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Original Article

Clinical and Bacteriological Profile of Chronic Dacryocystitis - A Hospital-Based Study

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Abstract

Background: Inflammation and fibrosis in patients with nasolacrimal duct obstruction may be brought on by concurrent infectious colonization within the lacrimal sac lumen. To investigate the likelihood of a primary bacterial etiology for the inflammatory response, we looked at the bacterial flora in the lacrimal sac at the confluence of the sac and duct.

Materials and Methods: Our study is a prospective hospital-based study of 41 patients suffering from chronic dacryocystitis, conducted in the Eye Department of R. D. Gardi Medical College, Ujjain, India, between January 2021 and December 2021. All patients underwent comprehensive ocular examination as well as laboratory investigation.

Results: Forty-one patients suffering from chronic dacryocystitis, out of which 7 patients had both eyes involved, were included in the study. We found that chronic dacryocystitis was more predominantly seen in female patients 58.53% (24). From the 48 samples, patients 100% had epiphora while discharge was seen in 50% (24) of cases and swelling was seen in 18.75% (9) of cases. Out of 48 samples, 45 (93.75%) were positive for culture, of which 4 (8.88%) had multiple isolates. Out of 41 single-isolation cultures, 27 are Gram-positive bacteria and 14 are Gram-negative bacteria. *Staphylococcus* spp. (74.07%) is the most commonly isolated Gram-positive organism. In both single and multiple isolates, the most common Gram-negative bacteria isolated was *Pseudomonas* spp.

Conclusion: Majority of adult individuals with chronic dacryocystitis have microorganisms in their lacrimal sacs. Therefore, before arranging any intraocular surgeries, ophthalmologists should carefully check for signs of nasolacrimal blockage.

Key words: Chronic dacryocystitis, Dacryocystorhinostomy, Epiphora, *Staphylococcus* spp

INTRODUCTION

A chronic inflammation of the lacrimal sac caused by nasolacrimal duct occlusion is known as chronic dacryocystitis. It is a significant contributor to ocular morbidity in both children and adults.[1] It is the most frequent cause of epiphora.[2] It has been observed to be more prevalent in people between the ages of 40 and 60, with females (80%) being more frequently affected than males (perhaps because of the bony canal's narrow lumen).[3] Patients with poor personal hygiene and those from lower socioeconomic groups are more likely to have the condition.

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Infections of the conjunctiva, nasal cavity (retrograde spread), paranasal sinus, allergic rhinitis, or deviated nasal septum are the main sources of infection. *Staphylococcus* species (spp.), *Streptococcus pneumoniae* species (spp.), *Streptococcus* species (spp.), and *Pseudomonas* species (spp.) are the most often reported etiologic agents. Rarely, dacryocystitis can also be brought on by persistent granulomatous infections such leprosy, syphilis, TB, and, very rarely, rhinosporidiosis. Each year, 1.6–1.9 million cataract operations are performed throughout India,[4] many in "camps" or rural peripheral centers.[4] Preoperative syringing of the nasolacrimal system is typically done in most clinics before cataract surgery in an effort to rule out chronic dacryocystitis, which is a significant risk factor for postoperative endophthalmitis. Any intraocular procedure that is performed in the presence of undiagnosed dacryocystitis runs the risk of causing panophthalmitis.[5]

Establishing contact between the lacrimal sac and nasal mucosa by forming a bone window in a procedure

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known as a dacryocystorhinostomy (DCR) either by an external or nasal approach is the gold standard treatment for dacryocystitis. Bacteriological tests would aid in the selection of appropriate antimicrobial treatments for chronic dacryocystitis and reduce the use of unnecessary antimicrobials prior to surgery.[6] Without the proper systemic antibiotics, infection can occur leading to secondary hemorrhage which, in turn, can lead to surgical failure.[7] We have conducted a study to identify the current bacteriology of the lacrimal sac in a given population along with the clinical presentation.

MATERIALS AND METHODS

A prospective analysis of microbiological and clinical data of 48 eyes of 41 patients had undergone external DCR for chronic dacryocystitis between January 2022 and December 2022 conducted in the Department of Ophthalmology, R. D. Gardi Medical College, Ujjain, Madhya Pradesh, India. Prior approval for the study was obtained from the Institutional Ethics Committee.

Written informed consent was obtained from each patient. The preliminary data of patients such as name, age, sex, and occupation were recorded first. A detailed history was taken, with regard to the chief complaint, past history, and any other disease.

There were 24 (58.53%) females and 17 (41.47%) males in the age range of 25–68 years (mean age 46.5 years). Seven cases were bilateral.

The patients were labelled as chronic dacryocystitis on the basis of history of persistent and discharge from affected eye and findings were confirmed by lacrimal syringing.

Specimens were obtained directly from the lacrimal sac under operating microscope during the making of a sac flap for external DCR. The materials were collected with sterile cotton tip applicators and sent for culture to the microbiology laboratory. All samples were cultured on the day of collection, aerobically and anaerobically, onto the appropriate media. The bacterial isolates were identified by standard procedures.

Growth and Identification of Clinical Cultures

Aerobic cultures

For the isolation of aerobes, specimens from patients with suspected chronic dacryocystitis were inoculated on trypticase soy agar (with 5% sheep blood), chocolate agar, and MacConkey agar plates. The plates were inoculated at 35–37°C in a 5–10% CO_2 atmosphere. The cultured plates were examined daily for 5 days. Any growth observed was quantified and documented.

Anaerobic cultures

A thioglycollate broth (enriched with hemin and Vitamin K) and trypticase soy blood agar plates were inoculated with specimens from patients with chronic dacryocystitis and incubated at 35–37°C in a CO_2-nitrogen atmosphere for the isolation of anaerobes. Anaerobic media were examined after 48 h. If no growth in the broth was observed after 48 h, a blind subculture of the thioglycollate media was then prepared on the 5th day of incubation.

Exclusion Criteria

- Patients who had a history of acute attack of dacryocystitis
- Patients who had a history of any previous lacrimal sac surgery.

RESULTS

A total of 48 samples of 41 patients with a clinical diagnosis of chronic dacryocystitis were analyzed. Forty-five samples (93.75%) revealed growth and 3 samples (6.25%) showed no growth of organisms [Figure 1]. The average age of the patients was studied 46.5 years (range: 25–68 years), with a female predominance 58.53% (24) compared to males 41.47% (17).

From the 48 samples, 100% of patients presented with a complaint of epiphora (48) while discharge was seen in 50% (24) of cases and swelling was seen in 18.75% (9) of cases [Figure 2].

A total of 52 organisms were isolated from the 45 samples. Among these 45 samples, 41 (91.11%) had single isolations and 4 (8.88%) samples had mixed bacterial isolations (more than one organism).

Out of 41, single-isolation Gram-positive bacteria were seen in 27 (65.85%) [Table 1] samples, and Gram-negative bacteria were seen in 14 (34.14%) [Table 2] samples. *Staphylococcus* spp. (74.07%) is the most commonly isolated organism followed by *Streptococcus* species (22.22%) among Gram-positive bacteria.

Pseudomonas spp. (50%), *Klebsiella* spp. (21.42%), and *Escherichia coli* (10.67%) were the most commonly isolated Gram-negative bacteria.

In multiple isolations out of 11 organisms, Gram-positive bacteria were isolated in (72.72%) samples [Table 2], and Gram-negative bacteria were isolated in (27.27%) samples [Table 3]. *Staphylococcus* spp. (62.5%) was the most commonly isolated, followed by *Streptococcus* spp. (25%) and others (12.5%) among Gram-positive bacteria [Table 4].

Table 1: Single-isolate Gram-positive bacteria distribution (*n*=27)

Bacteria isolated	No. of isolates	Percentage
Staphylococcus epidermis	12	44.4
Staphylococcus aureus	8	29.62
Streptococcus viridans	4	14.81
Streptococcus pneumoniae	2	7.4
Enterobacter	1	3.7

Table 2: Single-isolate Gram-negative bacteria distribution (*n*=14)

Bacteria isolated	No. of isolates	Percentage
Pseudomonas aeruginosa	7	50
Klebsiella pneumoniae	3	21.42
Escherichia coli	2	14.2
Corynebacterium spp.	1	7.14
Haemophilus	1	7.14

Table 3: Multiple-isolate Gram-positive bacteria distribution (*n*=8)

Bacteria isolated	No. of isolates	Percentage
Staphylococcus epidermis	3	50
Staphylococcus aureus	2	25
Streptococcus viridans	2	12.5
Enterobacter	1	12.5

Table 4: Multiple-isolate Gram-negative bacteria distribution (*n*=3)

Bacteria isolated	No. of isolates	Percentage
Pseudomonas aeruginosa	2	66.66
Klebsiella pneumoniae	1	33.33

Table 5: Age-wise distribution of cases in the study group (*n*=41 patients)

Age	No. of patients	Percentage
25–40	9	21.95
41–55	13	31.70
56–70	19	46.34

Pseudomonas spp. (66.66%) and *Klebsiella* spp. (33.33%) were isolated among Gram-negative bacteria.

Among Gram-positive bacteria, *Staphylococcus epidermidis* was the most common, accounting for 15 (28.84%), followed by *Staphylococcus aureus* 10 (19.23%) and *Streptococcus* spp. 8 (15.38%) for both single and multiple isolations. Among Gram-negative organisms, *Pseudomonas aeruginosa* 9 (17.3%), *Klebsiella pneumoniae* 4 (7.69%), *E. coli* 10 (6.84%), *Enterobacter* 2 (3.84%), and *Corynebacterium* spp. 1 (1.92%) were found in both single- and multiple-isolation cases.

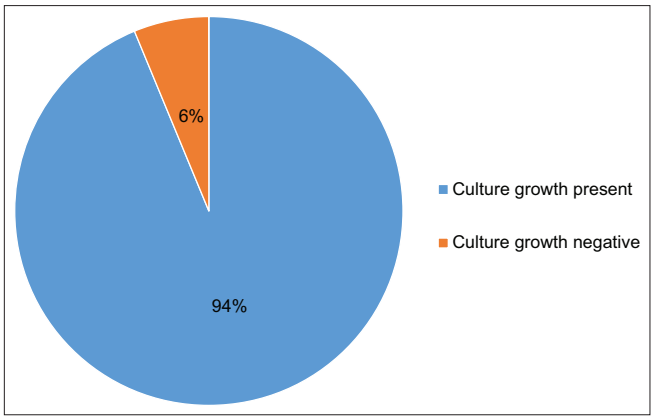

Figure 1: Growth-wise distribution of samples (*n*=48 samples)

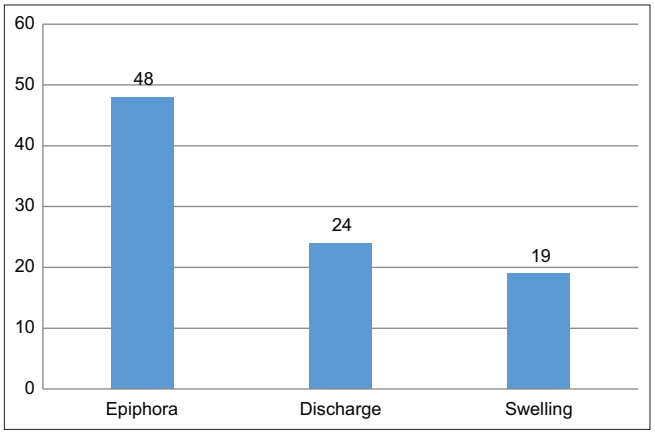

Figure 2: Bar diagram of presenting complaint-wise distribution of cases in the study group (*n*=48 cases)

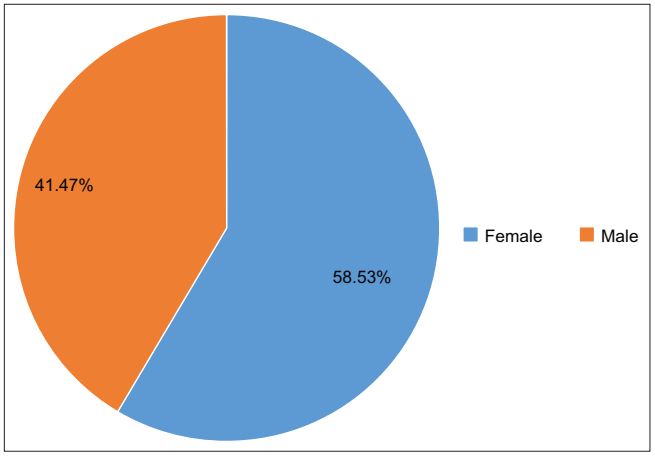

Figure 3: Pie diagram of sex-wise distribution of cases in the study group (*n*=41 patients)

DISCUSSION

With chronic dacryocystitis, infectious changes are always present in all of the lacrimal sacs. In DCR, the infected sac is bypassed in order to access the nasal cavity through a newly formed bone canal.

This implies that the patient should receive prophylaxis after surgery to reduce the chance of infection, which could result in problems like secondary hemorrhage. Without the proper antibiotic prophylaxis, even a low-grade infection near the anastomotic site of the sac and mucosa flap might significantly increase the likelihood of failure in an external DCR.

In our study, samples were taken directly from the lacrimal sac while making the sac flap for external DCR under the operating microscope. This method offers a lower risk of contamination than applying pressure to the lacrimal sac or allowing purulent material reflux through the sac while collecting samples.

In our study, females showed a higher incidence [Table 5 and Figure 3] which was similar to Hartikainen *et al.* in 1997 who found a female-to-male ratio of 79%:21%.[8]

In the present study, 93.75% of samples were culture positive, which is almost a little less than reported by Chaudhary *et al.* (2005) and higher than previously reported in comparable studies (De Angelis *et al.*, 2001; Hartikainen *et al.*, 1997; Islam *et al.*, 2006; Kuchar *et al.*, 2000; Usha *et al.*, 2006).[8-12]

Gram-positive bacteria were found in 65.85% of single isolations and 72.72% of mixed isolations. This is similar to previously reported studies (Chaudhary *et al.*, 2005; Coden *et al.*, 1993; De Angelis *et al.*, 2001; Hartikainen *et al.*, 1997).[8-10,13]

Staphylococcus spp. is the most commonly isolated from both mixed and single isolations, accounting for 74.07% and 62.5%, followed by *Streptococcus* spp. In the single-isolation groups of Gram-positive bacteria, *S. epidermidis* (44.4%) is the most commonly isolated followed by *S. aureus* (29.62%). Similarly, in mixed isolation, *S. epidermidis* (50%) is the most commonly isolated followed by *S. aureus* (25%). This is similar to Chaudhary *et al.* (2005), Hartikainen *et al.* (1997), and Islam *et al.* (2006).[8,10,11]

In cases of Gram-negative bacteria, single isolation reveals *P. aeruginosa* (50%) which accounted for the most commonly isolated bacteria followed by *K. pneumoniae* (21.42%), which is different than Hartikainen *et al.* (1997), who found *Haemophilus influenzae* to be the most common Gram-negative organism isolated.

According to Coden *et al.* (1993), *P. aeruginosa* is the most commonly isolated Gram-negative bacteria.[13]

The microbial isolates of chronic dacryocystitis vary with different geographical areas. Reports from Saudi Arabia (Chaudhary *et al.*, 2005), Toronto (De Angelis *et al.*, 2001), Finland (Hartikainen *et al.*, 1997), China (Sun *et al.*, 2005), and Australia (Sainju *et al.*, 2005) showed predominance of the *Staphylococcus* species, either epidermidis or aureus.[6,8,9,14,15] However, studies from the southern part of India (Usha *et al.*, 2006) and Nepal (Badhu *et al.*, 2006) showed predominance of *Streptococcus pneumoniae*.[16,17]

According to our study *Streptococcus epidermis* is the most common etiological agent in case of chronic dacryocystitis, while the second most common pathogen is *Staphylococcus aureus*.

CONCLUSION

Our study was a hospital-based study, in which 41 patients suffering from chronic dacryocystitis, out of which 7 patients had both eyes involved, were included in the study. We found that chronic dacryocystitis was more predominantly seen in female patients 58.53% (24). From the 48 samples, patients 100% had epiphora while discharge was seen in 50% (24) of cases and swelling was seen in 18.75% (9) of cases. Out of 48 samples, 45 (93.75%) were positive for culture, of which 4 (8.88%) had multiple isolates. Out of 41 single-isolation cultures, 27 are Gram-positive bacteria and 14 are Gram-negative bacteria. *Staphylococcus* spp. (74.07%) is the most commonly isolated Gram-positive organism. In both single and multiple isolates, the most common Gram-negative bacteria isolated was *Pseudomonas* spp.

Our research reveals that the majority of adult individuals with chronic dacryocystitis have microorganisms in their lacrimal sacs, and a sizable proportion of these microorganisms are polymicrobial. The much-increased probability of positive lacrimal sac cultures indicates that, before arranging any intraocular surgeries, ophthalmologists should carefully check for signs of nasolacrimal blockage. Because of the probable danger of endophthalmitis, patients with a history of persistent dacryocystitis should not undergo any intraocular surgeries. Gram-negative organisms, which could be potential pathogens for postoperative intraocular and lacrimal drainage surgery, were present in significant proportions of individuals. Therefore, in addition to the typical precautions, one may think about antibiotic prophylaxis, which also protects against Gram-negative and Gram-positive microorganisms for lacrimal drainage surgery. In patients with chronic dacryocystitis, DCR is recommended before any planned intraocular procedure.

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