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Dacryocystitis: Bacteriological profile and its management in a tertiary care hospital of Western Uttar Pradesh

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Abstract

Background: Dacryocystitis (acute and chronic) is caused by nasolacrimal duct obstruction and may be associated with structural abnormality, infectious disorder of the eye, and traumatic injury.

Objective: To study bacteriological profile in patients with dacryocystitis in a tertiary care hospital of Western Uttar Pradesh for early and more effective treatment.

Materials and Methods: A total of 120 patients with acute and chronic dacryocystitis were included for bacteriological investigations. The specimens were obtained by a broth-moistened swab across the lower conjunctival cul-de-sac and punctum by applying pressure over the lacrimal sac area. Surgically excised lacrimal sacs were also collected and subjected to microbiological analysis. Specimens were inoculated on plates of 5% sheep blood agar, chocolate agar and Sabouraud's dextrose agar (SDA) and incubated accordingly. The isolated organisms were identified and under went for antibiotic susceptibility tests using standard procedures.

Results: Culture rate was positive in 55% specimens. Most commonly isolated bacteria were *Staphylococcus* followed by *Pseudomonas, Streptococcus* and *Hemophillus influenzae*. There was also high incidence of anaerobic bacterial isolate. In cases of chronic dacryocystitis, *Staphylococcus aureus*, coagulase negative *Staphylococcus* and anaerobic bacteria were commonly isolated accounting for nearly 37%. Gatifloxacin (84%) and amikacin (78%) were the most susceptible drugs for bacterial isolates.

Conclusions: The microbiological analysis was differing in acute and chronic infections. Both Gram-positive and Gram-negative pathogens along with anaerobes were isolated from the eyes with acute and chronic dacryocystitis. Rural population was more commonly affected with chronic as well as acute dacryocystitis. Gatifloxacin and amikacin were the most sensitive antibiotics that can be used for empirical therapy of dacryocystitis in both acute and chronic dacryocystitis.

Keywords: dacryocystitis, nasolacrimal duct, antibiotic susceptibility tests

Introduction

Dacryocystitis is an infection of the nasolacrimal sac of an eye, frequently caused by nasolacrimal duct obstruction (NLDO). This complication is associated with structural abnormality, infectious disorder of the eye, and traumatic injury. The main clinical symptoms include pain, redness, and swelling of lacrimal sac at medial canthus and epiphora due to inadequate drainage of tears, which in the end result in severe inflammation [1]. Dacryocystitis occurs in both acute and chronic forms. The acute type is initially caused by nasolacrimal abscess, and in some instance, it is accompanied by dissemination of infection in the form of orbital cellulitis, thrombosis of the superior ophthalmic vein, and cavernous sinus [2-4]. Chronic dacryocystitis is more common than acute dacryocystitis and has several stages of presentation like epiphora, mucoid discharge, conjunctival hyperaemia and chronic conjunctivitis [5].

The microbiology of dacryocystitis may differ in its acute and chronic infections. In severe acute dacryocystitis; single infection may predominate, often involving gram-negative rods. Several other species of bacteria could be also involved in the pathogenesis of chronic dacryocystitis. In most cases of dacrycystitis polymicrobial infections were common [6, 7]. Lacrimal abscess can proceed to nasolacrimal obstruction and lodged with the harmful organisms, therefore, it is important for the ophthalmologists to know it before planning any intraocular procedure because of the potential risk of endophthalmitis. Hence, the present study was planned to know the etiological agents, clinical characteristics along with their antibiotic susceptibility patterns of dacryocystitis to contribute more effective treatment.

Materials and Methods

This cross-sectional study was carried out in ophthalmology department of tertiary care hospital of Western Uttar Pradesh, India over a period of 24 months i.e. from January 2017 to December 2018. All consecutive patients with dacryocystitis visiting the hospital in this study period were included and thus a total of 120 patients were eligible for microbiological analysis. Specimens for microbiological analysis were obtained by wiping a broth-moistened swab

across the lower conjunctival cul-de-sac and also from puncta by applying pressure over the lacrimal sac area. Surgically excised lacrimal sacs were collected and were also subjected to microbiological analysis. In cases of acute dacryocystitis, along with conjunctival swab, pus discharge following spontaneous bursting of abscess and/or following incision and drainage was also taken [8, 9]. In cases of chronic dacryocystitis, those cases with mucoid or mucopurulent discharge on syringing of the lacrimal sac or having mucocele or pyocele were advised surgery. In those undergoing dacryocystectomy, the sacs were collected intraoperatively and subjected to microbiological examination. All the specimens were inoculated directly onto surface of the solid media, sheep's blood agar, chocolate agar, Sabouraud's dextrose agar (SDA) and also inoculated into the depth of liquid media as brain heart infusion broth and thioglycollate medium. The material obtained was also smeared onto clean glass slides for 10 % potassium hydroxide wet mount, Gram's stain, Giemsa stain, Ziehl-Neelson acid fast stain. The inoculated SDA was incubated at 27°C, examined daily and discarded after 3 weeks if no growth was seen. The inoculated blood agar, chocolate agar, thioglycollate broth, brain-heart infusion broth were incubated at 37°C, examined daily and discarded after 7 days if no growth was not seen. Bacteria were identified on the basis of colony morphology and confirmed by further biochemical characters [10]. Sensitivity to relevant antibiotics was determined by the Kirby-Bauer disk diffusion method as per the Clinical and Laboratory Standards Institute guidelines using the commercially available antibiotic disks from Hi-Media (Mumbai, India). The following antibiotic disks were used, ampicillin (10ug), chloramphenicol (30ug), gentamycin (10ug), vancomycin (30ug), tetracyclin (30ug), co-trimoxazole (25ug), amoxicillin (20ug), ciprofloxacin (30ug), ceftriaxone (30ug), erythromycin (15ug), penicillin (10ug), and methicillin (5ug). NCCLS reference strains, *Escherichia coli* ATCC 25922, *Staphylococcus aureus* ATCC 25923 and *Pseudomonas aeruginosa* ATCC 27853 were included as control strains [11, 12].

Results

A total of 120 patients with dacryocystitis were enrolled in the study, which included 47 males (39.2%) and 73 females (60.8%). Out of 120 patients, 83 (69.2%) were from rural area and 37 (30.8%) were from urban area. In terms of type, 24 patients (20.0%) were encountered with acute dacryocystitis and 96 of them (80.0%) had chronic form. The most common 41 (34.1%) of the total patients were between 26-45 years of age group followed by 23 (19.1%) between 5-15 years of age group (Table 1). Among 120 patients, 34 (28.3%) were diabetic and 86 (71.7%) were non-diabetic. Among 66 (54%) culture positive patients, 51 patients were culture positive for single bacterial isolate, others had two or more than two bacterial isolates. Most commonly isolated bacteria were *Staphylococcus* species followed by *Pseudomonas* species. There is also high incidence of anaerobic bacterial isolate (Table 2).

Table 1: Age-related distribution

Sr. No.	Age Group	No. of patients
1.	5-15	23
2.	16-25	10
3.	26-35	18
4.	36-45	41
5.	46-55	18
6.	56 and above	10

Table 2: Most common isolated bacteria in dacryocystitis

Sr. No.	Bacterial isolates	No. of patients
1	Gram positive cocci:	
	Staphylococcus aureus	18
	Coagulase negative Staphylococcus	10
	Streptococcus pneumoniae	8
	Streptococcus viridans	7
2	Gram positive bacilli:	1
	Corynebacterium species	
3	Gram negative cocci:	1
	Moraxella species	
4	Gram negative bacilli:	
	Pseudomonas aeruginosa	12
	Escherichia coli	4
	Haemophilus influenzae	3
	Klebsiella	3
5	Anaerobic bacteria	8

Discussion

Dacryocystitis is a painful, debilitating condition and is usually a secondary bacterial infection in the presence of NLDO of various origins [7, 13]. Presentation varies from mild overlying preseptal cellulitis to frank lacrimal abscess and even vision problems or life threatening conditions, such as sepsis, orbital cellulitis and superior ophthalmic thrombosis [14, 15]. The treatment for acute dacryocystitis with abscess formation consists of warm compresses, systemic antibiotics and percutaneous abscess drainage, followed by external dacryocystorhinostomy when acute infection has subsided [16]. This treatment strategy, however, has several limitations.

The present study determinate the microbiological and clinical characteristics of dacryocystitis and investigate the antibiotic susceptibility patterns that helps the clinician to give empirical treatment to the patient without delay. In this study, among 120 patients, 73 (60.8%) were females that indicate anatomical preponderance for dacryocystitis in female patients due to obliteration of the lumen of nasolacrimal duct [17].

In the present study, 96 patients (80%) were diagnosed to have chronic dacryocystitis, while 24 (20%) patients presented with acute dacryocystitis. Chronic as well as acute dacryocystitis was more commonly seen in 36-45 years of age group. Patients above the 25 years were significantly ($P<0.0001$) more than patients below 25 years. In this study, overall 86 patients were non-diabetic while 34 patients were diabetic. Among these, 24 patients who presented to us with acute dacryocystitis, 13 were diabetic. It showed that low immunity in diabetic predisposes for acute dacryocystitis.

Present study showed 83 patients (69%) were from rural area. Less awareness towards hygiene, cleanliness and environment predisposition to infection is a leading factor to the higher incidence of dacryocystitis in rural area. Gopinathan *et al*. [18] reported that the patients with agriculture-based activities were at greater risk of developing microbial ocular infections. Nigam *et al*. [19] also reported that the presentation of dacryocystitis could also vary according to geographical area and the microbiological aetiology. In this study, culture positive rate was 55%. The percentage of culture positivity was found to be higher

among eye with chronic dacryocystitis. The predominant bacterial pathogen isolated from eyes with acute dacryocystitis was *Staphylococcus aureus* followed by *Pseudomonas* species that was also similar to the other studies [1, 18].

In the present study, Gram-positive cocci were (65%) of the isolates and similarly Coden *et al*. [20] and Hartikainen *et al*. [21] reported 65% and 69 % of the Gram-positive cocci from the patients with dacryocystitis respectively. In cases of chronic dacryocystitis, *Staphylococcus aureus*, coagulase negative *Staphylococcus* and anaerobic bacteria were commonly isolated in this study, accounting for nearly 37%. Similar incidence was reported by Sainju *et al*. [6] (34.2%) and Coden *et al*. [20] (49%). *St. pneumoniae* represented 10 % of the isolates in our study, which is higher than Coden *et al*. [20] (2.3%), Hartikainen *et al*. [21] (5%) and Huber-Spitzy *et al*. [1] (2%). The highest percentage of bacterial isolates was susceptible to gatifloxacin (84%) and amikacin (78%). The percentage of the resistance of bacterial isolates, both gram-positive cocci and gram-negative bacilli, recovered from acute infection was higher than that of isolates of the same organism recovered from chronic dacryocystitis infection. *Staphylococcus aureus* showed the highest multiple antibiotic resistance rates – ampicillin (46%), erythromycin (33%), co-trimoxazole (30%). *St. pneumoniae* showed complete resistance for tetracycline. All gram-positive bacteria were sensitive to vancomycin. Among gram-negative bacteria, *Pseudomonas* species and *H. influenzae* showed complete resistance to amoxicillin. Anaerobic culture was positive in eight patients. Two patients had acute while six patients had chronic dacryocystitis. Species identification was not done.

Conclusions

Preparation of smear and the culture of aspirated material can lead to specific antibiotic therapy, but in most instances, dacryocystitis is only treated based on clinical observations and antibiotic susceptibility tests are not performed routinely. It should be noted that clinical findings and broad-spectrum antibiotic therapy are not effective alone as a diagnostic tool and therapeutic strategy. Microorganisms and their susceptibility patterns are different in different geographical area. The present study is useful for determining the appropriate antibiotic for systemic treatment of dacryocystitis in our region. Gatifloxacin and amikacin are found most effective antibiotics against highest percentage of bacterial isolates in this study. Therefore, in each geographic region, having information about the common microorganisms responsible for dacryocystitis and its pattern of antibiotic susceptibility is necessary for the ophthalmologist to choose the empirical therapy for the treatment of patient without delay.

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