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Original Article

Bacteriological Study and Antimicrobial Sensitivity Pattern of Dacryocystitis

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Abstract

Introduction: Dacryocystitis is an infection and inflammation of lacrimal sac and duct secondary to obstruction of nasolacrimal duct. It is a most common ailment encountered in ophthalmology practice and we had tried to find mean and measures to combat this malady with the best possible measures.

Aims: The aim of this study was to identify the pathogenic organisms and also to determine the antimicrobial sensitivity pattern against those organisms.

Materials and Methods: This prospective study was conducted with 166 cases of patient having dacryocystitis over a period of 2.5 years. The organisms were identified from the samples collecting from lacrimal sac and conjunctiva, by conventional methods, and antimicrobial sensitivity pattern was established.

Analysis: The results were analyzed using mean, median, and the Chi-square (χ^2) test.

Results: Women were more affected than men. Chronic dacryocystitis (102) was the most common type of dacryocystitis as compared to acute (40) and congenital dacryocystitis (18). *Staphylococcus aureus* (52), *Streptococcus pneumoniae* (44), and *Pseudomonas aeruginosa* (28) were the most common organisms which were found. The Gram-positive organisms were most sensitive to vancomycin 100%. The Gram-negative organisms were most sensitive to tobramycin and gentamicin (100%).

Conclusion: Chronic dacryocystitis was most dacryocystitis than acute dacryocystitis. Gram-positive organisms were most commonly isolated than Gram-negative organisms. Women were affected more than men.

Key words: Antimicrobial sensitivity, Dacryocystitis, Epiphora

INTRODUCTION

Lacrimal apparatus is one of the important structures of ocular appendage. Its malfunction poses numerous unavoidable difficulties in proper functioning of ocular tissues. Dacryocystitis is the obstruction of nasolacrimal duct or nasolacrimal sac, leading to inflammation. It may be congenital or acquired. Acquired dacryocystitis has two forms: (a) Acute and (b) chronic. The bacteriological study would contribute to the choice of effective antibacterial agents which would also help in reducing the unnecessary load of antimicrobial agents.[1] Hence, this study was done.

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MATERIALS AND METHODS

A total of 172 patients were selected, who attended the ophthalmology outpatient department at tertiary hospital in Kolkata (West Bengal) and were studied over a period of 2.5 years.

Inclusion Criteria

All the patients coming with the symptoms and signs of dacryocystitis were included in the study.

Exclusion Criteria

Patients on systemic or topical antibiotics as well as patients with secondary dacryocystitis were excluded from the study.

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Specimen Collection

Specimen for microbiological analysis was obtained after aseptically cleaning the surrounding area of lacrimal sac. The samples were collected in two sterile cotton swabs from the lacrimal sac either by applying pressure over the lacrimal sac and allowing purulent material to reflux through the lacrimal puncta or by lacrimal syringing. The samples from the refluxing material were collected by ensuring that the lid margins or the conjunctiva was not touched. One swab was inoculated immediately on plates of MacConkey's agar, chocolate agar, and 5% sheep blood agar, and another swab was used for Gram staining. These were examined daily and discarded after 48 h if growth was not seen.

Microbial culture was considered significant if growth of the same organism was demonstrated on more than one solid-phase medium, and/or if it was confluent growth at the site of inoculation on one solid medium and/or if growth of one medium was consistent with direct microscopy finding (i.e., appropriate staining and morphology with Gram stain) and/or if the organism was grown from more than one specimen. The antimicrobial susceptibility testing was done by Kirby-Bauer disc diffusion method on Muller-Hinton agar according to Clinical and Laboratory Standards Institute, 2003.

Statistical Analysis

Statistical analysis was done by Chi-square test. P (predictive) value <0.05 was considered as a statistically significant association both the variables which were tested.

RESULTS

Out of 172 samples clinically diagnosed dacryocystitis over a period of 2 years, 160 were culture positive and 12 were culture negative. 160 samples were culture positive and 12 were culture negative. Bilateral cases were 16 (10%), only the right eye involved 64 (40%) and the left eye involved 80 (50%) cases as shown in Table 1.

In our study, males 48 (30%) were affected less than females 112 (70%). Hence, male: female ratio is 1:2.3. Both in acquired dacryocystitis (62.5%) and congenital dacryocystitis (7.5%), females were affected more than males.

In this study, 80 (50%) cases showed only epiphora and 64 cases (40%) showed epiphora and discharge (mucous/mucopurulent/purulent) as their major symptom. 16 cases (10%) presented with swelling and redness.

Chronic dacryocystitis was the most common type of dacryocystitis as compared to acute dacryocystitis 40 cases (25%) and congenital dacryocystitis 18 (11%) as shown in Table 2. 122 (65%) isolates were Gram-positive and 66 (35%) isolates were Gram-negative.

Of 160 samples, 66 samples (82.5%) showed a single organism and 28 samples (17.5%) showed mixed organisms (Tables 3 and 4).

Table 1: Distribution of eye affected versus sex determination

Eye affected	Number of cases		
	Female (%)	Male (%)	Total (%)
Right	40 (25)	24 (15)	64 (40)
Left	60 (37.5)	20 (12.5)	80 (50)
Bilateral	12 (7.5)	4 (2.5)	16 (10)
Total	112 (70)	48 (30)	160 (100)

Table 2: Types of dacryocystitis versus sex distribution

Clinical type of Dacryocystitis	Number of cases		
Clinical type	Female number (%)	Male number (%)	Total (%)
Acute	30 (18.75)	10 (6.25)	40 (25)
Chronic	70 (43.75)	32 (20)	102 (63.75)
Congenital	12 (7.5)	6 (3.75)	18 (11.25)
Total	112 (70)	48 (30)	160 (100)

Table 3: Distribution of dacryocystitis cases according to the spectrum of Gram-positive organism

Gram positive organisms	Number of cases		
Organism	Congenital (20)	Acquired (168)	Total 188 (%)
Staphylococcus aureus	2	50	52 (27.65)
Streptococcus pneumoniae	10	34	44 (23.40)
Staphylococcus epidermidis	2	14	16 (8.5)
Diphtheroids	0	6	6 (3.2)
β-hemolytic streptococcus	0	2	2 (1.05)
Streptococcus viridans	0	2	2 (1.05)
Total	14	108	122 (64.9)

Table 4: Distribution of dacryocystitis cases according to the spectrum of Gram-negative organism

Gram Negative Organisms	Number of cases		
Organism	Congenital (20)	Acquired (168)	Total 188 (%)
Pseudomonas aeruginosa	4	24	28 (14.9)
Klebsiella pneumoniae	0	14	14 (7.45)
Non-fermenting Gram-negative bacilli	0	10	10 (5.35)
Haemophilus influenzae	0	6	6 (3.2)
E. coli	0	6	6 (3.2)
Citrobacter freundii	2	0	2 (1.05)
Total	6	60	66.35

The most common Gram-positive organism was *Staphylococcus aureus* 52 (27.5%) and the most common negative organism was *Pseudomonas aeruginosa* 28 (14.9%). *S. aureus* was the predominant Gram-positive organism in chronic dacryocystitis. *Streptococcus pneumoniae* was the predominant Gram-positive organism in acute and congenital dacryocystitis. *P. aeruginosa* was the most common Gram-negative organism in both congenital and acquired dacryocystitis. The antibiotic sensitivity was done for all organisms. The sensitivity pattern is shown in Tables 5 and 6.

DISCUSSION

The lacrimal excretory system is prove to infection and inflammation for various reasons as mucous membrane-lined tract is contiguous with two surfaces (conjunctival and nasal mucosa) that are usually colonized with bacteria.[2] Dacryocystitis can become life-threatening infection with the potential to progress to orbital cellulitis, orbital abscess, meningitis, and cavernous sinus thrombosis.[3] It requires special attention with respect to the initiation of appropriate treatment at the earliest. In our study women were found to be more affected than men with the findings of Badhu *et al*.;[4] Rizvi *et al*.[5]

Reasons for female affected more because bony nasolacrimal canal is narrower and fatter against the nasal floor in female than in male patients.[5] Most of the female came from middle and lower socioeconomic class who used cow dung and wood for cooking which gave a lot of smoking particle which could have settled down in the conjunctival sac, entered nasolacrimal duct through tears, and blocked the nasolacrimal duct. Artificially prepared kajal may have been contaminated with organisms when applied to lower eyelid margin may have infected the lacrimal sac. The stagnation of tears due to obstruction and resultant accumulation of the debris in the lacrimal sac together acts as a potential nidus for the organism causing hyperemia, edema, inflammation, and hypertrophy of mucosal epithelium. Accumulation of mucoid and mucopurulent exudates causes the sac to dilate, ultimately leading to pyocele.

Table 5: Antibiotic sensitivity pattern of Gram-positive isolates

Penicillin	-	76%
Erythromycin	-	82%
Clindamycin	-	90%
Linezolid	-	99%
Cotrimoxazole	-	72%
Vancomycin	-	100%
Chloramphenicol	-	94%
Ciprofloxacin	-	78%
Tetracycline	-	90%
Gentamycin	-	90%
Tobramycin	-	99%
Cefotaxime	-	99%
Bacitracin	-	99%

Table 6: Distribution of growth according to discharge

Epiphora	-	50%
Epiphora with discharge	-	40%
Swelling and redness	-	10%

In our study, chronic dacryocystitis is the most common clinical type 102 cases (63.75%) followed by acute dacryocystitis 40 cases (25%) and congenital dacryocystitis 18 cases (11.25%). This was probably because acute dacryocystitis invariably led to chronic dacryocystitis.[6]

In this study, the disease was mainly unilateral (90%) either right or left. However, there were also few bilateral cases (10%). This was correlated with the finding of Ghose *et al*.[7] It was found that high incidence of the disease on the left side (40%) as compared to the right side (32%) which was also correlated with the findings of Brook and Frazier.[3] This was probably due to the narrow bony canal in females.[8] The nasolacrimal duct and nasolacrimal fossa formed a greater angle on the right side than on the left side.

In our study, single organism was isolated in 132 (82.5%) cases and multiple organisms were isolated in 28 (17.5%) cases which were correlated with the findings of Sainju *et al*.[9] and Kundu *et al*.[10] The mixed growth might be due to the stagnation of the tear for a longer time which provided a better environment for the pathogenic organisms to grow by suppressing normal flora.

The bacterial organisms have been changing from time to time and also from place to place. In our study, 122 (64.89°o) were Gram-positive organisms and 66 (35.11%) were Gram-negative organism. In congenital dacryocystitis, the most common Gram-positive organism was identified *Streptococcus pneumoniae* 10 (50%) cases and the most common Gram-negative organism was *P. aeruginosa* 4 (20%) cases which correlated with the findings of Bareja and Ghore.[11,12] In acquired dacryocystitis, the most common Gram-positive organism was *S. aureus* (29.76%) and the most common Gram-negative organism was *P. aeruginosa* (14.28%) which correlated with the finding of Briscoe *et al*.[13] McCulloch[14] studied the origin of *Pseudomonas* in the conjunctiva in general and found that this organism may be present in the eye as a result of

a) Being a part of normal conjunctival flora.
b) Contaminated solution which was used as drops.

c) Being associated with *Pseudomonas* infections elsewhere in the body (nose, mouth, palate, otitis media, etc.)

The antimicrobial sensitivity pattern varies from region to region. This is due to the emergence of resistant strains as a result of the indiscriminate uses of antibiotics. The Gram-positive organisms were most sensitive to vancomycin (100%) followed by tobramycin (99%). The least sensitive antibiotic against Gram-positive organism was penicillin.

The Gram-negative organisms were most sensitive to tobramycin (100%) and gentamicin followed by chloramphenicol (98%). The least sensitive antibiotic against the Gram-negative organism was ciprofloxacin (60%). In this study, the limitation was time and number of patients. For better outcomes, a larger study population should be taken for a longer duration to know the bacteriology and to select the effective drugs for dacryocystitis.

CONCLUSION

Chronic dacryocystitis was the most common type of dacryocystitis than acute dacryocystitis. Serous discharge was the most common clinical presentation. The females had higher predilection for the disease than males. The left eye was involved more than the right eye. Gram-positive cases were most commonly identified which highlighted the significance of this clinical condition for the ophthalmologists to specifically investigate for the presence of the symptoms of nasolacrimal obstruction before planning of any intraocular surgeries or procedures.

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