



Original Research Article

Clinico pathological study of lacrimal abscess with special reference to bacteriological etiology in southern part of Assam

Prasanna Jit Das^{1,*}, Saura Kamal Dutta¹, Harish Goswami¹, Tanveer Ahmed¹, Vikash Sharma¹

¹Dept. of Ophthalmology, Silchar Medical College and Hospital, Silchar, Assam, India



ARTICLE INFO

Article history:

Received 12-03-2020

Accepted 21-04-2020

Available online 22-12-2020

Keywords:

Dacryocystitis

Lacrimal abscess

Southern Assam

ABSTRACT

Aims: To determine the clinico-pathological status of lacrimal abscess with special reference to bacteriological flora of lacrimal abscess in the region of Southern Assam.

Materials and Methods: 50 patients of age group 15-65 years of either sex and age, presenting with lacrimal abscess from a period of January to December 2019 in Silchar Medical College and Hospital, Assam, were taken up for the study. Under aseptic and antiseptic conditions swabs were collected from lacrimal abscess and sent for microbiological analysis.

Results: In this prospective study 50 patients of lacrimal abscess were enrolled during study period. Out of the 50 samples, 40 samples yielded a positive result and out of the 40 samples, majority of micro-organisms isolated was Gram positive bacteria 60% (24) (Most frequently Staphylococcus aureus). Gram negative bacteria were encountered from 16 samples (most commonly E. coli).

Conclusion: In our study we have found that the most common causative organism of lacrimal abscess was Staphylococcus aureus but in patients with previous history of mucopurulent discharge the Gram-negative bacteria were potential pathogens. The study of the bacteriology of the disease helps significantly in the choice of specific antimicrobial agents in particular demographic trend.

© This is an open access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by/4.0/>) which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

1. Introduction

Dacryocystitis can be classified as acute, sub-acute, or chronic. Pericystitis is the infection localized to the sac as it causes a palpable painful mass at the inner canthus as there may be an obstruction present at the junction of the nasolacrimal sac and duct.¹⁻³ When the infection progresses, there is distension of the lacrimal fascia that tends to push on the common canaliculus and produces a kink within it, resulting in a non-reducible sac. This process involves either colonization of gram positive or gram-negative organisms with continuous build-up of infected debris viz. mucus and pus etc. within the sac that leads to further stasis and distention. Percolation of infected debris through the mucosal lining of the wall of the sac leads to

an exacerbated infection causing suppuration, cellulitis and then abscess formation.³⁻⁸

Bacteria is ubiquitous in the environment and are part of the normal flora of humans. The balance between the virulence of the bacteria and the strength of the immune system plays a role in whether or not an infection will occur. In order to initiate an infection, bacteria must be able to adhere to the surface of the host tissue, multiply, colonize, and evade the immune system, and finally, invade the tissue. In contrast, the host defence system of the eye includes mechanical removal of bacteria, such as the tear film and blinking reflexes. The immune system, both humoral and cellular response, is important in preventing and eliminating a bacterial infection.

Bacteria belong to the kingdom Protista, which encompasses fungi, protozoa, and algae as well. The more complex eukaryotic organisms are the fungi, protozoa, and

* Corresponding author.

E-mail address: pdprasannajit@gmail.com (P. J. Das).

algae; the simpler prokaryotic organisms are the bacteria.

Most of the organisms normally present in the eye and its adnexa are commensals, are non-pathogenic and they are viz, *Staphylococcus albus*, *Staphylococcus epidermidis*, *Diphtheroid*, *Propionibacterium acnes*, *Neisseria catarrhalis*, *Corynebacterium xerosis*, etc. but some of them are morphologically identical with pathogenic types. Diplococci indistinguishable from pneumococci are sometimes present. *Corynebacterium xerosis* is morphologically identical with *C. diphtheriae* and is frequently present in the normal conjunctival sac. They can only be distinguished by cultures. Staphylococci are often found and are relatively innocuous in the absence of other organisms but play an important part in mixed infections. Streptococci, *E. coli*, *B. proteus*, *Neisseria gonorrhoeae*, *Haemophilus aegyptius*, *Moraxella*, etc. are pathogenic and rarely found in normal eyes. *Streptococcus pneumoniae*, *Neisseria gonorrhoea* and *Pseudomonas pyocyanea* are among the most dangerous in ocular infections. Viruses as well as *Chlamydia* also play a large part in conjunctival disease.⁹

According to studies on the bacteriology of adult dacryocystitis, *Staphylococcus epidermidis* and *Staphylococcus aureus* are the most frequently isolated organisms in adult lacrimal sac infections.^{10–12} Significant changes of bacterial flora and antibiotic treatment of purulent dacryocystitis then previously published data was demonstrated by Briscoe et al. Where they found a higher incidence of Gram-negative organisms, particularly *Pseudomonas*.¹³

1.1. Epidemiology

R. Dagleish et al. stated that 35-40 years was the earliest expected age of onset of acquired idiopathic nasolacrimal duct obstruction.¹³ Saxena R.C. and Garg KC quoted a maximum age incidence in the fourth decade.¹⁴ Jacobs HB et al found a female to male ratio of 3:1 in his series of patients.¹⁵ R. Dagleish reported a percentage of 54% amongst females.¹⁶

Bacteriology for acute dacryocystitis is *Staphylococcus aureus* followed by *Pseudomonas aeruginosa* and or chronic dacryocystitis is *Hemophilus influenzae*, coagulase-negative staphylococci (CoNS), *S. aureus*, and *Streptococcus pneumoniae*.^{17,18} In North East India the majority is gram positive bacteria, 75% of the overall microorganisms cultured, with a predominance of *Staphylococcus* species. Gram-negative bacteria were isolated in 25% of the specimens with predominance of *Pseudomonas aeruginosa*.¹⁹

The definitive treatment of dacryocystitis in adults is surgery. In case of acute inflammation at first the inflammation is controlled conservatively by systemic antibiotics and analgesics followed by surgery. The conventional treatment of lacrimal abscess is systemic

antibiotics, percutaneous drainage or recently nasolacrimal drainage and subsequently external dacryocystorhinostomy. In chronic cases we can go for either external or endonasal dacryocystorhinostomy (DCR), occasionally silicone tube intubation according to the site of obstruction. If systemic antibiotic prophylaxis is not used then there is increased risk of soft tissue infection after surgery as reported by Walland and Rose⁸ which is a significant risk factor for failure in lacrimal surgery. Hence, the knowledge of the bacteriology of the disease is important for selection of proper antibiotic.

This study will highlight the major causative agents in the south eastern region of Assam and will limit the misuse of antibiotics resulting in anti-microbial resistance. Our study will help the ophthalmologists to use specific antibiotics targeting the causative organisms and benefit the patient as well as reduce the incidence of drug resistance. There is no sufficient data of any study that was carried out in the past in this part of the country.

In this study we aim to determine the bacteriological cause of lacrimal abscess in the region of Southern Assam and relate the bacteriological findings to clinical profile.

2. Materials and Methods

A prospective study was done over a period of 12 months on patients presenting with lacrimal abscess in our institution.

2.1. Inclusion criteria

Clinically diagnosed cases of lacrimal abscess in either sex, site, and age group of 15 to 65 years.

Patients with written consent with willingness to participate in the study were taken up for the study.

2.2. Exclusion criteria

Patients in extremes of ages, inflammatory diseases such as Wegener's granulomatosis and sarcoidosis treated with systemic corticosteroids, trauma, surgical injury, post dacryocystectomy, and foreign bodies.

Primary or secondary tumours or neoplasms of the lacrimal sac or arising in the adjacent areas i.e. sinuses were excluded from this study.

According to the above criteria, all the patients with lacrimal abscess were enrolled. For each case, informed consent was taken following which a detailed history was recorded including the demographic, and clinical profile of these patients. This also included the duration of pain, swelling, history of discharge etc.

Thereafter the materials collected with sterile cotton swabs was sent to Department of the Microbiology, Silchar Medical College and Hospital. The specimens received in were inoculated immediately on Mac Conkey agar and Blood agar and incubated for 16-18 hours overnight at 37°C under aerobic conditions. Organisms grown were identified using gram staining, standard method as per biochemical

reactions and antibiotic sensitivity was done by Kirby-Bauer disc the Clinical and Laboratory Standards Institute 2016.

Bacterial inoculums for antibiotic susceptibility testing was prepared from 4-5 well isolated colonies from a pure culture in 5ml of sterile peptone water. It was incubated at 37 degree Celsius until a slightly visible turbidity appeared (usually 2 hours) and the turbidity of the inoculum was compared with standard 0.5 McFarland. Standardized bacterial inoculum was cultures on Mueller Hinton agar using a sterile swab and evenly spreading in 3 directions of the agar plate to obtain a uniform growth. The inoculated plates were allowed to dry for 3-5 mins at 37 degree Celsius. Blood agar was used instead of MHA for testing Streptococcus species. Appropriate antibiotic disc was applied and incubated at 37°C for 16-18 hours. The diameter of the zone of inhibition was then measured.

3. Results

3.1. Clinical findings

50 patients were diagnosed with lacrimal abscess from January 2019 to December 2019, and among them 30 were female and 20 were male. Most of the patients were in the age group of 35-45 years (Table 1).

Table 1:

Age	Number of Patients
15-35	5
35-45	18
45-55	15
55-65	12

The detailed history was obtained which showed that 90% of the patients belonged to rural population and lived in poor hygienic condition. 10 (20%) of them had a history of diabetes and were on medication for the same. [Table 2]

Our study had 30 (60%) cases who had thick mucus discharge 20(40%) cases had epiphora/ minor mucopurulent discharge. Among the patients 10 patients presented with a lacrimal abscess up to 1 cm³ in size, 20 had it between 1-3 cm³, 15(30%) had a diffuse swelling with a pus pointing and 5(10%) patients presented with lacrimal fistula.

Table 2: Clinical profile of cases

Sex	Number	Percentage
(Male/Female)	20/30	40/60
History of Diabetes (Yes/No)	10/40	20/80
Hygiene (Good/Poor)	5/45	10/90

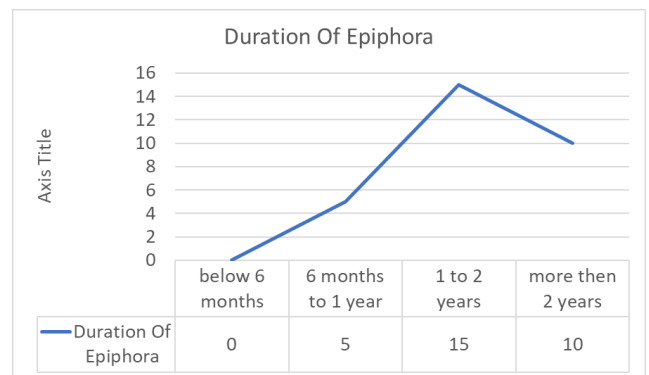


Fig. 1: Duration of epiphora

3.2. Bacteriological findings

Out of the 50 samples, 40 samples showed growth of microorganisms. Out of the 40 samples, majority of microorganisms isolated was Gram positive bacteria 24 (60%). Most frequently encountered species was Staphylococcus aureus.

Gram negative bacteria were encountered from 16 (40%) samples. The most common Gram-negative bacteria was E. coli. [Table 3]

30(60%) patients gave a history of copious discharge and most of the samples from these patients showed a growth of Gram negative organisms 15(50%). In our study most of the patients were from lower socioeconomic background and presentation in tertiary center was late and used local nonspecific treatment.

Table 3: Distribution of etiological agents of lacrimal abscess

Microorganisms isolated(n=50)	Copious purulent or mucous discharge (30 cases)	Minor mucopurulent discharge (20 cases)
Staphylococci	12	7
Streptococci	3	2
E. Coli	15	1
No Growth	0	10

4. Discussion

The lacrimal drainage system specially the lacrimal sac is prone to infection as it is a mucus membrane-lined tract which is continuous with both the conjunctival and nasal mucosa that are normally colonized with bacteria. Obstruction of the nasolacrimal duct results in stasis with the accumulation of tears, desquamated cells, and mucoid secretions which creates a fertile environment for secondary bacterial infections.²⁰

Acquired nasolacrimal duct obstruction usually occurs mainly in middle-aged or elderly people as found by

Linberg J.V et al. our study also showed similar results with maximum patients in the age group 35–45 years.²¹

On reviewing literature a very few of them dealt with acute dacryocystitis^{10,22,23} while most of the studies were on the microbiological profile of chronic dacryocystitis.^{24–33}

In our study most of the patients were from lower socioeconomic background and presentation in tertiary center was late and used local nonspecific treatment.

Though in our study we exclusively included only the lacrimal abscess, our results also concurred with some of the findings of published literature. We found Gram positive bacteria in 60% of the isolates and the most common organism encountered in our study was *Staphylococcus aureus* this compares well with the results of Huber-Spitzy et al.¹⁰ and Coden et al.¹²

In our study, gram negative organisms were detected in 15 cases (40%) of the isolates, and the most frequently isolated species being *E. coli* as reported by Huber-Spitzy et al. and Coden et al.^{10,12} Gram negative organisms occurred more frequently in cases with copious discharge.

As a general trend chronic dacryocystitis shows isolation of gram-positive organisms being more than gram-negative organisms.^{24–30} The most common organisms isolated being *S. aureus* (worldwide), *S. pneumoniae* (Africa), and *S. epidermidis* (USA). The gram-negative isolates, includes *H. influenzae* (Middle East), *P. aeruginosa* (North India and USA), *E. coli* (Europe), and *Corynebacterium diphtheriae* (China).^{18–21,34–36}

Acute dacryocystitis has been studied by the American Society of Ophthalmic Plastic and Reconstructive Surgery (ASOPRS) dacryocystitis group.²³ Where they found that around most of the isolates were gram-positive (78.3%) {Most commonly *Staphylococcus aureus*} while 21.7% were gram negative. Our current study shows similar results.

5. Limitation of Study

As our study is tertiary hospital based our sample size is only 50 and period of study is of a year so it does not represent the entire demography of southern Assam. Also we did not discuss the antibiotic sensitivity of the organisms. Some discrepancy might have crept in if the patient had self medicated with antibiotics over the counter for the same morbidity or the other unknowingly.

As we excluded the co morbidities we mentioned in our exclusion criteria our study data collectively can be representative of only a subset of population.

6. Conclusion

In our study we have found that the most common causative organism of lacrimal abscess was *Staphylococcus aureus* and in patients with history of mucopurulent discharge the Gram-negative bacteria were potential pathogens. Therefore, antimicrobial treatment in lacrimal

abscess should cover Gram negative rods. Those patients with epiphora due to blockage in nasolacrimal drainage system presented in our center had delayed or refused surgical intervention in the past complicating to acute on chronic dacryocystitis ultimately abscess formation and it's sequelae. Once an infection has occurred, the treating physician must attempt to identify the etiology of the infection and must understand about the effect of bacterial virulence and pathogenicity then host–bacterial interaction and the resultant therapeutic implications. The mainstay for treatment of bacterial infections are antibiotics, although recent evidence suggests that resistance to many commonly prescribed antibiotics is on the rise. The study of the bacteriology of the disease helps significantly to choose the specific antimicrobial agents in a particular demographic trend. Hence, awareness and early bacteriological diagnosis and initiation of specific antibiotic prophylaxis would surely reduce the morbidity.

7. Source of Funding

None.

8. Conflict of Interest

The authors declare that there is no conflict of interest.

References

1. Norn MS. Tear secretion in normal eyes. *Acta Ophthalmol.* 1965;43:567–77.
2. Jones LT, Wobig JL. Surgery of the eyelids and lacrimal system. Birmingham: Aesculapius Pub. Co; 1976.
3. Ahl NC, Hill JC. Horner's Muscle and the Lacrimal System. *Arch Ophthalmol.* 1982;100(3):488–93. doi:10.1001/archoph.1982.01030030490025.
4. Becker BB. Tricompartment Model of the Lacrimal Pump Mechanism. *Ophthalmol.* 1992;99(7):1139–45. doi:10.1016/s0161-6420(92)31839-1.
5. Linberg JV, McCormick SA. Primary acquired nasolacrimal duct obstruction: a clinical pathological report and biopsy technique. *Ophthalmol.* 1986;93:10551062.
6. Marthin JK, Lindegaard J, Prause JU, Heegaard S. Lesions of the lacrimal drainage system: a clinicopathological study of 643 biopsy specimens of the lacrimal drainage system in Denmark 1910–1999. *Acta Ophthalmol Scand.* 2005;83(1):94–9. doi:10.1111/j.1600-0420.2005.00383.x.
7. Yanoff M, Duker JS. The Lacrimal Drainage System. In: Hurwitz JJ, editor. *Ophthalmology*. Mosby; 2008.
8. Albert DM, Miller JW. *Alberty & Jakobiec Principle : Practice of Ophthalmology*. 3rd ed. Saunders; 2008.
9. Huber-Spitzy V, Steinkogler FJ, Huber E, Arock-Mettinger E, Schiffbänker M. Acquired dacryocystitis: microbiology and conservative therapy. *Acta Ophthalmol (Copenh).* 1992;70:745–9.
10. Blicher JA, Buffam FV. Lacrimal Sac, Conjunctival, and Nasal Culture Results in Dacryocystorhinostomy Patients. *Ophthal Plast Reconstr Surg.* 1993;9(1):43–6. doi:10.1097/00002341-199303000-00006.
11. Coden DJ, Hornblass A, Haas BD. Clinical Bacteriology of Dacryocystitis in Adults. *Ophthal Plast Reconstr Surg.* 1993;9(2):125. doi:10.1097/00002341-199306000-00008.
12. Dalgleish R. Idiopathic acquired lacrimal drainage obstruction. *Br J Ophthalmol.* 1967;51(7):463–8. doi:10.1136/bjo.51.7.463.

13. Saxena RC, Garg KC. Scope of dacryocystorhinostomy. *J All-India Ophthal Soc.* 1969;17:55–8.
14. Jacobs HB. Symptomatic epiphora. *Br J Ophthalmol.* 1959;43(7):415–34. doi:10.1136/bjo.43.7.415.
15. Dalgleish R. Idiopathic acquired lacrimal drainage obstruction. *Br J Ophthalmol.* 1967;51(7):463–8. doi:10.1136/bjo.51.7.463.
16. Ali MJ, Motukupally SR, Joshi SD, Naik MN. The microbiological profile of lacrimal abscess: two decades of experience from a tertiary eye care center. *J Ophthalmic Inflamm Infect.* 2013;3(1):57. doi:10.1186/1869-5760-3-57.
17. Bharathi MJ, Ramakrishnan R, Maneksha V, Shivakumar C, Nithya V, Mittal S. Comparative bacteriology of acute and chronic dacryocystitis. *Eye (Lond).* 2008;22(7):953–60. doi:10.1038/sj.eye.6702918.
18. Das JK, Deka AC, Kuri GC, Bhattacharjee K, Das D, Gogoi K. Bacteriology of chronic dacryocystitis in adult population of northeast India. *Orbit.* 2008;27(4):243–7.
19. Briscoe D, Rubowitz A, Assia EI. Changing Bacterial Isolates and Antibiotic Sensitivities of Purulent Dacryocystitis. *Orbit.* 2005;24:29–32. doi:10.1080/01676830590894897.
20. Linberg JV. Disorders of the lower excretory system. In: Milder B, Weil BA, editors. *The Lacrimal System.* Appleton- Century-Crofts. New York; 1983. p. 1–134.
21. Seal DV, Barrett SP, McGill JJ. Aetiology and treatment of acute bacterial infection of the external eye. *Br J Ophthalmol.* 1982;66(6):357–60. doi:10.1136/bjo.66.6.357.
22. Mills DM, Al E. The microbiologic spectrum of acute dacryocystitis. A national study of acute versus chronic infection. *Ophthal Plast Reconstr Surg.* 2007;23:302–6.
23. Razavi ME, Ansari-Astaneh MR, Farzadnia M, Rahmaniyan H, Moghiman T. Bacteriological evaluation of adult dacryocystitis in Iran. *Orbit.* 2010;29(5):286–90.
24. Delia AC, Uuri GC, Battacharjee K, Das D, Gogoi U. Bacteriology of Chronic Dacryocystitis in Adult Population of Northeast India. *Orbit.* 2008;27(4):243–7. doi:10.1080/01676830802224668.
25. Kebede A, Adamu Y, Bejiga A. Bacteriological study of dacryocystitis among patients attending in Menelik II hospital. *Ethiop Med J.* 2010;48:29–33.
26. Coden DJ, Hornblass A, Haas BD. Clinical Bacteriology of Dacryocystitis in Adults. *Ophthal Plast Reconstr Surg.* 1993;9(2):125. doi:10.1097/00002341-199306000-00008.
27. Hartikainen J, Al E. Bacteriology of lacrimal duct obstruction in adults. *Br J Ophthalmol.* 1997;81:37–40.
28. Sun X, Liang Q, Luo S, Wang Z, Li R, Jin X. Microbiological analysis of chronic dacryocystitis. *Ophthalmic Physiol Opt.* 2005;25(3):261–3. doi:10.1111/j.1475-1313.2005.00284.x.
29. Brook I, Frazier EH. Aerobic and anaerobic microbiology of dacryocystitis. *Am J Ophthalmol.* 1998;125(4):552–4. doi:10.1016/s0002-9394(99)80198-6.
30. Kotlus BS, Rodgers IR, Udell JJ. Dacryocystitis Caused by Community-Onset Methicillin-Resistant Staphylococcus Aureus. *Ophthal Plast Reconstr Surg.* 2005;21(5):371–5. doi:10.1097/01.iop.0000175035.22953.71.
31. Kods S. Community-acquired methicillin-resistant Staphylococcus aureus in association with chronic dacryocystitis secondary to congenital nasolacrimal duct obstruction. *J Ame Assoc Pediatr Ophthalmol Strabismus.* 2006;10(6):583–4. doi:10.1016/j.jaapos.2006.08.020.
32. Kubo M, Al E. Dacryocystorhinostomy for dacryocystitis caused by methicillin-resistant Staphylococcus aureus: report of four cases. *Jpn J Ophthalmol.* 2002;46:177–82.
33. Briscoe D, Rubowitz A, Assia EI. Changing Bacterial Isolates and Antibiotic Sensitivities of Purulent Dacryocystitis. *Orbit.* 2005;24(1):29–32. doi:10.1080/01676830590894897.
34. Iliff NT. Infections of the lacrimal drainage system. *Ocular Infection and Immunity.* 1996;p. 1346–1355.
35. Walland MJ, Rose GE. Soft Tissue Infections after Open Lacrimal Surgery. *Ophthalmol.* 1994;101(3):608–11. doi:10.1016/s0161-6420(13)31269-x.
36. Chaudhry IA, Shamsi FA, Al-Rashed W. Bacteriology of Chronic Dacryocystitis in a Tertiary Eye Care Center. *Ophthal Plast Reconstr Surg.* 2005;21(3):207–10. doi:10.1097/01.iop.0000161718.54275.7d.

Author biography

Prasanna Jit Das, Assistant Professor

Saura Kamal Dutta, Post Graduate Student

Harish Goswami, Post Graduate Student

Tanveer Ahmed, Post Graduate Student

Vikash Sharma, Post Graduate Student

Cite this article: Das PJ, Dutta SK, Goswami H, Ahmed T, Sharma V. Clinico pathological study of lacrimal abscess with special reference to bacteriological etiology in southern part of Assam. *Indian J Clin Exp Ophthalmol* 2020;6(4):605-609.