiac anomalies.	Moran- Barroso et al. (1998)(21)
OFD XIII (Degner Syndrome)	-	-	Psychiatric symptoms (major depression), epilepsy, and brain MRI findings of leukoaraiosis (patched loss of white matter of unknown pathogenetic origin, possibly of ischemic nature, considered to increase the risk of stroke) in association with core oral, facial, and digital findings.	Degner et al. (1999)(22)

OFDI – Papillion-Leage-Psaume Syndrome: OFD1 is characterized by malformations of the face, oral cavity, and digits with embryonic male lethality. The

embryonic male lethality is because OFD1 is caused due to mutations in gene *ofd1*.^{20, 21} *Ofd1* encodes a protein that localizes to the distal end of centrioles

where it functions as a cap to regulate centriole length.^{22, 23} As OFD1 is X-linked, males lacking OFD1 do not form cilia, resulting in prenatal lethality.²² Although these clinical features resemble the reported features of other forms of OFDS, OFD1 can be easily distinguished from others by its X-linked dominant inheritance pattern and by polycystic kidney disease, which seems to be explicit to type I.²³⁻²⁵

Clinical features: The list of facial features cover tongue hamartomas, bifid tongue, cleft lip and palate, multiple hypertrophic frenulae, thick alveolar bands, absence of central and lateral incisor, aplasia of nasal alae. Digital features entails polydactyly: mostly unilateral or asymmetrical, (bilateral, preaxial polydactyly has been reported once), syndactyly: skin or bone, brachydactyly, clinodactyly. Central nervous system features append mental retardation; pathological features include cerebral atrophy, porencephaly, hydrocephaly, hydranencephaly.¹ Whereas facial milia, coarse thin hair, sometimes alopecia accounts for the features listed for skin manifestations.²⁶

Polycystic kidney disease is another feature annexed to OFD1 symptoms.^{27, 28} It is a multisystem disorder characterized by bilateral renal cysts, renal manifestations like hypertension, renal pain and renal insufficiency. Cysts formation in organs like liver, seminal vesicles, pancreas, and arachnoid membrane, few vascular abnormalities which include intracranial aneurysms, dissection of the thoracic aorta, mitral valve prolapsed, dilatation of the aortic root and abdominal wall hernias.²⁹

Diagnosis: OFD1 is diagnosed in few infants at the time of the birth based on characteristic oral, facial and digital anomalies and molecular genetic testing. In case isn't diagnosed at the time of birth, the diagnosis is suspected only after polycystic kidney disease is identified in later childhood or adulthood. In a worldwide cohort of 120 individuals clinically diagnosed with OFD1, cleft palate / high-arched palate was present in 23.5%, tongue anomalies in 90.1%, aberrant frenula in 65.4%, and abnormal teeth in 42%.³⁰ None of these abnormalities is specific to

OFDS, and accessory frenula, for instance, may be more suggestive of Pallister–Hall syndrome.³¹

Oral findings: The disease affects predominantly the tongue, palate, and teeth. The tongue is lobed and described as bifid or trifid depending on its state. Tongue nodules are usually hamartomas or lipomas, they also occur in at least one third of individuals with OFD1. Ankyloglossia which give rise to a short lingual frenulum is common in this condition. Cleft of hard or soft palate, submucous cleft palate, or highly arched palate, this condition is observed to be in more than 50% of diseased cases. Trifurcation of the soft palate has also been reported. Alveolar clefts and accessory gingival frenulae are common which are hyperplastic frenulae, these extends from the buccal mucous membrane to the alveolar ridge, thus leading to formation of notch in the alveolar ridges. Other oral findings include missing teeth which is most common when considering only teeth, then, supernumerary teeth, enamel dysplasia, and malocclusion.^{32, 33}

Facial findings: Ocular hypertelorism or telecanthus occurs in at least 33% of affected individuals. Hypoplasia of the alae nasi, median cleft lip, or pseudocleft upper lip, micrognathia and downslanting palpebral fissures are commonly observed.³²

Digital findings: These include clinodactyly of the fifth finger, brachydactyly and syndactyly of varying degrees. The other fingers, chiefly the third one may show variable radial or ulnar deviation. Duplicated hallux occurs in fewer than 50% of affected individuals, and if present is usually unilateral. Preaxial or postaxial polydactyly of the hands occurs in 1-2% of afflicted people. Radiographs of the hands often demonstrate fine reticular radiolucencies, which is described as irregular mineralization of the bone, may be with or without spicule formation of the phalanges.^{32, 33}

Neural findings: Structural brain abnormalities may occur in as many as 65% of individuals with OFD1.³³ Anomalies most commonly include agenesis of the corpus callosum, intracerebral cysts and cerebellar

agenesis with or without Dandy-Walker malformation. Other reported anomalies include type 2 porencephaly (schizencephalic porencephaly), hydrocephalus, pachygyria and heterotopias, cerebral or cerebellar atrophy and berry aneurysms, each of which has been described in a few affected individuals.

Renal findings: Renal cysts can develop from both glomeruli and tubules. Polycystic kidney disease occurs in at least 50% of individuals with OFD1 although the exact frequency is unknown. Data indicate that renal cystic disease is present in 60% of affected individuals older than age 18 years.³⁰ The age of onset is most often in adulthood, but renal cysts in children as found in young age of two years have been illustrated.

Molecular Genetic Testing Gene: OFD1 is the only gene currently known to be associated with oral-facial-digital syndrome type I.²³

Clinical testing: Sequence analysis: A variety of mutations have been identified, the majority of which predict premature protein truncation. The reported mutation detection rate is about 80% (30). Deletion/duplication analysis: One study found that six of 131 individuals with OFD1 had a deletion which has a size ranging from one to fourteen exons but not even a single had the same deletion. In this group, 23% of the individuals who did not have a mutation identified on gene sequencing were found on qPCR to have an exonic or multiexonic deletion³⁴

Prevalence: It is a rare disease with an estimated incidence of 1:50,000–250,000 live births with description in multifarious ethnic backgrounds.^{35, 36}

Penetrance and Anticipation: OFD1 appears to have high penetrance, though it has high variability in expression. Few have reported that renal cysts are the only probable manifestation in diseased females but no evidence for such forethought is available.³⁷

Inheritance: Seeing the reported cases it can be said that OFD1 is *especifico par alas hembras* (specific to females) with few exceptional cases seen in males.

OFD1 is considered lethal to males and the condition described by Wahrman et al., in 1966 in an XXY male strengthened the idea of male-lethal X-linked dominant inheritance.^{35, 37} Vaillaud *et al* in 1968 described a pedigree in which 10 females had OFD. One female along with 9 of her granddaughters through 3 unaffected sons had OFD. The 9 affected included all daughters of the 3 carrier sons. The most plausible theory appears to be that of an x-linked dominant gene with lethality in the hemizygous males and this theory has been applied to earlier published pedigrees. In order to explain the findings in this specific family, they presupposed that the OFD gene is on a terminal segment of the X chromosome homologous with a segment of the Y chromosome and the 3 carrier males had inherited a Y chromosome which in a way concealed the expression of the OFD gene.³⁸

Risk to Family Members

Parents of a proband: Approximately 25% of females diagnosed with OFD1 have an affected mother. A female proband with OFD1 may have the disorder as the result of a *de novo* gene mutation. Approximately 75% of affected females are simplex cases (i.e., occurrence of OFD1 in a single family member). Recommendations for the evaluation of the mother of a proband with an apparent *de novo* mutation add up clinical evaluation and molecular genetic testing if the mutation in the proband has been recognized. Literature suggests that if the mother of the proband fulfils the diagnostic criteria required for OFD1 or if she has an afflicted relative, she is a carrier of an *OFD1* gene mutation.³⁹⁻⁴¹

Siblings of a proband: The risk to siblings depends on the genetic status of the mother. When the mother of an affected female is also racked by this baleful disease, the risk to siblings of inheriting the disease-causing *OFD1* allele at conception is 50%; however, most male conceptuses with the disease-causing *OFD1* allele miscarry.⁴¹ If there is no family history of the disease, there is 1% probability that the unaffected mother of an affected female will give

birth to another affected female. Two possibilities account for this minor increased risk, first, a new mutation in a second child and second, germline mosaicism in a parent. Although germline mosaicism has not been reported, it remains a possibility.⁴²

Offspring of a proband: The risk to the offspring of females with OFD1 must take into consideration the presumed lethality to afflicted males during the gestation period. At the time of conception, there are 50% chances that the *OFD1* allele will be carried on and most of the male fetuses affected get miscarry. At the time of the birth the expected gender ratio of the offspring is 1/3 unaffected females, 1/3 affected females, 1/3 unaffected males.^{41, 42}

Other family members of a proband: The risk to other family members depends on the status of the proband's mother, if her mother is also affected, her family members might be at risk of having the disease.

Molecular Genetics: The locus of *Odf1* was first mapped by linkage analysis to a 19.8 cm interval, flanked by crossovers with markers DXS996 and DXS7105 in the Xp22 region.⁴⁰ The causative mutations of *Odf1* were labeled in the *CXORF5* transcript and so *CXORF5* was renamed as *Odf123*.⁴⁰ *Odf1* comprises of 23 exons encoding a 1011 amino acid protein. The gene encodes a centrosomal protein found in the primary cilia⁴³ and consequently, OFD1 has been considered a ciliopathy.⁴⁴ It is widely expressed in metanephros, brain, tongue, and limb⁴³ which could explain the clinical expression of the syndrome.

Mutations of *Odf1*, located on the X chromosome account for most cases of OFD1 syndrome with most mutations tracked down in the first half of the gene.^{23,41,43,45} Human *Odf1* is a region on X-chromosome where transcript frequently escapes X inactivation and the affected females are probably composed of cells with reduced levels of normal OFD1 protein.⁴⁶ *Odf1* is the first gene for an X-linked dominant male lethal disorder found to escape X inactivation.⁴⁷ Apparently, in affected

females, one normal copy is not adequate to give protection from the disorder to occur. It is convincing to theorize that unaffected males who carry only one normal copy of OFD1 may exhibit a surpassing expression of the transcript on the single active X chromosome, but more studies are warranted to comment on the level of expression of this transcript in both the genders.³⁴ An alternative hypothesis is that *Odf1* undergoes X inactivation in the tissues affected in OFD1 syndrome at developmental stages when its function is necessary. Therefore, some tissues of affected females at certain stages during development may result in *Odf1* functional nullisomy, by inactivation of the normal X. Individual variation in the X-inactivation pattern of this gene may also explain the clinical variability observed in OFD1 syndrome.

There remain, however, some OFD1 syndrome individuals for which *OFD1* mutations cannot be detected.³⁴ In human embryos, *OFD1* is expressed in many organs, accomodating those that develop abnormally in the syndrome.^{43, 45} *Odf1* gene has been identified in the olfactory and respiratory epithelium of the nasal cavities and nasopharynx, in the endoderm-derived surface epithelium of the tongue and oropharynx and in a number of ectodermally derived structures of the mouth and palate enlisting upper labial structures, the surface epithelium of the gingiva and tooth primordial.²⁷ In the embryonic nervous system, *Odf1* gene is observed in telencephalic primordia of the cerebral cortex and striatum and even in cranial and dorsal root ganglia. In postnatal brain, *Odf1* gene is detected in all the underlying structures, with a higher expression in the hippocampal region. *Odf1* expression is also observed in the thymus, lungs, kidney, surface ectoderm and vibrissae follicles. This expression leads to alopecia and hair problems and nephrotic abnormalities.^{43, 45}

Odf1 gene has 23 exons and generates two main splice variants, *Odf1a* and *Odf1b*, the latter coding for an unstudied putative protein of 367 amino acids derived from exons 1–11.⁴⁸ More is avowed about OFD1a (OFD1), the protein encoded by exons 1–23, itself with a variant lacking exon 10, with a predicted molecular weight of ~110 kDa. The

existence of several coiled-coil domains suggests that OFD1 execute through a protein-protein interaction mechanism. The recognition of OFD1 protein interactors might provide identification of novel genes involved in mammalian development and conceivable implications in other types of OFD syndromes.⁴⁹

OFD1 protein contains an N-terminal LisH homology (LisH) motif and an extended C-terminal domain containing what have been alternatively indicated as either five or six putative coiled-coils (47,48,50-52). These C-terminal regions, which are sighted as containing six coiled-coils based on SMART analysis (<http://smart.embl-heidelberg.de/>), is essential for localizing OFD1 to the centrosome.^{45, 50} It is also cardinal for interaction with the *LCA5*-encoded ciliary protein, lebercilin, itself mutated in Leber congenital amaurosis. LisH motifs present in proteins are responsible for dimerization, stability and/or OFD1 regulates centriolar satellites 601 localization and protein-protein interactions.⁵⁰⁻⁵² Along with this LisH motif may even control the microtubule dynamics directly or indirectly through cytoplasmic dynein.^{46,50,52,53}

It is interesting to note that the genes leading to autosomal dominant polycystic renal have been observed to interact via a coiled-coil domain and it has been already stated that OFD1 is often associated with polycystic kidney.⁴⁹ Interestingly, Miller-Dieker lissencephaly and Treacher Collins syndrome are caused by mutations in genes encoding LisH-containing proteins, and both disorders have been attributed to incorrect cell migration resulting from cytoskeletal defects^{50, 52} Hence, certain neuronal components of the OFD1 syndrome might involve aberrant cell migration. In addition, missense mutation of the OFD1 LisH domain deregulates centriole elongation.^{50, 54}

Ciliopathies: Intriguingly, *OFD1* mutations have recently been associated with other disease phenotypes, including the nephronophthisis (NPHP)-related ciliopathy, Joubert Syndrome.^{48,50,51}

Genotype/Phenotype Correlations: In 2006, 25 females with OFD I from 16 French and Belgian families were reported. Eleven novel mutations in the *CXORF5* gene were identified in 16 patients from 11 families. Further observation disclosed that mental retardation was associated with mutations in exons 3, 8, 9, 13, 16, kidney cysts were found to be in association with splice site mutations and tooth abnormalities were related to mutations in coiled-coil domains. Seven out of 23 patients had nonrandom X inactivation.³⁴

By in vitro functional expression studies in retinal cells, it was found that the JBTS10 mutations weakened the interaction with *LCA5*, but didn't account for abnormal pericentriolar localization. Literature suggests that the OFD I syndrome-related mutations are male-lethal and shorten the protein *CXORF5*, lead to abnormal cytoplasmic localization and even complete disruption of interaction with *LCA5*. It was observed that males with JBTS mutations, which were identified in the coiled-coil domain nearest to the C terminus, might have age expectancy beyond the age of 30 years and did not afflict carrier females. In general the severity of the phenotype appears to be related to minimization of protein length. These findings help conclude that the inverse correlation between *CXORF5* mutant protein length and phenotypic severity can be concluded by observing the differences in binding to functionally interacting proteins and disruption of ciliary localization.⁵¹

Animal Models: Using a Cre-LoxP system, knockout animals were generated lacking OFD1 and reproduced the main features of the clinical disorder. It was observed that there was increase in severity due to difference between human and mouse and the observation also disclosed that there was failure of left-right axis specification in mutant male embryos and there was absence of cilia in the embryonic node. The experiment showed that the formation of cilia was defective in cystic kidneys from heterozygous females and there was impairment of patterning of the neural tube and altered expression of the 5-prime

Hoxa and *Hoxd* genes in the limb buds of mice lacking.⁵⁵

In another experiment OFD1 function was analyzed using zebrafish embryonic development. In the experiment Disruption of OFD1 using antisense morpholinos led occurrence of bent in the body axes, hydrocephalus, and edema. The laterality was randomized in the brain, viscera and heart. This was supposed to be an effect of shortening of cilia along with disruption of axonemes and disruption of intravesicular fluid flow in Kupffer vesicle. The embryos which were injected with OFD1 antisense morpholinos led to convergent extension defects and it was also observed that pronephric glomerular midline fusion was compromised in Vangl2 and OFD1 loss-of-function embryos. This led to the

conclusion that OFD1 is required for ciliary motility and function in zebrafish and also that OFD1 is cardinal for convergent extension during gastrulation.⁵⁶

Pathologic allelic variants: To date, 99 different mutations (92 point mutations and 7 genomic deletions) have been identified.^{23, 34, 43, 51-54} Both exonic and intronic pathologic allelic variants have been described. Point mutations in exons encompass single base-pair changes, frameshifts, and deletions. These changes have been identified in exons 2 through 17 and Seven different genomic deletions in the exons 1-23 have been stated till date,^{41,57} (Table no. 2)^{23, 58-62}

Table No. 2: Selected Pathologic Allelic Variants of OFDSI

Allelic Variant	Mutation	Protien amino acid change	References
.0001 OROFACIODIGITAL SYNDROME I	1303A-C	p.S434R	Ferrante et al. (2001)(23)
.0002 OROFACIODIGITAL SYNDROME I	1-BP DEL, 312G	p.V105YfsX144	Odent et al. (1998)(58), Ferrante et al. (2001)(23)
.0003 OROFACIODIGITAL SYNDROME I	19-BP DEL, NT294, Exon3	p.S98RfsX138	Ferrante et al. (2001)(23)
.0004 OROFACIODIGITAL SYNDROME I	IVS5AS, T-G, -10	(Abnormal Splicing)	Rakkolainen et al. (2002)(59)
.0005 OROFACIODIGITAL SYNDROME I	2-BP INS, 1887AT, Exon16	p.N630IfsX666	Rakkolainen et al. (2002)(59)
.0006 OROFACIODIGITAL SYNDROME I	4,094-BP DEL 14-BP DEL	(Frameshift)	Morisawa et al. (2004)(60)
.0007 SIMPSON-GOLABI-BEHMEL SYNDROME, TYPE 2	4-BP DUP, 2122AAGA	p.N711KfsX713	Budny et al. (2006)(61)
.0008 JOUBERT SYNDROME 10	7-BP DEL, NT2841	p.K948NfsX8	Coene et al. (2009)(62)
.0009 JOUBERT SYNDROME 10	1-BP DEL, 2767G	p.E923KfsX3	Coene et al. (2009)(62)

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Pro-Argin: A Breakthrough Technology for Dentin Hypersensitivity Treatment

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Abstract

Pro-Argin technology is a novel treatment for dentin hypersensitivity, a common clinical condition difficult to treat as the treatment outcome is not consistently successful. Although some of the traditional methods have been clinically evaluated and found to be effective, we need to continue looking for more effective, faster acting and longer lasting treatment. This technology is based on the interaction between arginine and calcium carbonate which infiltrate and block the dentinal tubules and prevent dentinal fluid flow, thus reducing dentin hypersensitivity. The successful treatment of dentin hypersensitivity requires application of Pro-Argin paste along with modification of salivary factors.

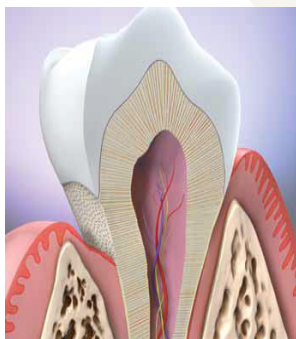
Keywords: Dentin Hypersensitivity, Tubule Occlusion, Pro-Argin Technology, Arginine, Calcium Carbonate, Colgate Pro-Relief.

Introduction:

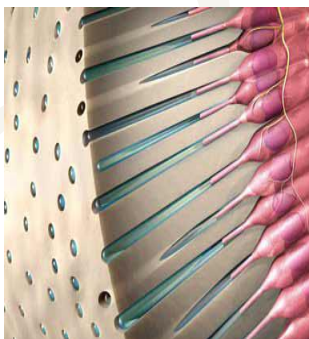
Dentin hypersensitivity is a pain arising from exposed dentin, typically in response to clinical, thermal, tactile, evaporative or osmotic stimuli that cannot be explained as arising from any other form of dental pathology.

Most authorities agree that Brannstrom's "Hydrodynamic Theory" of nerve stimulation due to movement of dentinal fluid, best explains dentin hypersensitivity. The relationship between dentin hypersensitivity and the patency of dentin tubules in vivo has been established and occlusion of the tubules

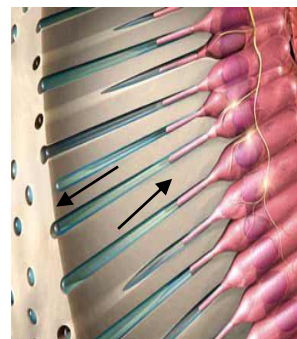
seems to decrease that sensitivity. Clinicians have used many materials and techniques to treat dentin hypersensitivity, including specific dentifrices, dentin adhesives, antibacterial agents, aldehydes, resin suspensions, fluoride rinses, fluoride varnishes, calcium phosphate, potassium nitrate, oxalates, and strontium agents among others. More recently, dentin desensitizing solutions also have been used under amalgam restorations and crowns to prevent postoperative sensitivity. Also used are Nd:YAG laser, bioactive glass, Casein phosphopeptide and Portland cement.¹



Gingival Recession



Open Tubules

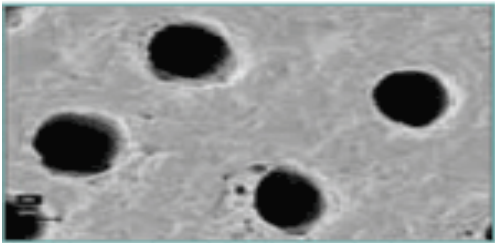


Fluid Movement

Courtesy: www.colgateprofessional.co.in

Pro-Argin™ Technology

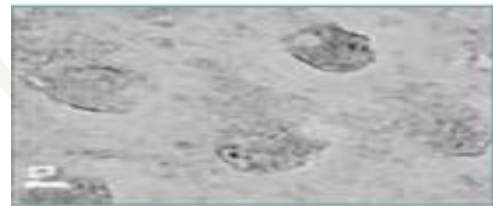
In 2002, Kleinberg et al, at the State University of New York – Stony Brook, reported the development of a new anti-sensitivity technology based on their understanding of the role that saliva plays in naturally reducing dentin hypersensitivity over time. The essential components of this new technology are Arginine, an amino acid positively charged at physiologic pH(6.5-7.5), Bicarbonate, a pH buffer, and insoluble Calcium carbonate, a source of calcium.² The arginine present in the products are obtained from vegetable sources.³



SEM photograph of untreated dentin surface with exposed tubule

An in-office product based on this technology (ProCludea) was marketed in the United States for the management of tooth sensitivity during professional prophylaxis.

The technology has also been incorporated into toothpaste (DenCludea) for use at home following prophylaxis. In 2009, Colgate-Palmolive re-launched ProClude as Colgate Sensitive Pro-Relief in-office desensitizing paste.³ Other products based on Pro-Argin technology include a Mouthwash(alcohol free, containing 0.8% arginine), Enamel Protection paste, Whitening toothpaste and a Multiprotection toothpaste.



SEM photograph of dentin surface showing occlusion of dentin tubules after application of desensitizing paste with Pro-Argin™ Technology⁴

Courtesy: www.colgateprofessional.co.in

Mechanism of action

In healthy patients, saliva is naturally very effective in reducing dentin hypersensitivity by supplying and carrying calcium and phosphate ions into open dentin tubules to gradually occlude them and form a surface protective layer consisting of precipitate of salivary glycoproteins with calcium phosphate.

A recent review of biological approaches to dentin hypersensitivity therapy proposed that the ideal treatment should mimic natural desensitizing processes leading to spontaneous occlusion of open dentin tubules. The Pro-Argin technology mimics saliva's natural process of plugging and sealing open dentin tubules.

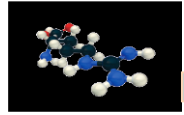
When the desensitizing paste is applied to exposed dentin, Arginine (positively charged) and calcium carbonate, found in saliva naturally, work together to accelerate the natural mechanisms of occlusion by binding to the negatively charged dentine surface to

deposit a dentin-like mineral, as a plug within the dentin tubules and a protective layer on the dentin surface. This consists of arginine, calcium carbonate and phosphate and salivary glycoproteins.⁴ Freeze fracture images have shown that this plug reaches a depth of 2 μm into the tubule.² It is resistant to normal pulpal pressures and to challenge by acids in oral cavity. It is also effective in reducing dentin fluid flow thereby relieving hypersensitivity.

Chemical mapping of the occluded surfaces using energy dispersive x-ray (EDX) has shown that the material on the dentin surface and within the dentin tubules contains high levels of calcium carbonate and phosphate. Confocal Laser Scanning Microscopy (CLSM) and High resolution scanning electron microscopy (SEM) images studies have demonstrated that the arginine-calcium carbonate desensitizing paste is highly effective in occluding open dentin tubules and is resistant to acid challenge.² CLSM has also confirmed that the toothpaste and the

desensitizing prophylaxis paste have the same mechanism of action.

Atomic force microscopy (AFM) revealed that images of untreated specimens showed the helical fine structure of both inter-tubular dentin and tubules that



Arginine, calcium carbonate



Sealed surface

were completely open while images of specimens treated with the desensitizing paste displayed absence of the helical structure on the dentin surface, as a consequence of surface coating, and the tubules were sealed.²



Plug within the tubules

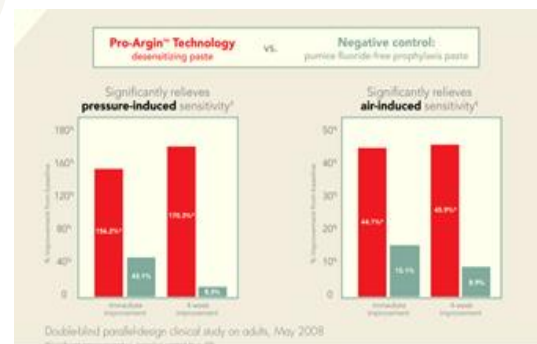
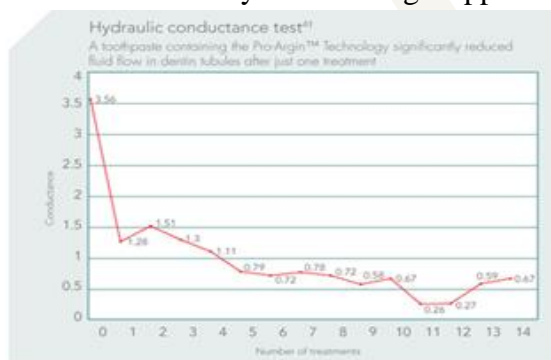
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Literature Review:

Number of studies have been performed testing the efficacy of pro-argin on dentin hypersensitivity.

Kleinberg, et al, demonstrated that application of the arginine-calcium carbonate in office desensitizing paste to sensitive teeth following dental prophylaxis resulted in instant relief from discomfort and that relief lasted for 28 days after a single application.

Clinical evaluation of the in-office desensitizing paste prior to dental prophylaxis revealed that there was a significant decrease of 83.94% in the hypersensitivity of subjects using the Test paste while the group using the Control paste showed a 13.43% desensitization.⁵



Courtesy: www.colgateprofessional.co.in

When the clinical efficacy of a Pro-Argin paste with 1000 ppm fluoride was compared to a commercially available anti-sensitive toothpaste containing 2% Potassium ion, as potassium nitrate, on dentin hypersensitivity in a randomized clinical trial, the former combination showed greater efficacy after two, four and eight weeks of use.⁶

Comparison of the effects on dentin permeability of two commercially available sensitivity relief dentifrices, based on in vitro hydraulic conductance study, the dentifrice containing 8.0% arginine, calcium carbonate, and 1450 ppm fluoride was significantly more effective in reducing dentinal fluid flow after first application than the dentifrice containing 8% strontium acetate and 1040 ppm fluoride and the occlusion obtained with the Pro-Argin formula dentifrice was resistant to acid challenge.

Studies have shown that the whitening variant contains a high cleaning calcium carbonate system, which gives it a higher cleaning efficiency, allowing it to remove extrinsic stains but no difference was observed in the desensitizing efficacy between the whitening and non-whitening versions.⁷

In another study, Hamlin et al applied the products prior to a professional dental cleaning procedure and sensitivity measurements immediately thereafter. The results showed that the occlusion led to highly significant reductions in dentin fluid flow, and that the tubule plug is resistant to normal pulpal pressure.²

Together, these results have clearly demonstrated that the arginine-calcium carbonate desensitizing paste reduces dentin hypersensitivity. It is simple and has been proven to show strong efficacy, fast onset and long lasting effect. Significant reduction in hypersensitivity is obtained during and after scaling, post-operative due to bleaching, periodontal procedures and also in response to any other pathology leading to dentin exposure.

Application:

The desensitizing paste is available both as in office and at home paste. The desensitizing paste is gentle to gingival soft tissue, with no pain on application and has a pleasant mint flavor. A small amount of paste is applied by the dental professional to sensitive tooth surfaces by burnishing it with a slowly rotating soft prophylaxis cup, using low speed and a moderate amount of pressure. Paste can also be applied to accessible spots by massaging thoroughly with a cotton-tipped applicator and to furcations and other hard-to-reach areas with a microbrush, focusing on the CEJ and exposed cementum and dentin. Studies have shown that a single direct topical application of the paste to sensitive teeth, with fingertip or cotton swab along with 1 minute of massage, resulted in immediate relief of hypersensitivity and that the relief was maintained with subsequent twice-daily brushing. The clinical effect of direct topical application by both cotton swab and fingertip, remains same.⁸ Rinsing immediately after application is avoided.

Conclusion:

Prior to initiating treatment, it is important to determine which patients are at risk for dentin hypersensitivity and may benefit from the arginine-calcium carbonate desensitizing therapy.

Treatment with a Pro-Argin product is only one aspect of the management of dentin hypersensitivity. Effective plaque control, dietary modifications and strategies to enhance flow of saliva, buffering capability and upsurge salivary pH may each be important in achieving lasting comfort. Controlling dentin hypersensitivity is an ongoing challenge that requires patient cooperation and participation.

Dentin hypersensitivity management is a quality of life issue. Left untreated, patients may suffer needlessly and risk further deterioration of valuable tooth structure. Taking better care of patients with dentin hypersensitivity using clinically proven, effective treatment products is both appropriate and responsible.

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Cocos Nucifera: Its Properties and Contributions to Dentistry

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Abstract

Though still part of daily diets for many, traditions consider Coconut or *Cocos nucifera*, and its components have valuable properties for medical and healing purposes. The water within the fruit has a high content of electrolytes, used for oral rehydration purposes, blood transfusion and avulsed tooth transport mediums, culture medium for cell culture studies. Past generations believed coconuts protect against medical illnesses. Studies recognize traditional Indian folk remedy using coconut oil for strengthening teeth and gums by preventing decay, oral malodor, bleeding gums, and cracked lips. Researchers should explore these components and integrate in medical systems to relieve and prevent diseases, plus incorporating them into products used in dentistry. Herbal remedies as adjuncts to our daily hygiene may improve our health. The use of herbal products should be certified based on literature evidence. Scientific data and validations of such traditional approaches could justify the use of such products in dentistry.

Keywords: Coconuts, Coconut Oil, Oral Hygiene Adjunct, Culture Medium.

Conventional health treatments have been practiced and revised for many years, but the recent era has been visualizing a new trend into the medical fraternity. The inclination towards an alternative treatment comprising of herbal remedies to treat systemic conditions have been globally accepted. A wide range of herbal extracts have been explored and studied to extricate their health benefits. Among them, coconut have been used as traditional medicine for many illnesses. The coconut palm, *Cocos nucifera*, belongs to the family Arecaceae. The term 'coconut' botanically is classified as a fibrous one-seeded drupe. It is highly nutritious, rich in fiber, vitamins and minerals.

Coconuts have their origin all over the globe with major focus in the tropics such as India, Sri Lanka, Brazil etc. They are part of a staple diet of such areas and are readily available to many, therefore parts of the coconuts can be easily accessed for different uses.

Dental diseases like caries, gingivitis are commonly overlooked health problem affecting 60-

90% of children and the majority of adults in industrialized countries. Literature search provides information that coconut oil was found to have antibacterial effect against most strains of *Streptococcus* bacteria, including *S. mutans* that is responsible for causing caries and gingivitis.^{1,2} This fruit is also known for its commercial, domestic and industrial uses, but it has also been used for medical benefits according to traditional and modern medicine in the following ways³:

- Healing Wounds: the ability to accelerate re-epithelialization, improve antioxidant enzyme activity, and stimulate higher collagen cross-linking within the tissue being repaired.
- Supplying our bodies with energy, due to its high levels of electrolytes.
- Its antimicrobial properties heal many conditions such as athlete's foot and dermatitis.
- Anti-ageing and antioxidant properties

- The Medium Chain Triglycerides present in coconut oil lowers the level of cholesterol; helps clear blockages therefore cutting down the risk of a heart attack.⁴
- Anti-Ulcer Activity: Coconut milk as an NSAID-associated anti-ulcer agent.

This paper highlights the benefits of various forms of coconut used in dentistry. With the knowledge of all the indispensable properties and uses of coconuts, incorporation into treatment modalities can be beneficial to the patient as well as the clinician as an alternative therapy.

An important part of the Coconut Tree is the Coconut Fruit which is considered as a functional food. It mainly consists of three layers: the exocarp (outer layer), the mesocarp (fleshy, middle layer), and the endocarp (hard, woody layer that surrounds the seed).⁵ The exocarp and mesocarp make up the husk of the coconut, which was utilized as an indigenous toothbrush. The babassu (*Orbignya phalerata*) is a native tree of the Arecaceae (Palmae) family from northern Brazil. The mesocarp of Babassu variant of coconut has been widely used as a treatment of pain, fever, ulcerations, tumors, wounds, and inflammation.

Chemical constituents in coconut fruit include:

- Lauric acid, is a crystalline fatty acid occurring as glycerides in 45-52% of coconut oil, is converted to a monoglyceride called monolaurin. It is a strong anti-viral, anti-bacterial and anti-protozoal agent.
- Myristic acid, a saturated fatty acid, 16-21% in coconut oil is commonly used as a flavoring agent and is an important to stabilize many proteins.
- Caprylic acid: 5-10% and Caproic acid: 0.5-1% are potent antifungal agents found in coconut oil. These acids work by interfering with the cell walls of the Candida yeast. Capric acid has strong antiviral and antimicrobial properties.
- Palmitic acid, due to their medium-chain fatty acids, which are utilized for energy and do not

raise cholesterol levels and displays antioxidant.

- Oleic acid is known to be rich in antioxidants that help remove free radicals in the body.
- Linoleic acid, an omega-6 fatty acid, an essential fatty acid, potent anti-oxidant, anti-carcinogen, and a powerful immune system enhancer and is effective in children who suffer from cystic fibrosis from essential fatty acid deficiency due to malabsorption, as well as dermatitis, which is one of the first signs of an essential fatty acid deficiency in humans.
- Stearic acid is a saturated fatty acid, commonly seen in various soaps as a detergent, lubricant etc.

Other components present, comprise of Vitamin E, moisture and suspensions of proteins. All these constituents supplement for the health benefits.

Beneficial uses of coconut in dentistry:

Coconut oil is used to practice Oil Pulling or Oil Mulling. Oil pulling is an ancient act of “swishing or swirling” oil in ones’ oral cavity, resulting in rinsing the mouth with natural oils. It is an Ayurveda remedy that was traditionally used in India, for cleansing and maintaining oral health and systemic health. This process involves swishing a tablespoon of coconut oil in the mouth for 20 minutes. The oil with the bacterial contents is spit out, and the patient is advised to brush normally. The swirling action creates a negative pressure in the oral cavity. Along with the pressure build-up and the viscosity of the oil, aids in collecting food particles, bacteria or any other microorganisms that may be present on the tooth and gingival surfaces. The debris gets trapped within the oil and gets pulled away from the tooth surface, and into the whirlpool of the oil.⁶

The clear liquid within the fruit which is an electrolyte-packed drink is also extremely refreshing and contains a variety of nutrients including vitamins, antioxidants, amino acids, growth factors, enzymes and other major minerals like magnesium, calcium, and potassium.⁶ It is useful in preventing and relieving many health problems including dehydration, digestive disorders, malnutrition, fatigue,

osteoporosis etc. Cytokinins, a valuable plant growth hormones, present in coconut water regulate growth, development, and aging. For this reason, coconut water is used extensively as a growth-promoting component in tissue cultures. It also serves as storage media to preserve the viability of periodontal ligament cells (7&8). Since it is hygienic and sterile, it has been used as a transport medium for an avulsed tooth in cases of emergencies.⁸

Coconuts have been in our midst for centuries and it contains constituents with beneficial properties. Researchers should be able to investigate these components and incorporate into medical system that can help relieve and prevent diseases. Countries with an ancestral background of traditional medicine should support and integrate herbal remedies as an adjunct along with current health care systems. However, the use of these herbal products /practices should be ensured based on literature evidence. Scientific data and validations of such traditional approaches could justify the use of such products in dentistry.

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A Vexing Problem: Diagnosing Vertical Root Fractures

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Abstract

Vertical root fractures (VRFs) are often difficult to recognize, especially in the early stages. A protocol S-O-A-P (subjective, objective, assessment, procedure) that will enable the practitioner to identify these often hidden root fractures is described in this paper.

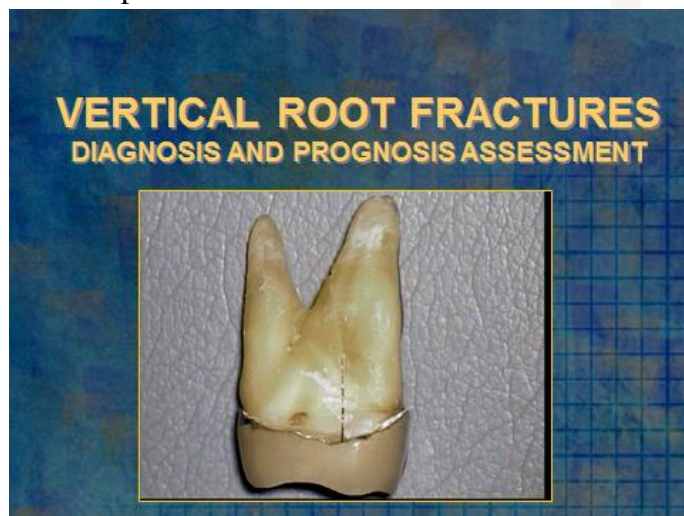
Key words:

Key Words: Root Fracture, Toluidine Blue Dye, CBCT, Informed Consent.

One of the hardest diagnoses to make it to recognize when a patient has an occult vertical root fracture

(VRF). Roots are like egg shells—once they crack, they can never be made “whole” again.

VRF is more commonly found in mandibular second molars, maxillary first molars and premolars. Teeth with prior endodontic therapy that remain unrestored with proper occlusal coverage are also at greater risk of VRF due to the slight loss of moisture content.



Etiology

Contributing Factors

- **Anatomic considerations:**
 - Predilection for lower second molars and upper first molars and premolars
- **Decreased moisture content following endodontic treatment:**
 - About 5-9% water loss after treatment
- **Predilection of root fractures in endodontically treated teeth**

Diagnosis

In the course of making a diagnosis, many steps are involved which include:

- Medical History
- Dental History
- Clinical and radiographic examination
- Percussion and pulp vitality assessment
- Periodontal evaluation

To accurately diagnose a VRF, there is a protocol that must be followed. To skip over any of these steps may lead the practitioner to a misdiagnosis. Unfortunately I have seen many VRFs that were avoidably misdiagnosed, thus leading to a lot of unnecessary and inappropriate treatment.

Occasionally, vertical root fractures are relatively obvious to diagnose from radiographic or clinical observations.



However, less obvious vertical root fractures are often overlooked or misdiagnosed.

The determination of a vertical root fracture is a combination of subjective and objective findings. If the clinician does not ask the right questions, he or she will not get the right answers.

Medical History

- The patient's medical history may seem like an unusual place to elucidate any suggestion of a vertical root fracture. However, the indication of facial trauma may only be discovered by asking the proper questions. For example, patients with seizure disorders may be prone to dental trauma, either from severe seizure-induced clenching, or from physical injuries sustained secondary to a grand mal seizure.
- Additionally, a patient that has had a stroke, heart attack, or any other ailment that might have rendered the patient unconscious, could result in the patient accidentally traumatizing a tooth. This could result in a vertical root fracture if the trauma is directed accordingly.

A medical history may possibly include a heart attack (patient falls on face during an attack), stroke or an epileptic seizure. So it is essential that the dentist listen carefully to what the patient reports in the medical history.

The dental history often provides early clues that a VRF may have occurred. Examples of common chief complaints are listed here.

Dental History

- "it only hurts when I bite a certain way."
- "it only started hurting after my dental visit when a post was placed."
- I accidentally bit down on a hard object and it has been hurting ever since."
- "My filling keeps falling out."
- "I had a root canal performed on this tooth three times and it still hurts."

Here is just one example where periapical images may be slightly suggestive of a VRF, but a full-thickness flap retraction may be necessary for diagnostic purposes just to confirm a suspicion! Of course, now with the advent of CBCT combined with the knowledge of interpreting the "slices" from different planes, the clinician may be able to avoid the surgical flap for an accurate diagnosis.

Diagnosis

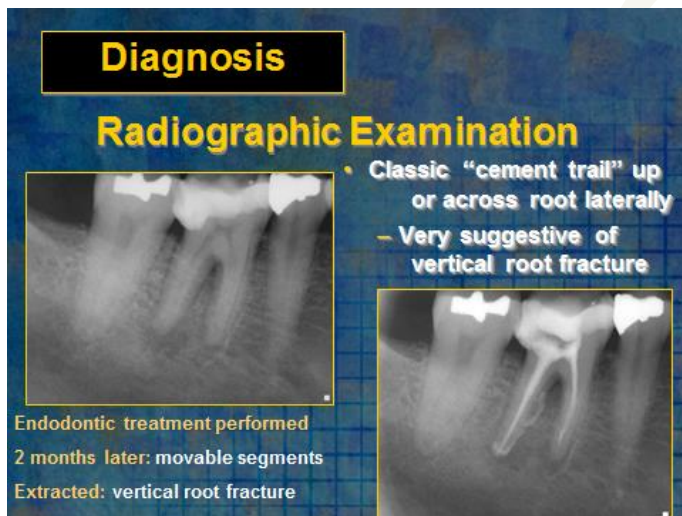
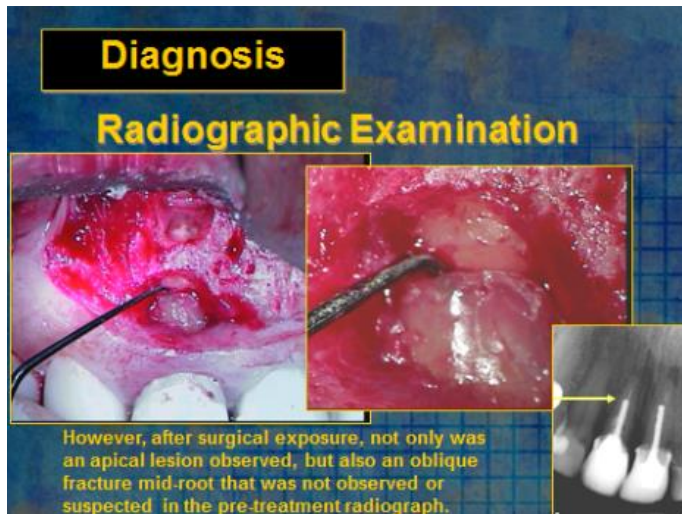
Radiographic Examination



Case Example:

- Moderate apical swelling #8
- No significant mobility
- Periodontally within normal limits
- No radiographic indication of a root fracture

Tentative Diagnosis: periapical pathology secondary to non-healing endodontics

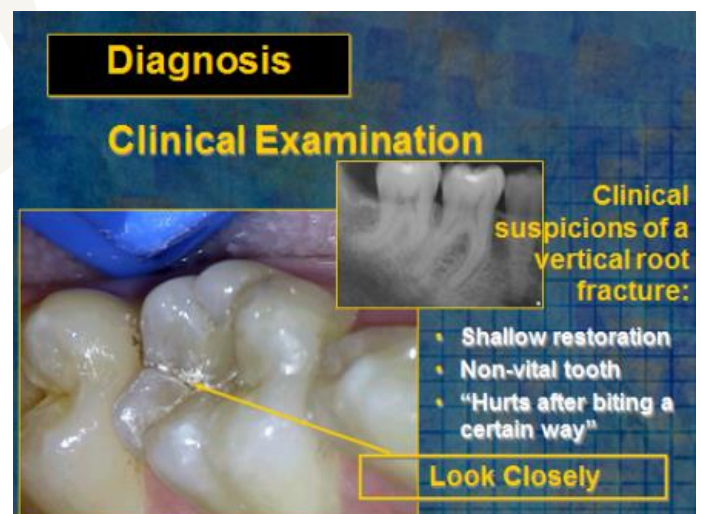
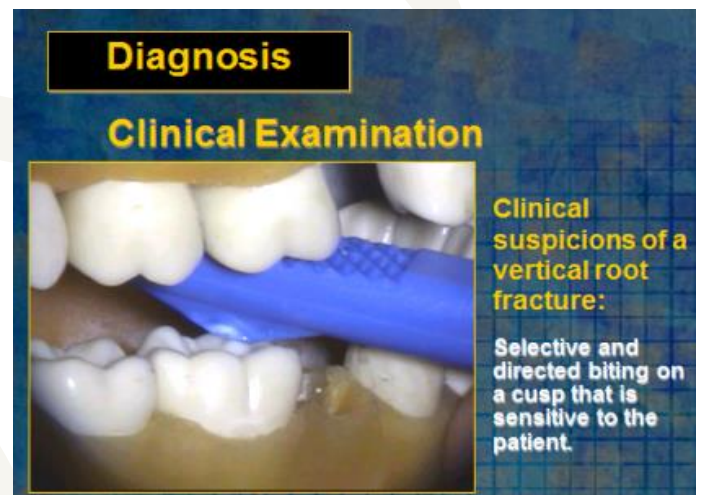
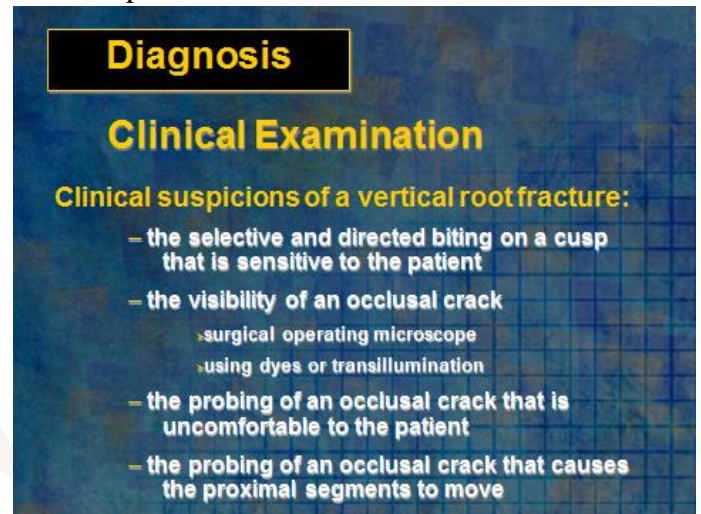


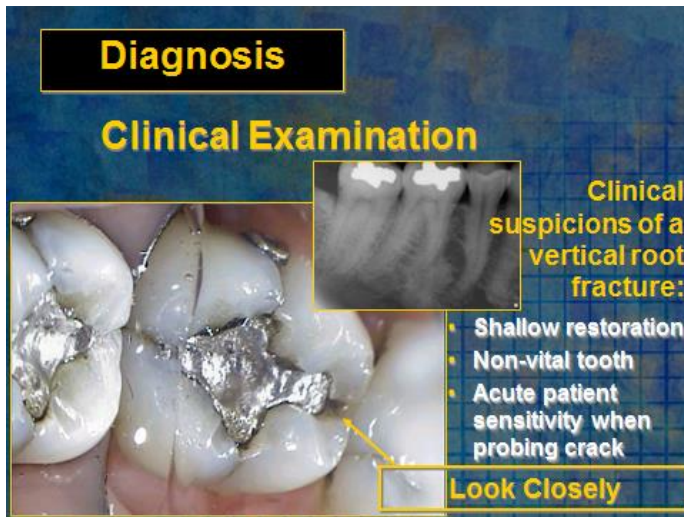
Whenever the clinician observes periradicular demineralization, the first consideration in the differential diagnosis should be VRF.

The clinical examination, conducted after gathering a full medical/dental history, includes a number of investigative techniques, e.g.:

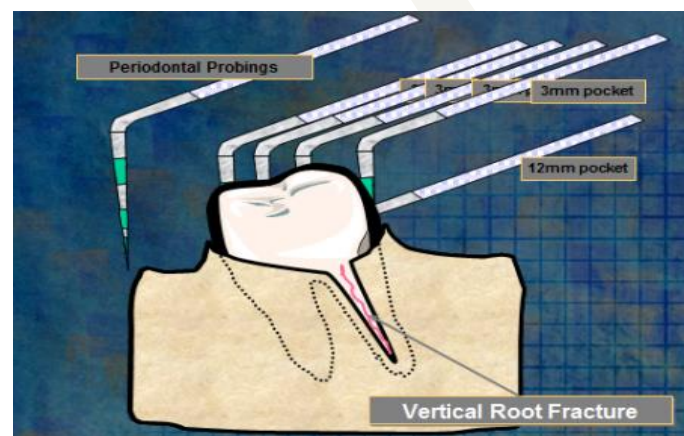
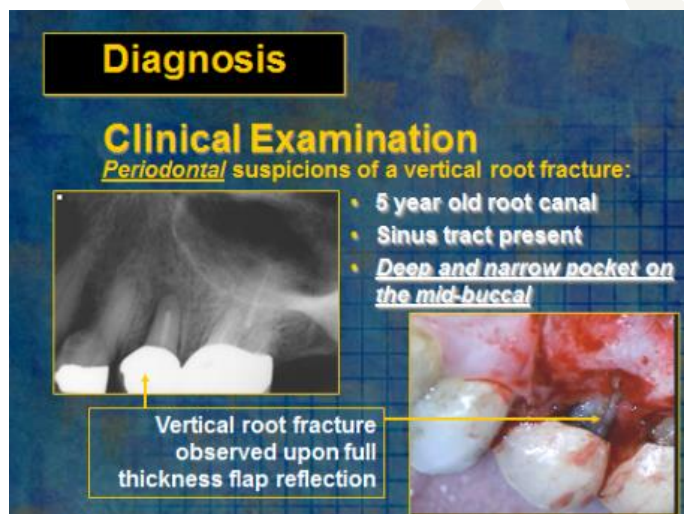
- Examining the suspect quadrant with a bright light and sufficient magnification (≥ 3.5 mag.) when the teeth are dried; of course, a dental operating microscope is much better for detecting M-D fracture lines on occlusal surfaces.
- Applying toluidine blue dye on the dried occlusal surfaces, using isopropyl alcohol slightly moistened on a 2 X 2" gauze to remove

the excess dye before searching for the suspected VRF.

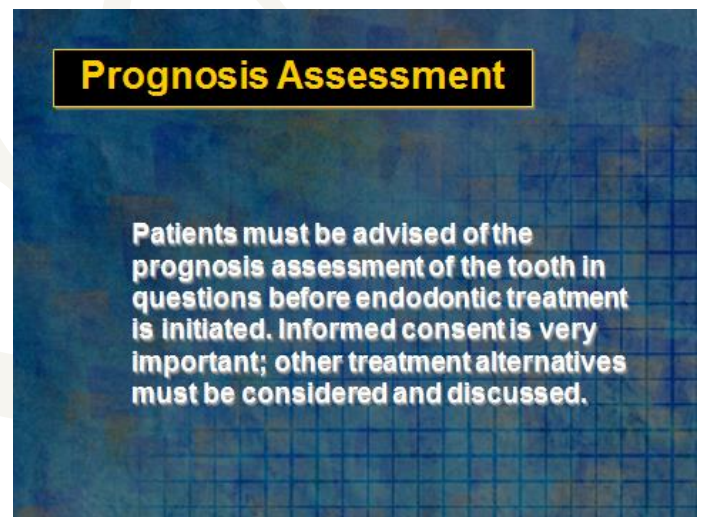




Look carefully with a probe for a narrow, deep periodontal pocket. Absent moderate periodontal disease, if a probe suddenly props down to 12mm along one side of one root, it quite likely that a VRF exists.



If a VRF is discovered, it is very important to inform the patient of the very guarded to poor prognosis if the patient wishes to attempt to preserve the tooth. In the USA, we have patients sign an "Informed Consent" form if the patient insists on gambling to retain the tooth. These forms are very helpful if the tooth has to be removed a few months later, because patients may forget that they were cautioned about the poor prognosis.



In summary, a VRF is quite challenging to diagnose, but if the clinician is aware of how to detect these vexing entities it will provide the highest quality of care for the patient and bring a quiet sense of professional satisfaction to the clinician.

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Bony Deformity in Bardet Biedl Syndrome – A Rare Case Report with X-RAY Findings

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Abstract

Bardet Biedl syndrome is a rare autosomal recessive condition which has a wide spectrum of symptoms. This syndrome was first described by Bardet and Biedl in 1920. The incidence is 1 in 100,000 with a higher prevalence in Arab and Bedouin populations wherein the incidence is 1 in 13,500. Chromosomal tests are available which can be done prenatally as well as postnatally. The most common clinical presentation is retinal dystrophy and the cause of mortality in most patients is End stage Renal Disease. This case report describes the presentation of a 16 year old Indian girl with this rare ciliopathy.

Key Words: Autosomal Recessive, Bardet Biedl Syndrome, Ciliopathy, Hypothyroidism, Obesity.

Introduction:

Bardet Biedl Syndrome is a rare autosomal recessive disorder, belonging to the family of ciliopathies.^{1,2} The cardinal symptoms of this condition comprise of rod-cone dystrophy, central obesity, polydactyly, complex female genitourinary malformations, cognitive impairment, male hypogonadism, and renal dysfunction.^{3,4} The secondary features include speech disorders, strabismus, cataract and astigmatism, craniofacial dysmorphism hepatic fibrosis, ataxia brachydactyly or syndactyly, nephrogenic diabetes insipidus, developmental delays, congenital heart disease and diabetes mellitus.² According to a study by Beales et al. if four cardinal or three cardinal plus two secondary features are present, then it is diagnostic of Bardet Biedl syndrome.²

Mutations have been detected in 16 different genes (*BBS1-BBS16*; BBS – Bardet Biedl Syndrome) out of which four distinct BBS loci have been mapped.^{5, 6, 7, 8} They are 11q13 (BBS1) – which is the most common, followed by 16q21 (BBS2), 15q22.3-q23 (BBS4) and 3p(BBS3). BBS3 is the rarest of all.^{8,9,10}

Other ciliopathies with which BBS shares phenotypic traits include Joubert (JBTS), Alström (ALMS) and Meckel (MKS) syndromes.^{11,12} Another syndrome which closely resembles BBS is Laurence Moon syndrome. Till 1970, they were considered as a

single entity – known as Laurence moon Bardet Biedl syndrome (LMBBS). Since they do not share phenotypic traits, they are now referred to as two separate conditions. Presence of progressive spastic paresis is characteristically seen in Laurence Moon syndrome while polydactyly is seen in BBS.¹³

Case report:

A 16 year old Indian girl, born out of a third degree consanguineous marriage presented with deformity of both lower limbs since the age of one and half years, when she had begun walking. The child was observed to be obese since the age of 3 months although her birth weight was 2.8 kilograms. She is also unable to see distant objects clearly. There was no developmental delay, but she goes to a special school, where her performance is satisfactory.

She was evaluated for the deformity at the age of 7 and was diagnosed to have bilateral tibia vara. Corrective osteotomy for the left tibia and temporary lateral epiphysiodesis for the right tibia were performed and the deformities were corrected. She did not follow up since the age of 8 years.

She presented at the age of 15 with pain abdomen and recurrence of deformity. She gave a history of irregular menstrual cycles since 7 months following surgery for right torsion of the ovary. She also presented with history of recurrent urinary tract

infection and inability to see distant objects clearly. Hence she was collectively evaluated by department of obstetrics and gynaecology, ophthalmology, medicine and orthopaedics.

On general examination, she was conscious, cooperative and oriented. Her BMI was found to be 42.1 (height – 164 cm, weight – 114 kg), hence she is morbidly obese. In the right hand, the 4th and 5th

fingers, syndactyly was observed along with polydactyly. No thyroid swelling, no neurocutaneous markers were present.

Orthopaedic evaluation revealed waddling gait with windswept deformity of the knees - right side – 20 degree valgus and left side 35 degree varus. No other deformities or limb length discrepancy was observed. **(Figure No. 1-5)**



Figure No. 1



Figure No. 2



Figure No. 3



Figure No. 4



Figure No. 5

Ophthalmologic evaluation suggested high myopia. There was no evidence of retinitis pigmentosa. Patient did not cooperate for Goldman's parametric analysis. A complete thyroid and sugar profile was done based on which a diagnosis of hypothyroidism and diabetes was made and she was started on medications for the same. Echocardiography was done which was normal. On ultrasound of the abdomen, a small left ovary was seen and the right ovary was absent. Secondary sexual characters are not well developed, breasts not completely developed. She is currently admitted for correction of the deformity of the knee.

Discussion:

Bardet Biedl syndrome is a multisystem, rare autosomal recessive disorder. The patient here presented with obesity, syndactyly, polydactyly, hypothyroidism, diabetes mellitus and hypogonadism and fulfills 'Beales criteria' for diagnosis of Bardet Biedl syndrome. This case report describes the presentation of Bardet Biedl syndrome along with skeletal deformities - Deformities of the knee associated with recurrence.

Various other rare associations have been reported in patients with Bardet Biedl syndrome such as hypokalemic paralysis, dilated cardiomyopathy and renal osteodystrophy.^{14,15,16} Some reports also suggest that renal dysfunction is present in almost 100 % patients, the earliest manifestations being polydipsia, reduced concentrating ability and polyuria. A case report describes Bardet Biedl syndrome in a Romanian boy who presented with End stage renal disease at the age of 4.¹⁷ Another case report presents the association of the syndrome to multiple skeletal deformities such as kyphosis, skeletal fractures and bilateral hip dislocation.¹⁵

Since there is multisystem involvement, the patient must undergo fundoscopic examination of the eyes, blood pressure measurements and urinalysis for glucose, protein and leukocytes. Electrocardiography, echocardiogram, ultrasound of the kidneys and urinary tract should be done to check the progress of the disease and alter management. The patient here has undergone ophthalmologic, gynaecologic,

cardiac, orthopaedic and endocrine evaluation. She has been treated symptomatically for Diabetes Mellitus, Hypothyroidism and skeletal deformity. No renal dysfunction or gross visual impairment has been detected yet. Advice has been given to her regarding compliance to medication, diet and regular follow up.

Conclusion:

Although rare, diagnosis of this condition initiates complete evaluation, follow up and undertaking measures that can improve the quality of life of the patients. Visual impairment is the most common manifestation and its progression must be monitored to delay the onset of blindness. It is important to monitor renal function as renal dysfunction is the most common cause of death.

Training, rehabilitation, change in diet, exercise are the main supportive modalities along with regular follow up. Management alters with the progression of symptoms. Diagnosis of the condition is confirmed by genetic evaluation. Chromosomal tests are available which can be done prenatally and postnatally. This enables evaluation of similar cases if suspected in the family. The life expectancy varies with the severity of symptoms and course of management.

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Orbital Invasive Aspergillosis - A Rare Fungal Infection of Eye

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Abstract

Invasive orbital aspergillosis in immunocompetent patients is a rare clinical entity and is often misdiagnosed. Infections of the eye give rise to severe ocular morbidity. Morbidity and Mortality may be avoided with timely treatment. We present the clinical features, treatment and outcome of a 34 year old male patient who is diagnosed for having fungal infection aspergillosis of the left apex of the orbit. A radioopacification of the left orbital apex was observed in CT scan for which biopsy was performed and diagnosis was made as Aspergillosis.

Key Words: Fungal Infection, Aspergillosis, Fungal Eye Infection.

Introduction:

Invasive Aspergillosis in a healthy host is a rare occurrence but it may become pathogenic under special circumstances in head and neck region. Aspergillosis of paranasal sinus is one of the infrequently reported diseases which can occur as invasive and non – invasive forms. Diagnosis of the condition itself is a difficult task and challenge for the clinician. Early diagnosis is essential in order to avoid high morbidity and mortality associated with the destructive disease and to instigate treatment before irreversible condition arise. The purpose of this paper is to report a case of fungal infections involving the orbital region in immune-competent patients with an emphasis on the fact that early diagnosis is vital in these infections, because delay in initiation of treatment can be life threatening due to propensity of fungi to invade adjacent blood vessels and embolize to distant organs.

Aspergillus is pathogenic in birds, animal and man. Though Aspergillus Fumigatus is the most common fungi which affect the paranasal sinus, it is rarely reported in the English literature. Mycotic sinusitis is on the increase worldwide. It is unclear whether this increase is due to a heightened awareness of the disease or rather to a higher incidence

precipitated by the increased use of antibiotics and corticosteroids.¹

This fungus grows best anaerobically. The Primary sites of fungal infection are respiratory tract, external auditory canal, naso-pharynx, cornea, gastrointestinal tract and occasionally the skin. Opportunistic fungal infections usually occur in immune-compromised patients, but can infect healthy individuals as well.²⁻⁵

This paper reports a case of aspergillosis in an apparently healthy male with involvement of the apex of the orbit.

Case Presentation:

A 34 year old male patient presented with chronic headache and proptosis of left eye (Fig 1). The visual acuity and fields were normal. His medical history, inspection and palpation were unremarkable and the patient was found to be immuno-competent.

As a radiographic investigation computed tomography (CT) scan of orbit was taken, which revealed an ill-defined, heterogeneous, hyperdense mass infiltrating the orbital apex (Fig 2&3), Idiopathic orbital inflammatory syndrome, optic neuritis and orbital bacterial cellulitis/orbital abscess

cellulitis were counted as the differential diagnosis for the same.

Patient was undertaken for biopsy and the histopathological examination of specimen showed tissue invasion by fungal hyphae, with characteristics

of *Aspergillus*: non-caseating multinucleate giant cell granulomas, and chronic inflammatory infiltrate composed of eosinophils, lymphocytes and plasma cells. Culture on Sabouraud's agar media was positive grew *Aspergillus flavus* (Fig 4&5).



Figure No. 1: Photography showing proptosis of left eye



Figure No. 2: Computer tomography (CT) scan of the orbit showing heterogeneous mass in the apex of the orbit, of the right maxillary sinus with evidence of palatal perforation.

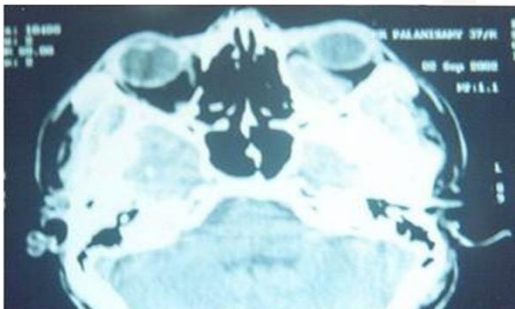


Figure No. 3: Computer tomography (CT) scan of the orbit showing heterogeneous mass in the apex of the orbit.

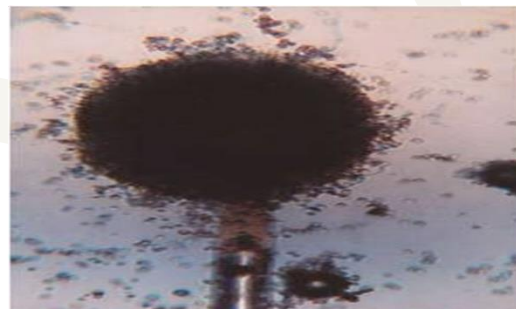


Figure No. 4: Exposure of the lesion through an orbital incision

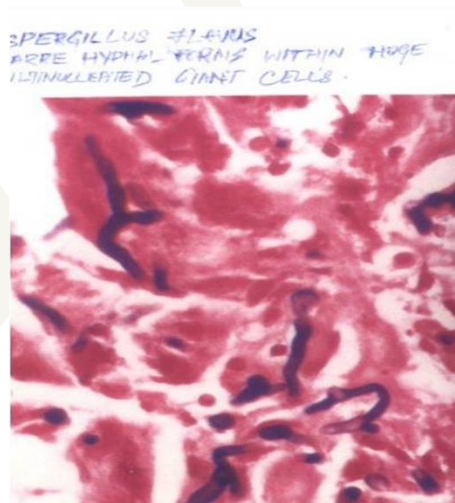


Figure No. 5: Specimen of excised necrotic maxilla

Treatment:

The patient was hospitalized and extensive debridement of the orbital apex under general anaesthesia was performed. Surgical exploration was performed by infra orbital incision (Fig 6). The orbit was explored and friable granulomatous material was found to extend to the apex of the orbit. Extensive debridement was done (Fig 7) and primary

reconstruction was done. The patient was administered Amphotericin-B, 0.8mg/kg/day, intravenously for two weeks. Blood urea and creatinine levels were monitored as the drug can cause renal toxicity.

Post operatively the healing was uneventful (Fig 8) and follow up examination of the patient's clinical outcome was found to be satisfactory.

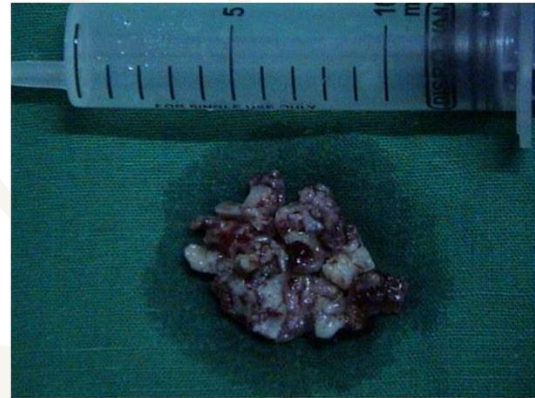
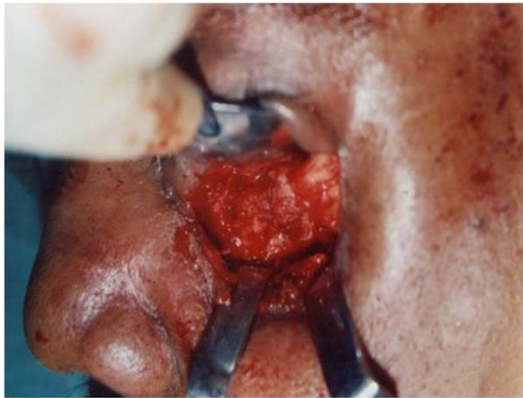


Figure No. 6 & 7: Hematoxylin and eosin stained section showing fungal hyphae with spores.



Figure No. 8: Post operative follow up after 8 months

Discussion:

Aspergillosis is a large spectrum of diseases caused by members of the genus *Aspergillus*. It is a saprophytic mold of the Ascomycetes class that is widely distributed in the environment and is particularly found in soil, cereals, and decaying

vegetation. Although invasive fungal sinusitis may be seen in apparently healthy individuals,¹⁻³ *Aspergillus fumigatus* is most often encountered in among immune-compromised patients.³

Aspergillosis is the most common fungal infection of the para-nasal sinuses in both healthy and

immune compromised subjects. Two ways of contaminating the para-nasal sinuses with aspergillus exists. The first is the “aerogenic” pathway in which spores are inhaled directly in the antrum and the second is “iatrogenic” mode where spores are introduced to the antrum via an oro-antral communication that occurs at the time of a dental procedure such as a dental extraction or a root canal perforation. Once the spores are introduced, they may act as opportunistic pathogens and colonize in the maxillary sinus, particularly when conditions that decrease sinus ventilation, such as bacterial sinusitis already exist. The individual species *A. fumigatus*, *A. flavus*, *A. glaucus*, *A. terreus*, and *A. Niger* have been implicated in human infections, with *A. fumigatus* being the most common causative agent.⁴

Aspergillosis appears in three forms: 1) saprophytic, in which there is fungal growth without invasion of viable tissue; 2) allergic, characterized by the presence of a hypersensitivity reaction to fungal hyphae or conidia; and 3) invasive, in which there is extension of the fungus into viable tissue, resulting in severe necrosis.⁵ The saprophytic and allergic forms affect the immune-competent host and have relatively low morbidity and mortality.⁶ where as invasive or fulminant aspergillosis is rapidly progressive and primarily affects patients who are immune-compromised, such as those with diabetes mellitus or a malignant disease or those undergoing steroid and immunosuppressive therapy.^{7, 8}

Allergic aspergillosis sinusitis was first described by Katzenstein et al in 1984.⁶ A very rare case of aspergillus infection of the periodontal tissues and dental pulp, confirmed histologically, was reported in a tuberculosis patient by Kobayakana et al (1964). Upon review of the English-language literature, Thomas H. Faqua et al found only 25 reported cases of primary intra oral aspergillosis.¹¹

Usually only one sinus, i.e. Maxillary sinus, is affected, and bacterial super infection may lead to episode of acute sinusitis. Symptoms such as pain and swelling, ulceration, nasal obstruction and rhinorrhea may also develop with the development of ocular and neurologic signs occurring from either local compression or direct invasion, hence the clinical

picture of para-nasal aspergillosis can therefore be similar to the malignant disease, chronic sinusitis with osteomyelitis, Wegener's granulomatosis, mucormycosis, and inverted.

Because the clinical picture of aspergillosis is often similar to that of other disease, effective imaging techniques are essential to help establish an early diagnosis. The presence of a radiodense foci in associated with homogenous opacification of the sinus is highly suggestive of a non-invasive mycetoma. In addition it is found to affect only one sinus at a time. Such foci may simulate either a foreign body, an antrolith, a calcified hematoma, or an osteoma.¹⁰

On a radiographic evaluation, invasive form usually involves multiple sinuses with possible added evidence of bony destruction. Allergic aspergillosis presents with diffuse expansile involvement of multiple sinuses. Tissue invasion is not a common characteristics however, cases involving intracranial extension have been reported.¹¹

CT examination is a more sensitive diagnostic tool than plain radiography, and in addition to being useful in identifying early invasive disease.

Oral lesions of aspergillosis, seen predominantly in some immune-compromised patients, are yellow or black, necrotic ulcers, typically in the palate or occasionally the posterior tongue. The main differential diagnosis are from mucormycosis, pseudomonas.

Conclusion:

Fever and incorrect initial diagnosis was found to be associated with high mortality rate in patients with invasive aspergillum of the orbit. The most common ocular symptoms were visual disturbance, periorbital swelling and periorbital pain. Clinical, radiological and histopathological findings are useful for establishing the extent of the disease and eliminating other conditions from the differential diagnosis.

Key message:

1. Fungal infections of the paranasal sinuses and orbit are usually seen in immuno-compromised and occasionally in immune-

competent individuals, so clinicians should be aware that chronic sinusitis that is unresponsive to usual management is highly suggestive of mycoses of the paranasal sinuses.

2. The bone of maxilla-facial region rarely undergoes necrosis due to its rich vascularity. Unlike bacterial infections which cause tissue necrosis due to its direct effects, the destruction caused by fungi is due to avascular necrosis secondary to embolisation of the blood vessels.

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Plasma Cell Granuloma of Gingiva -A Rare Case Report

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Abstract

The term “plasma cell granuloma” is used to describe a localized benign proliferation of mature plasma cells. Intraoral plasma cell granulomas involving the tongue, lip, oral mucosa and gingiva have been reported in the past. This case presents a 16year-old female with maxillary anterior gingival overgrowth. Histological examination revealed inflammatory cell infiltrate containing sheets of plasma cells. This case highlights the need that tends to locate in the oral cavity, primarily on the periodontal tissue. It reinforces the existence of plasma cell granuloma on the gingiva that it is extremely uncommon. Clinical features and histopathologically in early stages closely resembles plasmacytoma (malignant). This case highlights the need to biopsy unusual lesions to rule out potential neoplasms and also emphasizes the need to submit all the excised tissue for histological.

Key Words: Plasma Cell; Gingiva; Oral Cavity.

Introduction:

Plasma cell granuloma (PCG) is a rare form of idiopathic inflammatory pseudotumor, characterized by a benign proliferation consisting predominantly of plasma cells and reticuloendothelial elements.¹ These lesions have no sex predilection and may occur at any age. It manifests primarily in the lungs, but may occur in various other anatomic locations like the oral cavity which is very rare on the gingiva. Intraorally, involves most commonly the tongue, lip, oral mucosa and least commonly on the gingiva.² The exact incidence and etiopathogenesis is unclear and may arise due to periodontitis, periradicular inflammation due to the presence of a foreign body or may be due to an idiopathic antigen. The lesion's, biological behavior, and appropriate treatments are unclear. The most commonly considered treatment for plasma cell

granuloma is a complete resection and little is known about the prognosis.³

We present such a rare case of plasma cell granuloma of gingival in the oral cavity.

Case Report:

A 16-year-old female patient reported to the Department of Oral Medicine And Radiology, M.M College of Dental Sciences and Research, Mullana with the chief complaint of growth in upper right front region of jaw since 20 days. History of present illness revealed that this growth was initially small and was present one and half months back. Initially the growth was small in size and bleeding was present on touching. The patient had got the growth excised from a local hospital in Saharanpur 1 month back and then 20 days back, the growth had reappeared, and it grew in size and attained the present size. The lesion was

painless but the patient complained of bleeding on touching and interference with oral hygiene practice. The medical history was non significant.

On intraoral examination, a solitary growth was extending from mesial aspect of 11 to distal aspect of 12 on palatal aspect and on buccal aspect in between 11 and 12. The growth was well-circumscribed, oval, and sessile. The growth was firm in consistency. The approximating size of growth was 3 cm x 2 cm diameter. The colour of the growth was reddish pink to that of surrounding mucosa (Fig 1).

On palpation the inspectory findings were confirmed. It was firm in consistency, fixed to

underlying structures. It was nontender, nonpulsatile, non fluctuant and non compressible in nature. Bleeding was elicited on palpation.

A working diagnosis of pyogenic granuloma was made and radiographic investigations were done. Radiographic examination revealed no significant bony changes. There was no bony invasion and no bony destruction, no osseous changes seen (Fig 2). A provisional diagnosis of pyogenic granuloma was made and the patient was sent for the excision of the mass to the department of Oral and Maxillofacial Surgery.



Figure No. 1



Figure No. 2

Before surgery, complete hemogram was done. The findings were within the normal limits. The patient was uncooperative, so it was decided to excise the growth under General Anaesthesia. Preanaesthetic check up was done in which Chest X-ray, ECG revealed no significant features.

The patient was sent for urine analysis for Bence Jones proteins to rule out multiple myeloma.

The lesion was excised under General anaesthesia and the specimen was sent for histopathological examination.

Histopathological examination revealed parakeratinized stratified squamous epithelium with long and thin rete pegs and underlying connective tissue. The connective tissue was fibrocellular with

numerous proliferating endothelium lined blood vessels. The connective tissue showed the presence of plasma cells in clusters surrounding the blood vessels. The plasma cells were variable in size and shape, with very few large cells and numerous binucleated plasma cells (Fig 3).

So, final diagnosis of plasma cell granuloma was made based on clinical and histopathological findings.

The lesion was excised in the Department of Oral And Maxillofacial Surgery (Fig 4). Follow up was done and revealed nothing significant findings.

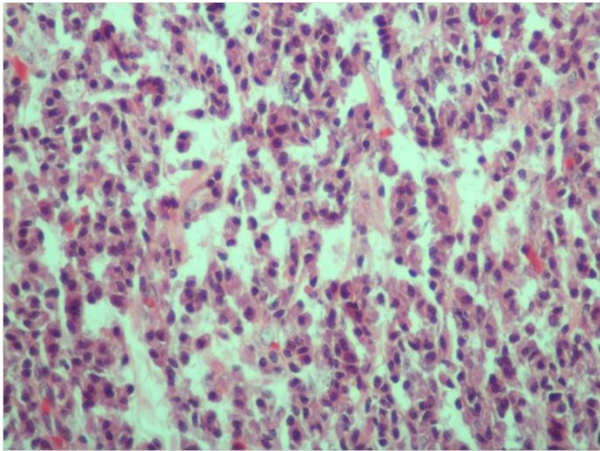


Figure No. 3

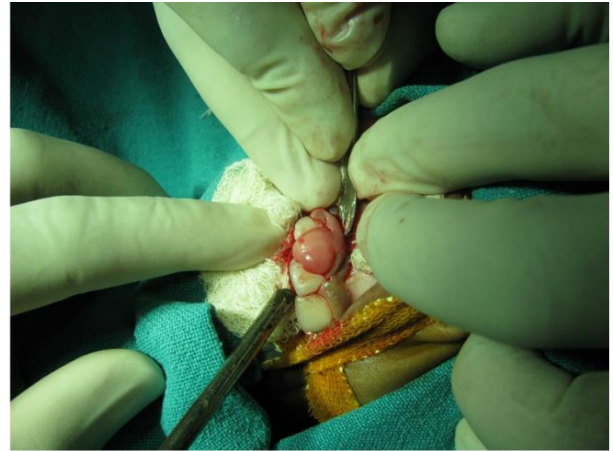


Figure No. 4

Discussion:

Plasma cell granuloma (PCG) is a highly, uncommon, reactive tumor-like lesion whose etiology remains uncertain. Although some authors suggest that it has a parasitic etiology.⁶

It has been called by different terms, namely; inflammatory myofibroblastic tumor, inflammatory pseudotumor, inflammatory myofibrohistiocytic proliferation, and Xanthomatous pseudotumor.⁵

It is formed by aggregates of mature plasma cells intermixed with mesenchymal cells mostly of the fibroblast and histiocyte-type and arranged in a granulomatous pattern. These are terminally differentiated B lymphocytes which are typically found in the red pulp of the spleen, medulla of the lymph nodes, tonsils, lamina propria of the entire gastrointestinal tract, mucosa of the nose and upper airway, and sites of inflammation. These are characterised by basophilic cytoplasm with an eccentrically placed nucleus.⁴

Plasma cell granuloma has been found in several sites in the body. The lungs and the stomach are the commonest sites; the tonsil, bladder are rarely affected.⁷

It is rarely found in oral cavity. Aveledo and Buchler-Mark and Steven, Karthikeyan and Pradeep and Baltacioglu *et al.* have reported lesion on the gingiva.² Kim *et al.* also reported gingival plasma cell

granuloma in patients with cyclosporine-induced gingival overgrowth which was not true in our case.²

In our case, the young age of the patient suggested it to be a reactive lesion. It has been postulated that the presence of a large number of plasma cells may represent an altered antigen-antibody reaction of the host or an alteration of blood flow imposing congestive vasodilation.³

The plasma cell granuloma should be differentiated from plasmacytoma and multiple myeloma. Multiple myeloma is the tumor of the bone, whereas, plasmacytoma and plasma cell granuloma are soft tissue tumors. Differentiating the type of soft tissue tumor is mandatory, as plasma cell granuloma may be benign, but plasmacytoma may show early stages of multiple myeloma.³

In our case, the growth was differentiated from multiple myeloma on the basis of negative Bence Jones protein and from plasmacytoma on basis of histopathological findings. It is suggested that biopsy is mandatory to rule out other differentiating lesions.

The treatment modality and follow-up of the soft tissue lesions varies. Plasma cell granulomas are usually treated by simple excision and removal of underlying inciting agent whereas neoplasms may require surgical excision, followed by chemotherapy and or radiotherapy.⁴ In our case, simple excision, followed by regular check up sufficed.

With respect to prognosis, plasma cell granuloma seems to be a generally benign, nonrecurring

condition; nevertheless, local aggressiveness and recurrences may complicate the outcome of the disease.⁵

Conclusion:

Plasma cell granulomas tend to locate in the oral cavity, primarily on the periodontal tissue and exact incidence of these cases have not been reported in literature. This case report reinforces the existence of plasma cell granuloma on the gingiva that it is extremely uncommon. So there is a need for submitting all the excised gingival tissue for histopathological examination, irrespective of the clinical features and clinical diagnosis.

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Mandibular Incisor Extraction: A Case Report

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Abstract

A proper case selection and treatment planning for lower incisor extraction is gaining popularity with its numerous advantages in mandibular crowding cases. Lower incisor extraction has helped in avoiding expansion of intercanine width and in relieving crowding. It also helps to simplify the orthodontic treatment mechanics with improvement in occlusion and dental esthetics in reduced treatment time.

Key Words: Occlusal Harmony, Inter Canine Width, Alignment.

Introduction:

Extraction in orthodontics is a therapeutic method to gain space for relieving crowding. Extraction to create space for accommodation of the remaining teeth of crowded dental arches was written up in the dental literature as long as 1771. Extractions of first or second premolars were common alternatives to gain space considering the facial profile and space requirement. However, extraction of one or more lower incisor was considered as a controversial method as it was found to present with unwanted side effects as increase in overbite, overjet, space reopening, partly unsatisfactory posterior occlusion, recurrence of crowding in remaining three incisors and unesthetic loss of interdental gingival papilla in mandibular anterior region. These side effects can be minimized with a proper case selection and controlled use of simple treatment mechanics.^{1, 2, 3} This article presents a case of lower incisor extraction.

Case Report:

A female patient 16 years old reported with a chief complaint of crowding in lower anterior teeth and forwardly placed upper anterior teeth. She had a mild convex pleasing facial profile with competent lips [Figure 1]. Her intra-oral clinical examination

showed severe crowding with mandibular anteriors and mild crowding with maxillary anteriors and Angles Class I molar relation bilaterally. Due to lower anterior crowding, mandibular left canine was displaced buccally [Figure 2] Model analysis showed Boltons ratio, mandibular anterior and overall excess of 5.6 mm and 1.4 mm respectively.

The main objective of treatment plan was aimed at relieving lower and upper anterior crowding without much disturbing her facial profile. Extraction of mandibular left lateral incisor, to facilitate proper aligning of 33 was planned which would gain space enough to relieve lower anterior crowding. Prior to start of orthodontic treatment, periodontal maintenance in form of scaling and extraction of incisor was done.

The orthodontic treatment was started using PAE 0.022 slot brackets. 0.014 inch NiTi preformed arch wire was used as initial wire as to exert very light forces.⁴ Alignment and levelling was achieved with subsequent wire sequence (Table 1). After levelling, using 0.019 x 0.025 SS arch wire space closure was started with very light forces using tie backs. Anterior teeth were also placed together with continuous ligation when retracted, for distributing the force acting on the anterior teeth.



**Figure 1.a: Pre Treatment
Extra Oral Frontal View**



**Figure 1.b: Pre Treatment
Extra Oral Frontal Smile
View**



**Figure 1.c: Pre Treatment
Extra Oral Lateral Profile
View**



**Figure 2.a: Pre Treatment
Intra Oral Frontal View**



**Figure 2.b: Pre Treatment
Intra Oral Right Lateral
View**



**Figure 2.c: Pre Treatment
Intra Oral Left Lateral
View**



**Figure 2.d: Pre Treatment
Intra Oral Maxillary
Occlusal View**



**Figure 2.e: Pre Treatment
Intra Oral Mandibular
Occlusal View**

Table No. 1: Table Wire with Sequences

Table 1	Wire Sequence	Treatment
1	0.014" NiTi	Initial wire
2	0.016 NiTi	Aligning
3	0.018 NiTi	Aligning
4	0.016 x 0.022 NiTi	Aligning and Leveling
5	0.019 x 0.025 NiTi	Aligning and leveling
6	0.019 x 0.025 SS	Retraction

Note: NiTi- Nickel Titanium, SS- Stainless steel.

Her treatment resulted in good facial profile with alignment and levelling with no crowding in upper and lower arch [Figure 3, 4]. The total duration of orthodontic treatment was 17 months. After the appliance removal, bonded lingual retainers were given for permanent retention of the maxillary and mandibular arches.⁵

Discussion:

Extraction of lower incisor was advocated as early in 1904. Later, Reidel and co-workers and case reports by various authors have favoured removal of one or more incisors in severely crowded mandibular arches and considered one of the only logical alternatives.^{6,7} Arch length and tooth size discrepancy helps to evaluate the amount of space required for correction of crowding, levelling curve of spee and inclination of lower incisors. Anterior boltons discrepancy of more than 83 mm can be a definite case for lower incisor extraction.⁸ Extraction decision should be carried to produce harmony between the upper and lower arches without any deficient or excess space left.

This case presented with Boltons anterior mandibular excess and showed space requirement of 5.6 mm. Hence though proximal stripping an alternative to gain space, incisor extraction was planned to achieve more stable results. Simple mechanics with adequate torque control and axial inclinations of mandibular teeth was monitored to prevent lingual tilting of the mandibular canine crowns and unwanted narrowing of the inter-canine width. Care was taken to keep maxillary midline overlying the centre of three incisors.

On lower incisor extraction, the lower cuspids may be positioned mesially; as a result their cusp tips contact the distolingual marginal ridges of maxillary lateral incisors, instead of mesial fossa of maxillary cuspids. The interference should be compensated by equilibrating the non functioning portion of the lower cuspids or extruding lower incisors to maintain occlusal contact in centric occlusion.⁶

Extraction of one incisor in cases of moderate to severe crowding may even satisfy the requirement of maintaining the arch form and width without expansion of the inter-canine width.⁷



Figure 3.a: Post Treatment Extra Oral- Frontal View



Figure 3.b: Post Treatment Extra Oral Frontal Smile View



Figure 3.c: Post Treatment Extra Oral Lateral Profile View



Figure 4.a: Post Treatment Intra Oral Frontal View



Figure 4.b: Post Treatment Intra Oral Right Lateral View



Figure 4.c: Post Treatment Intra Oral Left Lateral View



Figure 4.d: Post Treatment Intra Oral Maxillary Occlusal View



Figure 4.e: Post Treatment Intra Oral Mandibular Occlusal View



Figure 5.a: Crowded Lower Anteriors With Lack of Space for One Incisor



Figure 5.b: Class III Cases Where Extraction of Lower Incisor Followed by Retrusion of Lower Anteriors Improves Occlusion

Lengthy retention to allow for periodontal adaptation is better for the post-retention stability; hence fixed bonded retainers were given in both the arches in this case.

However, as all cases may not favour this strategy, a proper case selection and careful planning is required prior to decision on lower anterior extraction. Cases that may favour lower incisor extraction are: Crowded lower anteriors with lack of space for one incisor [Figure 5.a], moderate crowding with lower anterior region with good normal maxillary dentition, perfect buccal interdigitation, in cases of lower incisor with bone loss, periodontitis & fracture, incisor tooth size anomaly, ectopic eruption of lower incisor, Class I cases with anterior dental cross bite due to lower anterior crowding and protrusion, severe anterior tooth size discrepancy due to small upper or large lower anteriors, in class III cases where retrusion of lower anteriors improves occlusion [Figure 5.b], acceptable soft tissue profile, minimal to moderate over bite & over jet, minimal growth potential, missing lateral incisor or peg laterals, mandibular tooth material excess.⁸⁻¹³

Cases with definite need for extractions of bicuspid while canines in class I relationship, cases with deep bite with horizontal growth pattern, bimaxillary crowding cases with no anterior boltons discrepancy and cases with anterior discrepancy due to either small lower anteriors and/or large maxillary

incisors, should not be selected as lower incisor extraction cases.⁸⁻¹³

Summary and Conclusion:

Selecting the best treatment option is often difficult and not all factors can be achieved, but a proper case selection and proper decision on which tooth to extract can prove extraction of mandibular incisor a therapeutic extraction option in severe lower anterior crowded cases. A systematic treatment approach with simple mechanics and torque control can aid in achieving a stable occlusion that is esthetic and in functional harmony.

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