

Original research article

A Clinico-Bacterial Evaluation of Chronic Dacryocystitis in Adults Reporting to a Tertiary Care Hospital

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Abstract

Background: Middle-aged people are more likely to develop chronic dacryocystitis, an inflammation of the lacrimal sac that is frequently accompanied by partial or complete obstruction of the nasolacrimal duct. Numerous bacteria are thought to be the root cause of persistent dacryocystitis. The current study aimed to isolate the current spectrum of bacterial pathogens causing dacryocystitis along with antibiotic sensitivity patterns.

Methods: Based on the inclusion and exclusion criteria n=75 patients who fulfilled the inclusion criteria were included in the study by random sampling method. A detailed ocular examination in each case was done. The sample was collected from patients who fulfil our inclusion criteria. Collection of samples was done by Applying pressure over the lacrimal sac and allowing the fluid/purulent material to reflux through the lacrimal punctum or by irrigating the lacrimal drainage system with sterile saline and collecting the sample from the refluxing material. The sample was collected with a sterile cotton swab from the everted puncta, avoiding contamination from the conjunctiva and eyelid.

Results: *S. epidermidis* was susceptible to moxifloxacin in 89.28% of samples however it was found to be resistant to many antibiotics and none of the antibiotics was 100% effective against *S. epidermidis* in these cases. *S. aureus* was found to be 93.33% susceptible to chloramphenicol and 73% sensitive to ciprofloxacin its susceptibility ranged from 6 % to 66% in various antibiotics. *S. pneumoniae* was 83% susceptible to tobramycin and in other antibiotic sensitivity ranged from 16 % to 66% given in table 4. *Pseudomonas* was 100 sensitive to moxifloxacin and ceftazidime and 80% sensitive to tobramycin and *Micrococci* were sensitive 100% to ceftazidime and tobramycin.

Conclusion: The most common microorganism isolated was *Staphylococcus epidermidis* followed by *Staphylococcus aureus* and *Streptococcus species*. Gram-positive organisms showed the highest sensitivity to Moxifloxacin, Chloramphenicol, and Gram-negative organisms to Gentamycin. The high rate of microorganism-positive cultures suggests that adult patients should be treated for their lacrimal sac infection before any intraocular surgery because of the potential risk of post-operative infection.

Keywords: Chronic Dacryocystitis, *Staphylococcus epidermidis*, *Staphylococcus aureus*, *Streptococcus species*, Antibiotic sensitivity

Introduction

Chronic dacryocystitis is an inflammatory condition of the lacrimal sac commonly associated with partial and total obstruction of the nasolacrimal duct, which affects patients of middle age. Several bacteria have been implicated as causative agents of chronic dacryocystitis. ^[1] It has bimodal distribution affecting children less than 1 year and adults over 40 years of age. ^[2] It is a significant cause of ocular morbidity in adults and children. This disease is more common in patients with poor personal hygiene. ^[3] Dacryocystitis is also a threat to the integrity of the eye by becoming the source of infection to orbital cellulitis and pan-ophthalmitis. ^[4,5] Nasolacrimal duct obstruction (NLDO) can occur from different aetiologies, such as primary idiopathic obstruction and secondary obstruction which finally results in stasis of tears, and desquamated cells and mucoid secretions in the lacrimal sac, this creates a favorable environment for inflammation and infection. ^[6,7] The lacrimal drainage system is prone to infection due to, the contiguity of the nasolacrimal duct with conjunctival and nasal mucosal surfaces which are usually colonized with bacteria. In turn, dacryocystitis can spread to adjoining structures because of continuity. ^[4] The close association of conjunctival and nasal mucosa with the sac makes it more prone to infection. The most common sources of infection are the nose, paranasal sinuses, and peri cystic tissues. ^[8] It is currently believed that the inflammation and fibrosis in patients with nasolacrimal duct obstruction may be secondary to coexisting infectious colonization within the lumen of the lacrimal sac. Many cases of primary acquired nasolacrimal duct obstruction may be secondary to unrecognized low-grade dacryocystitis. ^[9] Dacryocystitis is mostly caused by bacteria and rarely by fungi. The organisms causing dacryocystitis may be different in acute and chronic infections. In chronic dacryocystitis, mixed infections are more common. ^[6] Acute dacryocystitis usually presents with pain and tenderness over the lacrimal sac area. It may present with a lacrimal abscess. Complications include acute conjunctivitis, lid abscess, orbital cellulitis, acute ethmoiditis, and very rarely cavernous sinus thrombosis. Chronic dacryocystitis is more common than acute one. It usually presents with persistent watering and discharges from the eye. Complications like chronic conjunctivitis and ectropion of the lower eyelid can occur. Because of prolonged watering, eczema and maceration of lower eyelid skin can occur. It is an important contributory factor for corneal ulcer development and pan ophthalmitis. ^[10] In Ophthalmology practice, syringing of the nasolacrimal system is performed preoperative to cataract surgery, to exclude dacryocystitis because it is the risk factor for postoperative infection. If any intraocular surgery is done in the presence of unrecognized dacryocystitis, pan ophthalmitis can occur. ^[3] There are several bacteria known to have been implicated as etiological agents of dacryocystitis. Also, there is a change in the agents responsible for chronic dacryocystitis over time. ^[11, 12] Knowledge of the microbial organisms responsible for chronic dacryocystitis in a particular geographical area is essential in choosing the appropriate antibiotics. ^[13] Hence this study was undertaken to know the etiological agents of chronic dacryocystitis.

Material and Methods

This cross-sectional study was conducted in the Out-patient Departments of Ophthalmology and Microbiology, Regional Eye Hospital, Warangal, Telangana state. Institutional Ethical approval was obtained for the study. Written consent was obtained from all the patients in the study.

Inclusion Criteria

- Patients with epiphora
- All the cases aged above 18 yrs
- Males and females
- Patients with purulent or mucopurulent discharge.

Exclusion criteria

- Patients with other ocular infections
- Patients with acute dacryocystitis
- Contaminated samples
- Patients with the usage of systemic or topical antibiotics in the previous 2 weeks.

Based on the inclusion and exclusion criteria n=75 patients who fulfilled the inclusion criteria were included in the study by random sampling method. A detailed ocular examination in each case was done. The sample was collected from patients who fulfil our inclusion criteria. Collection of samples was done by Applying pressure over the lacrimal sac and allowing the fluid/purulent material to reflux through the lacrimal punctum or by irrigating the lacrimal drainage system with sterile saline and collecting the sample from the refluxing material. The sample was collected with a sterile cotton swab from the everted puncta, avoiding contamination from the conjunctiva and eyelid. The sample was immediately sent to the microbiology department, for gram staining, KOH mount, and isolation of the bacteria or fungi for culture under aerobic and anaerobic conditions. The sample was collected before antibiotic instillation, if already instilled, the sample was collected 2 weeks after stopping antibiotic drops if possible.

Specimen processing: One swab was spread on two labeled slides to prepare smears. The direct smears so made were stained by Gram stain and KOH method for fungal elements. The second swab was used for inoculation into culture media like Brain Heart Infusion broth (BHI), Blood Agar (BA), Mac-Conkey (MA), Chocolate agar (CA) Sabouraud's dextrose agar (SDA). The inoculated media were incubated at 37°C for 24 to 48hrs. A positive culture was defined as a growth of the same organisms on more than two solid phase media or confluent growth on one solid medium and smear results were consistent with cultures. The isolates were subjected to antimicrobial susceptibility testing by a modified Kirby-Bauer disc diffusion method and interpreted as per CLSI 2018 guidelines. ^[15]

Results

A total of n=83 eyes of n=75 patients fulfilling our inclusion criteria were studied in respect of their mean age, sex, duration of symptoms, patency of duct, microbiological profile, and antibiotic susceptibility. Of the n=75 patients, n=45(60%) were females and n=30(40%) were males. The mean age of presentation of chronic dacryocystitis among females was 50.3 ± 16.1 years whereas among males it was 47 ± 19.0 -years. The difference between the mean age of the sexes was not statistically significant ($P > 0.05$) the details of the distribution of patients age-wise are given in table 1.

Table 1: Demographic profile of the cases included in the study

Age group in years	Males Frequency (%)	Females Frequency (%)	Total Frequency (%)
< 20	3 (10.00)	0 (0.00)	3 (4.0)
21 – 30	3 (10.00)	8 (17.78)	11 (14.67)
31 – 40	6 (20.00)	8 (17.78)	14 (18.67)
41 – 50	5 (16.67)	7 (15.56)	12 (16.00)
51 – 60	6 (20.00)	12 (26.67)	18 (24.00)
61 - 70	5 (16.67)	7 (15.56)	12 (16.00)
70 – 80	1 (3.33)	2 (4.44)	3 (4.00)
> 80	1 (3.33)	1 (2.22)	2 (2.67)
Total	30 (100.0)	45 (100.0)	75 (100.0)

In male cases, the right eye was involved in 51.85%, the left eye in 48.15%, and both eyes in 11.1%. In females the incidence in the right eye is 48.15%, the left eye is 61.54% and both eyes are 88.9%. The total incidence in the right eye was 36%, incidence in the left eye is 52% and involvement of both eyes is 12% details depicted in table 2.

Table 2: Comparison of laterality in males and females

Sex	Right-sided Frequency (%)	Left-sided Frequency (%)	Bilateral Frequency (%)	Total Frequency (%)
Male	14(51.85)	15(38.46)	1(11.1)	30 (40)
Female	13(48.15)	24(61.54)	8(88.9)	45 (60)
Total	27(100.0)	39(100.0)	9(100.0)	75 (100)

In this study, the number of samples collected was n=83 from n=75 patients with Chronic Dacryocystitis. Out of the n=83 samples, 69.8% were culture positive and 30.2% were culture negative details depicted in figure 1.

Culture Reports

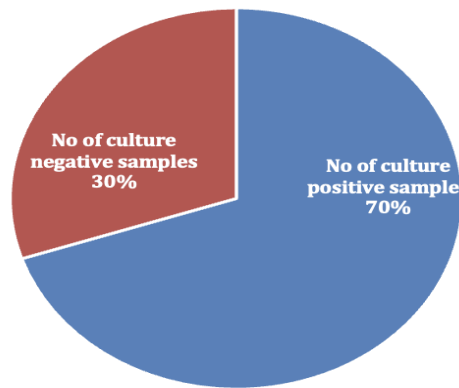


Figure 1: showing the results of the samples cultured in the study

In this study number of samples collected was n=83 from n=75 patients with Chronic Dacryocystitis. Out of n=83 samples, 69.8% were culture positive 30.2% were culture negative. In this study among n=58 culture positive, n=56 cases were purely bacterial isolates and n=2 cases were mixed [bacterial +fungal] isolates. Among n=56 bacterial isolates, n=51 samples were gram-positive, and n=5 samples were gram-negative. Among gram-positive cases *Staphylococcus epidermidis* 28 (48.27%), *Staphylococcus aureus* 15(25.86%), *Streptococcus pneumoniae* 6 (10.34%), *Micrococci* 2(3.45%), and 2 were gram-negative *Pseudomonas* (3.45%) details given in table 3.

Table 3: Microbiological profile of collected specimens

Organisms Isolated	No of Positive Samples	Percentage
<i>Staphylococcus epidermidis</i>	28	48.27%
<i>Staphylococcus aureus</i>	15	25.86%
<i>Streptococcus pneumoniae</i>	6	10.34%
<i>Pseudomonas</i>	5	8.63%
<i>Micrococci</i>	2	3.45%
<i>Streptococcus+ fungus</i>	2	3.45%
Total	58	100.0%

S. epidermidis was susceptible to moxifloxacin in 89.28% of samples however it was found to be resistant to many antibiotics and none of the antibiotics was 100% effective against *S. epidermidis* in these cases. *S. aureus* was found to be 93.33% susceptible to chloramphenicol and 73% sensitive to ciprofloxacin its susceptibility ranged from 6 % to 66% in various antibiotics. *S. pneumoniae* was 83% susceptible to tobramycin and in other antibiotic sensitivity ranged from 16 % to 66% given in table 4. *Pseudomonas* was 100 sensitive to moxifloxacin and ceftazidime and 80% sensitive to tobramycin and *Micrococci* were sensitive 100% to ceftazidime and tobramycin and the mixed organism was sensitive in 100% samples to moxifloxacin and ofloxacin.

Table 4: Antibiotic pattern of different isolates from the cases of the study

Antibiotic Sensitivity	<i>Staphylococcus epidermidis</i> (n=28)	<i>Staphylococcus aureus</i> (n=15)	<i>Streptococcus pneumoniae</i> (n=6)	<i>Pseudomonas</i> (n=5)	<i>Micrococci</i> (n=2)	Mixed (n=2)
Chloramphenicol	17.85	93.33	16.67	20.00	50.00	0.00
Ciprofloxacin	50.00	73.33	16.67	20.00	50.00	0.00
Moxifloxacin	89.28	66.67	50.00	100.00	50.00	100.0
Gatifloxacin	35.71	53.33	66.67	60.00	50.00	0.00
Ofloxacin	42.85	53.33	16.67	60.00	50.00	100.0
Ceftazidime	50.00	60.00	50.00	100.00	100.00	0.00
Gentamycin	57.14	06.67	33.33	40.00	00.00	0.00
Tobramycin	50.00	60.00	83.33	80.00	100.00	000

Discussion

In the current study, the number of male patients in our study was 30(40%) and females 45(60%). Thus, there was a female preponderance the male to female ratio was 2:3. In a similar study by Bharathi MJ et al.,^[15] found overall female to male ratio was 3.9:1 and females (80.9%) were more in number than males (19.1%). Delia A Ch et al.,^[16] in their study found that among 421 cases of chronic dacryocystitis, 61.04% were females and 38.95% were males. The mean ages of presentation were 46.9 ± 19 years in males and 50.33 ± 16.0 years in females. Bale RN et al.,^[17] report in their study that nearly 78% of cases were over the age of 30 years. Amongst this, the peak was at 51-60 years of age (26%). Bharathi MJ et al.,^[15] in their study found that patients with an age greater than 30 years were significantly more number in chronic dacryocystitis (90%) than those aged less than 31 years (10%). Similarly, Jyoti Bhuyan et al.,^[18] and Shah CP et al.,^[19] in their study found that chronic dacryocystitis was more common in the age group of 41-50 years. In our study in males, the right eye was involved in 46.66%, the left eye in 50%, and both eyes in 3.44%. In females the incidence in the right eye was 28.9%, the left eye was 53.3% and both eyes were 17.8%. This finding correlates with the study done by Khevna Patel et al.,^[3] in which dacryocystitis was more common in the left eye (56%) than the right eye (44%). Prakash R et al.,^[19] found in their study that there was a higher incidence of dacryocystitis on the left side (50%) as compared to the right 76 sides (40%) and 10% of the cases were bilateral. BH Jacobs et al.,^[20] in a similar study found that the right side was involved in n=53 cases left side in n=37 cases and n=14 cases were bilateral. The most common gram-positive organism cultured in our study was *Staphylococcus epidermidis* followed by *Staphylococcus aureus* and *Streptococcus pneumoniae*. It coincides with the findings of studies done by B Eshraghi et al.,^[21] and Razavi et al.,^[22] were *Staphylococcus epidermidis* was the predominant organism in chronic dacryocystitis cases. Das JK et al.,^[11] report in their study the occurrence of gram-positive organisms is 75% which were predominantly *Staphylococcus* species. M. Chaudry et al.,^[23] found in their study that *CoNS* constituted 33.96% and *Staphylococcus aureus* 25.46% of gram-positive organisms. Bharathi MJ et al.,^[15] reported *CoNS* (44.2%) followed by *S. aureus* (10.8%) and *S. pneumoniae* (8.7%) were found to be the predominant bacterial pathogens in cases of chronic dacryocystitis.

Streptococcus species represented 7% in our study which is higher than Huber Spitzky et al.,^[24] (2%), Coden et al.,^[25] (2.3%), and Hartikainen et al.,^[26] (5%). In our study, Gram-negative organisms contributed to 6% of all isolates. *Pseudomonas aeruginosa* was the most predominant. Our findings correlate with the works of Assefa Y et al.,^[26] and Shah CP et al.,^[27] who reported *Pseudomonas aeruginosa* as common Gram-negative bacteria in chronic cases. On the contrary, Das JK et al.,^[11] found gram-negative organisms to be 25% with a predominance of *Pseudomonas aeruginosa*. Coden DJ et al.,^[25] observed gram-negative organisms in 27% of all isolates, including *Pseudomonas* in 9%. Huber Spitzky et al.,^[24] reported gram-negative organisms accounting for 26% of isolates, the most frequent being *E. coli* (12%).

Conclusion

The most common microorganism isolated was *Staphylococcus epidermidis* followed by *Staphylococcus aureus* and *Streptococcus species*. It is well established that they are normal commensal of the conjunctiva along with diphtheroid. Several reports have proved its pathogenicity in postoperative ocular infections, blepharoconjunctivitis, and corneal ulcers. Gram-positive organisms showed the highest sensitivity to Moxifloxacin, Chloramphenicol, and Gram-negative organisms to Gentamycin. The high rate of micro-organism-positive cultures suggests that adult patients should be treated for their lacrimal sac infection before any intraocular surgery because of the potential risk of post-operative infection. Hence a prudent use of antibiotics is essential. Unnecessary usage of antibiotics leads to the emergence of resistance.

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