

# Clinical Study of Intact Canal Wall Technique in the Management of Chronic Suppurative Otitis Media

V Anil

Associate Professor, Department of ENT, Santhiram Medical College, Nandyal, Kurnool, Andhra Pradesh, India

## Abstract

**Background:** Chronic suppurative otitis media (CSOM) is a common inflammatory disorder of middle ear cleft accounting for the majority of conductive hearing losses in the population worldwide. CSOM is managed by intact canal wall (ICW) or canal wall down procedures (CWD) depending on the keratin formation in the middle ear cleft. Auditory gain is better in ICW procedures when compared to CWD procedures.

**Aim of the Study:** This study aims to evaluate the long-term effects on auditory gain following ICW technique of mastoidectomy with tympanoplasty in the treatment of CSOM (tubotympanic).

**Materials and Methods:** A total of 60 patients with CSOM were randomly selected and subjected to ICW mastoidectomy and tympanoplasty after necessary investigations. The auditory gain was calculated after 8 weeks of surgery and follow-up of 2 years.

**Observations and Results:** Among the 60 patients, 53% were males and 47% were females. 75% of the study group belonged to the age group between 20 and 40 years. About 67% of the individuals were of the low socioeconomic group. About 55% of the mastoids were pneumatized. Mucosal edema was observed in 53% and mucosal hypertrophy in 38%. The auditory gain was 15-35 dB in 80% of the individuals.

**Conclusions:** The overall incidence of CSOM in the study was 5% in the study. The most common pathology was middle ear mucosal edema followed by hypertrophied mucosa. Auditory gain was 15-30 dB in 80% of the patients.

**Keywords:** Auditory gain, CSOM, Mastoid pneumatization, Intact canal wall mastoidectomy, Pure tone audiometry

## INTRODUCTION

Chronic suppurative otitis media (CSOM) is typically a persistent disease of middle ear cleft, insidious in its onset.<sup>1</sup> This disease often causes severe destruction and irreversible sequelae, involving the tympanic membrane, ossicles, and the temporal bone.<sup>2</sup> It manifests clinically as discharge and deafness of variable severity.<sup>3</sup> It can be subdivided into active or inactive depending on whether or not there is an infection. Chronic otitis media develops after long-standing inflammation in the middle ear and mastoid. Even though conservative treatment makes the ear temporarily dry, the susceptibility for future reinfection persists as long

as the perforation is present, especially in children.<sup>4</sup> The Foci of sepsis lies in the adenoids, tonsils, sinuses, and teeth.<sup>5</sup> The principal aim of surgery for CSOM is first to clear the disease and only then, if possible, to reconstruct the hearing mechanism in the middle ear.<sup>6</sup> Randomized clinical trials comparing medical and surgical intervention are not available. Hence, the treatment of CSOM is almost exclusively based on empirical experience.<sup>7</sup> Either procedure is a valid alternative. Duration and time frame of medical treatment for patients who remain asymptomatic still remains unclear.<sup>8</sup> However, case series describing the intraoperative findings of medically intractable cases have been published.<sup>9</sup> The indications for abandoning medical therapy are currently unclear; thus, no justification in making definite recommendations for the performance of either procedure.<sup>10</sup> The surgery of mastoid and the middle ear has evolved in the present time with the use of operating microscope and endoscopes to its pinnacle.<sup>11</sup> The post-operative complications are minimal. The post-operative end results are convincingly encouraging. The incidence of chronic middle ear infection is about 5%

### Access this article online



www.ijss-sn.com

Month of Submission : 08-2017  
Month of Peer Review : 09-2017  
Month of Acceptance : 10-2017  
Month of Publishing : 10-2017

**Corresponding Author:** Dr. V Anil, Department of ENT, Santhiram Medical College, Nandyal, Kurnool, Andhra Pradesh, India.  
E-mail: anilswanthu@gmail.com

in Indian population.<sup>12</sup> The present study is to assess the auditory gain in the intact canal wall (ICW) technique mastoidectomy in patients with CSOM (tubotympanic).

### Aim of the Study

This study aims to evaluate the long-term effects on auditory gain following ICW technique of mastoidectomy with tympanoplasty in the treatment of CSOM (tubotympanic). Final success rate, FS (dry ears for 2 years) and the optimal final success rate, OFS (dry ears for 2 years without reoperations and without retractions/perforations) were estimated.

### Study Period

February 2009-January 2013.

### Institute of Study

General Hospital Attached to Santhiram Medical College, Nandyal, Kurnool, Andhra Pradesh.

## MATERIALS AND METHODS

A total of 60 patients attending the OPD of the Department of ENT with CSOM were selected randomly for this study. After obtaining detailed history thorough ENT examination including endoscopy of the ear was done.

### Inclusion Criteria

1. Patients aged between 18 and 50 were included,
2. Patients with central perforation only were included,
3. Patients with only conductive deafness were included,
4. Patients undergoing primary surgery were alone included.

### Exclusion Criteria

1. Patients aged below 18 and above 50 years were excluded,
2. Patients with sensorineural hearing loss were excluded,
3. Patients undergoing revision surgery were excluded,
4. Patients with diabetes mellitus were excluded,
5. Patients with intracranial complications were excluded.

All the patients were subjected to surgical profile and auditory assessment. Auditory assessment was done with pure tone audiometry (PTA) taking the pure tone average (500-2000 KHZ), PTA as the index of measurement. Auditory assessment was done postoperatively after 8 weeks to calculate the auditory gain. All the patients were subjected to ICW mastoidectomy and tympanoplasty procedure either under local anesthesia or general anesthesia. Mucosal disease and hypertrophied mucosa in

the middle ear cleft were removed. Water test was done to see that auditus became patent in every patients. Underlay graft with temporalis fascia was done. Kerr's technique of anterior tucking was done in all the patents. Wherever necessary a 30° sinus endoscope was used to visualize critical areas of the middle ear and sinus tympani. All the patients were followed up for 2 years to assess the auditory gain and observe the graft healing and symptomatic relief of tinnitus and loss of hearing.

## OBSERVATIONS AND RESULTS

Among the 60 patients, there were 32 (53%) males and 28 females (47%) (Figure 1).

There were 10 patients (17%) aged between 11 and 20 years, 35 (58%) belonging to the age group of 21-30, 10 (17%) belonging to 31-40 years, and 5 (8%) belonging to the age group of 41-50 years (Figure 2).

Among the 60 patients, 40 (67%) belonged to the low socioeconomic group, 15 to the mid-income group (25%), and 5 (8%) to the upper-income group (Figure 3).

The most common symptom in the study group was discharged from the ear in all the patients (100%), followed by loss of hearing in 50 (83%) patients. Other symptoms were pain in the ear in 14 (23%), tinnitus in 8 (13%), and vertigo in 2 (3%) (Figure 4).

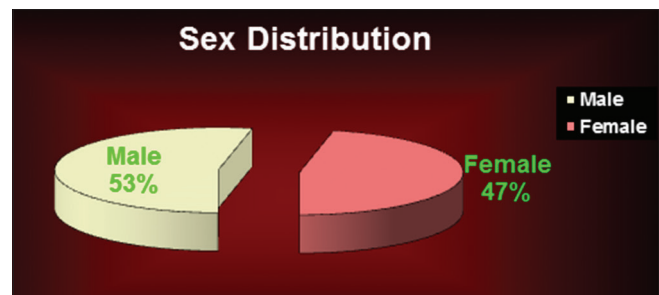


Figure 1: The gender incidence (n = 60)

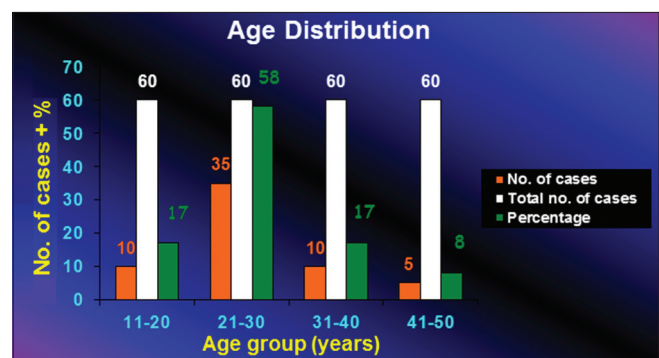


Figure 2: The age incidence of the study group (n = 60)

Observation of the duration of symptoms in the study group revealed that 1-6 months duration was found in 21 (35%), 6 months to 1 year in 31 (52%), 1-5 years in 5 (8%), and 5-10 years in 3 (5%) patients (Figure 5).

The type of perforation was observed in the study and found that central perforation was seen in 37 (62%) patients, posterior quadrant perforation in 15 (25%), subtotal in 6 (10%), and anterior marginal in 2 (3%) of the patient (Figure 6).

X-ray mastoids of the patients revealed that well-pneumatized air cells were found in 55%, mixed type in 20%, and acellular in 25% of the patients (Figure 7).

Peroperative observation revealed that the type of middle ear mucosa was edematous in 32 (53%), polyp

formation in 7 (9%), hypertrophied mucosa in 18 (30%), adhesion in 3 (5%) and ossicular erosion in 12 (20%), and tympanosclerosis in 20 (33%) of the patients (Figure 8).

In the study group, pre-operative audiograms showed 0-20 dB loss in 10 (17%), 21-40 dB loss in 36 (60%), 41-55 dB loss in 12 (20%), and 56-70 dB loss in 2 (3%) patients (Figure 9).

The post-operative PTA showed an auditory gain of 15-30 dB in 80% of the patients. 10-15 dB gain in 3.33% and 30-35 dB in 16.66% of the patients (Table 1).

Final success rate, FS (dry ears for 2 years) was 100% in the present study and the optimal final success rate, OFS (dry ears for 2 years without reoperations and without retractions/perforations) was also 100% in the present study.

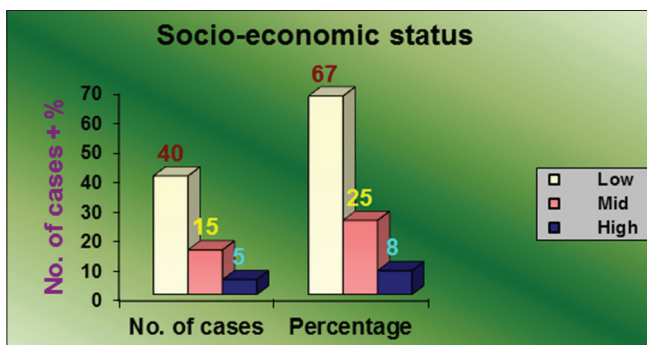


Figure 3: The incidence among economic groups (n = 60)

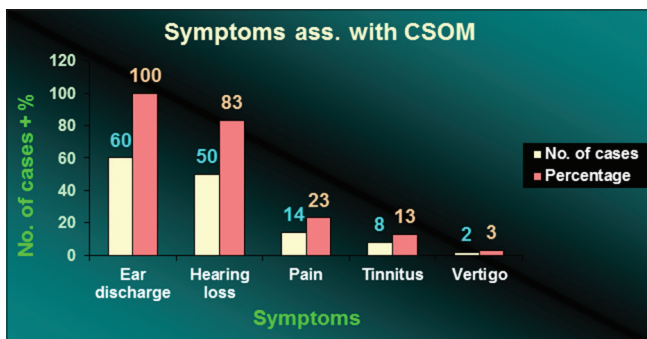


Figure 4: The incidence of symptoms (n = 60)

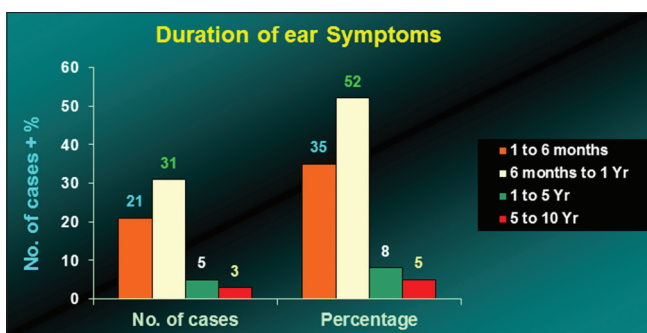


Figure 5: The duration of the disease in the study group (n = 60)

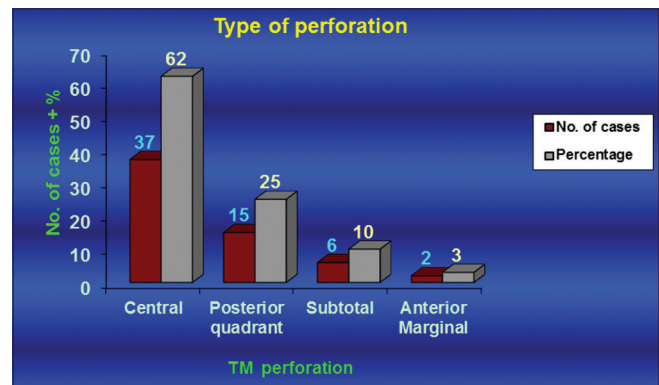


Figure 6: The type of perforation (n = 60)

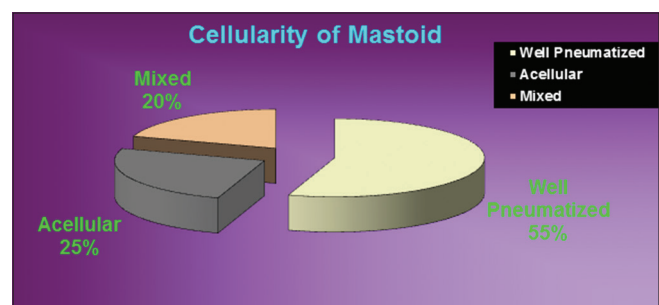


Figure 7: The cellularity of the mastoid X-ray (n = 60)

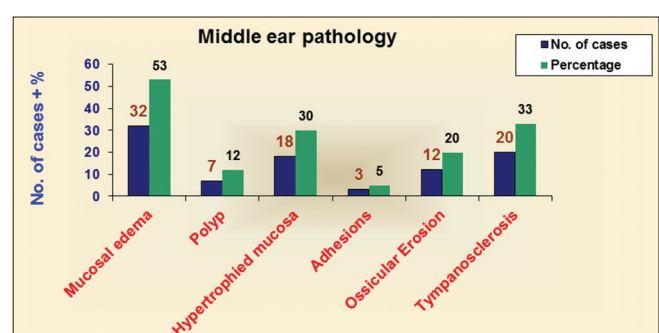


Figure 8: The pathology peroperatively (n = 60)



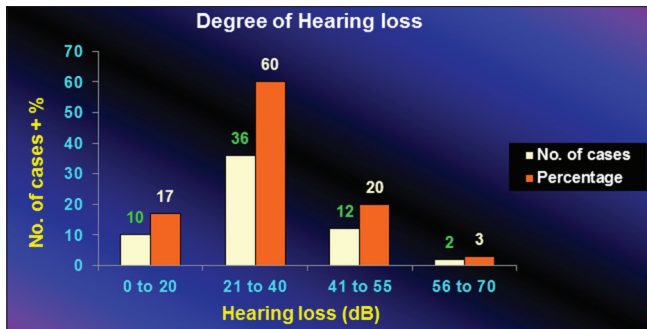


Figure 9: The loss of hearing in the study group (n = 60)

Table 1: The auditory gain following 8 weeks post-operative audiometry (n=60)

Auditory gain in dB	Number of patients (%)
10-15	02 (3.33)
15-20	13 (21.66)
20-25	14 (23.33)
25-30	21 (35)
30-35	10 (16.66)

## DISCUSSION

CSOM and its complications are among the most common conditions seen by the otologist, pediatrician, and the general practitioner. It is a persistent disease with irreversible complications. Early otoscopic, bacteriological, and radiological diagnosis with surgical intervention will assume accurate and appropriate effective therapy. It is observed in the present study that the incidence in the general population is about 5% which was also observed by Vijayendra *et al.*<sup>13</sup> The number of consults (pediatric) with diagnosis of CSOM in the Nigerian epidemiological study was 325 (5.6%) in 2008.<sup>14</sup> It is observed in the present series that majority of the patients belonged to the age group of 21-30 years, i.e., 58%, followed by the age groups of 11-20 and 31-40 years both 17%. Poorie and Iyer<sup>15,16</sup> found the incidence more common in the age group of 0-10 years. This may be because this study includes those patients who underwent surgery of mastoid, unlike their study which is a bacteriological study. CSOM is found to be more common in males; the ratio of M:F is 1.1:1 in the present study. It was 1.4:1 in the study by Poorie and Iyer.<sup>15,16</sup> A similar study by Verma *et al.* showed incidence in M:F as 1.4:1; the prevalence in India was 0.9% of children and 0.5% of adults having CSOM with no difference between the sexes. The incidence of CSOM appears to depend on race and socioeconomic factors. In the present series, the incidence in the low socioeconomic group is 67%, 25% in mid, and 8% in high group. Poor socioeconomic status, overcrowding, poor nutrition, poor hygiene, and infectious diseases (e.g., measles) have been found to contribute to the development of CSOM. In the present series, ear discharge

is present in all the patients (100%), loss of hearing in 83%, pain in 23%, tinnitus in 13%, and vertigo in 3% of patients. The duration of symptoms before reporting for treatment range from 6 months to 10 years among the patients studied. About 52% of the patients reported between 6 months and 1 year (51%). It shows the awareness among the general population in regards to the discharge and other symptoms of the ear. Central perforation is noted in 62%, posterior quadrant perforation in 25%, sub-total perforation in 12%, and anterior marginal in 3% of cases.

The assessment began with a thorough history of the frequency, duration, and characteristics of the discharge. Physical examination of the affected ear requires cleansing of the external auditory canal before the tympanic membrane can be accurately assessed. The eardrum was adequately visualized for accurate diagnosis. All the patients were subjected to PTA and found to have purely conductive deafness in 100%. The loss of hearing was found to be more in patients with sub-total and posterior quadrant perforations. The PTA was 21-40 dB loss in 60%, 41-55 dB loss in 20%, and 0-10 dB loss in 17% of patients. This shows the ossicular involvement, apart from simple perforation of the tympanic membrane, in the diseases process of CSOM. It varied from mucosal edema, hypertrophy, fibrosis, ossicular necrosis, and IS joint dislocation to tympanosclerosis on surgical exploration. It gives baseline data regarding the pre-operative hearing status that is important for surgical planning and for evaluating the effectiveness of tympanoplasty and ossiculoplasty. It must be emphasized that PTA should be done only after thoroughly cleaning the ear and in the absence of acute suppurative symptoms. Mucosal edema was seen in (53%), hypertrophied mucosa (30%), polyp (12%), ossicular erosion (20%), and adhesions in (5%) of cases. A hearing loss of 30 dB or more may represent ossicular disruption. Progressive loss with no obvious middle ear pathology on examination may represent tympanosclerosis or otosclerosis; Sunderman and Dyer.<sup>17</sup> All the patients are subjected to plain X-ray of the mastoid law's lateral oblique view, and it is found that (55%) of cases showed cellular mastoid, 25% showed acellular and 20% of cases mixed variety of pneumatization. The primary surgical treatment in all the patients is cortical mastoidectomy "ICW technique" (CWU) with tympanoplasty through a postaural route. Pre-operative broad-spectrum systemic antibiotic like ceftriaxone sodium 1 g is administered to all cases just before the surgery. In all the patients, standard tympanomeatal flaps are raised and that includes posterior meatal skin flap, superior tympanomeatal flap, inferior tympanomeatal flap, and posterior tympanomeatal flap, which help to preserve the vascularity and thus helps in rapid epithelialization of the tympanic membrane. In 100% of patients, the anterior window is made to tuck the

anterior end of the graft to stabilize it as described by Kerr. This helps in preventing retraction of the graft and in such cases, leading to remnant perforation in the anterior part. In the present study, this technique was observed to help in preventing blunting also. It helps the flaps to improve blood supply which will bring down the rate of canal skin break down, chronic myringitis and chronic external otitis. Handle of malleus is skeletonized. In 15 patients, 45° endoscope is used to determine the patency of auditus and condition of the ossicles. Canaloplasty was done in 20 patients (33%). It helps in visualization of the tympanic ring in its entirety so that the graft can be placed accurately. This has helped in rapid epithelialization of the tympanic membrane as there is good aeration of external canal. In all the patients, underlay grafting is done. In 45% of cases, the handle of malleus is exteriorized, and in remaining 55% of cases, it was medialized. In all the cases, the patency of the auditus is judged by the water test, i.e., water flushed through the auditus flows easily through the middle ear and external ear. This precludes good ventilation of the middle ear postoperatively and also helps in keeping the graft *in situ* which is a prerequisite for rapid epithelialization. In all the possible cases, (40%) primary ossiculoplasty is done depending on the ossicular status. Septal cartilage and homograft ossicles are used as prostheses for partial ossicular replacement. In 62% of cases, in the present study, the ossicular chain was intact; hence, Type I tympanoplasty is done. In cases, where malleus is found eroded Type II tympanoplasty (20%), in cases of incus erosion, Type III tympanoplasty is done (12%) in this series. Where incus, malleus, and stapes supra structure are eroded with mobile foot plate, Type IV tympanoplasty (6%) is done. Single-stage procedure is adopted in the present study. Vijayendra *et al.*,<sup>13</sup> in their series performed single-stage procedure in 95% of cases. All the patients are followed postoperatively for 2 years, with the patient reporting to the outpatient department. Suture removal is done after 1<sup>st</sup> week. External canal pack removed after 3 weeks. Ear drops are allowed after 3 weeks. Where the purulent discharge is noticed microscopic examination is done to find out the cause and cleaning. This will help in drying the canal which helps in rapid epithelialization. Among the patients, 80% of them turned up regularly for follow up. About 15% of them came irregularly and 5% did not turn up for follow up. About 98% of the cases showed final success rate and 88% showed optimal final success rate in this study. About 2% of patients presented with small remnant perforation anteriorly, persistent inflammation on the surface of tympanic membrane with intact TM and mild retraction pocket. Vijayendra *et al.*<sup>13</sup> showed similar result of final success rate of 98% in their series. In a study by Habib *et al.*<sup>18,19</sup> successful closure of the tympanic membrane was in 78% of tympanoplasty initially but only 52% had a healed graft with good post-

operative middle ear function. Albu *et al.* had a 92% rate of successful graft healing but when using the strictest reporting criteria at 2 years of follow-up only had a 38% success rate. They also found that patients with previous adenoidectomy and more impressively adenotonsillectomy had statistically higher success rates of tympanoplasty. Combining mastoidectomy with tympanoplasty is an appropriate option in reducing the need for future surgery. In the present study, 90% of the patients showed well healed dry ear within a period of 8 weeks, 2-3 months in 20% of patients. These patients presented with fungal infection, otitis externa, and myringitis. The post-operative follow-up included an audiometric examination after a gap of 6 months to 2 years showed an auditory gain of 15-35 dB in 80% of the patients. The closure of air-bone gap in the present series was also good with 10-15 dB residual hearing loss. Final success rate, FS (dry ears for 2 years) was 100% in the present study and the optimal final success rate, OFS (dry ears for 2 years without reoperations and without retractions/perforations) was also 100% in the present study.

## CONCLUSIONS

The overall incidence of CSOM in the study was 5% in the study. The most common pathology was middle ear mucosa followed by hypertrophied mucosa. Auditory gain was 15-35 dB in 80% of the patients.

## REFERENCES

1. Hannley MT, Denny JC 3<sup>rd</sup>, Holzer SS. Use of ototopical antibiotics in treating 3 common ear diseases. *Otolaryngol Head Neck Surg* 2000;122:934-40.
2. Bluestone CD, Gates GA, Klein JO, Lim DJ, Mogi G, Ogra PL, *et al.* Panel reports: 1. Definitions, terminology, and classification of otitis media. *Ann Otol Rhinol Laryngol* 2002;111 Suppl 188:8-18.
3. Shambaugh GE Jr. Pathology and clinical course of inflammatory diseases of the middle ear. In: Glasscock ME 3<sup>rd</sup>, Shambaugh GE Jr, editors. *Surgery of the Ear*. 4<sup>th</sup> ed. Philadelphia, PA: W.B. Saunders; 1990. p. 16-93.
4. Schuknecht HF. *Pathology of the Ear*. 2<sup>nd</sup> ed. Philadelphia, PA: Lea and Febiger; 1993. p. 191-253.
5. Strasnick B, Haynes DS. Otologic history and physical examination of the ear. In: Canalis RF, Lambert PR, editors. *The Ear: Comprehensive Otology*. Philadelphia, PA: Lippincott Williams and Wilkins; 2000. p. 157-66.
6. Backous D, Niparko J. Evaluation and surgical management of conductive hearing loss. In: Cummings CW, Harker LA, Krause CJ, Schuller DE, Richardson A, editors. *Otolaryngology-Head and Neck Surgery*. Vol. 13. St. Louis: Mosby; 1998. p. 2894-907.
7. Esposito S, D'Errico G, Montanaro C. Topical and oral treatment of chronic otitis media with ciprofloxacin. A preliminary study. *Arch Otolaryngol Head Neck Surg* 1990;116:557-9.
8. Merifield DO, Parker NJ, Nicholson NC. Therapeutic management of chronic suppurative otitis media with otic drops. *Otolaryngol Head Neck Surg* 1993;109:77-82.
9. Brackmann DE, Giddings NA. *Otologic Surgery*. 2<sup>nd</sup> ed. Philadelphia, PA: W.B. Saunders; 2001. p. 578-82.
10. Hirsch BE. Myringoplasty and tympanoplasty. In: Myers EN, editor. *Operative Otolaryngology and Head and Neck Surgery*. Philadelphia, PA:

- Saunders; 2008. p. 1246-61.
11. Shambaugh GE, Glasscock ME. Surgery of the Ear. 3<sup>rd</sup> ed. Philadelphia, PA: W.B. Saunders; 1980. p. 167-93.
  12. Halik JJ, Smyth GD. Long-term results of tympanic membrane repair. Otolaryngol Head Neck Surg 1988;98:162-9.
  13. Vijayendra H, Mahadeviah A, Surendran K, Sangeetha R. Micro ear surgery-its purpose and procedure for tubo tympanic pathology. Indian J Otolaryngol Head Neck Surg 2005;57:360-3.
  14. Olatoke F, Ologe FE, Nwawolo CC, Saka MJ. The prevalence of hearing loss among schoolchildren with chronic suppurative otitis media in Nigeria, and its effect on academic performance. Ear Nose Throat J 2008;87:E19.
  15. Poorey VK, Lyer A. Study of bacterial flora in csom and its clinical significance. Indian J Otolaryngol Head Neck Surg 2002;54:91-5.
  16. Verma AK, Vohra A, Maitra A, Banerjee M, Singh R, Mittal SK, *et al.* Epidemiology of chronic suppurative otitis media and deafness in a rural area and developing an intervention strategy. Indian J Pediatr 1995;62:725-9.
  17. Sunderman J, Dyer H. Chronic ear disease in Australian aborigines. Med J Aust 1984 9;140:708-11.
  18. Habib MA, Huq MZ, Aktaruzzaman M, Alam MS, Joarder AH, Hussain MA. Outcome of tympanoplasty with and without cortical mastoidectomy for tub tympanic chronic otitis media. Mymensingh Med J 2011;20:478-83.
  19. Albu S, Tralbalzini F, Amadori M. Usefulness of cortical mastoidectomy in myringoplasty. Otol Neurotol 2012;33:604-9.

**How to cite this article:** Anil V. Clinical Study of Intact Canal Wall Technique in the Management of Chronic Suppurative Otitis Media. Int J Sci Stud 2017;5(7):65-70.

**Source of Support:** Nil, **Conflict of Interest:** None declared.