Original article

A comparative bacteriological profile and antibiogram of dacryocystitis

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Abstract

Introduction: Dacryocystitis is an infection and an inflammation of the lacrimal sac and is an important cause of ocular morbidity in India.

Objective: To isolate and identify the bacterial patterns associated with dacryocystitis and to determine their antibacterial sensitivity pattern.

Materials and methods: A total of 100 lacrimal swab materials were subjected to bacaterial analysis. Children less than 8 years were not included in the study.

Results: The chances of chronic dacryocystitis were more than acute dacryocystitis and were commonly found in the age group of 41 - 50 years. Females were more vulnerable to the infection than males. From a 100 samples a total of 122 bacterial isolates were obtained. Both Gram positive and Gram negative bacteria were equally distributed in the study. The most common organism associated with the infection was S. aureus. The antibacterial sensitivity showed more effectiveness towards Gram positive isolates than Gram negative isolates.

Conclusion: Both Gram positive and Gram negative organism are associated with with chronic dacryocystitis. Knowledge of the bacteriology of dacryocystitis and the susceptibility of the bacteria towards antibiotics will better guide a clinician in the choice of the medication for the most appropriate drug for the treatment.

Keywords: Acute dacryocystitis, chronic dacryocystitis, lacrimal sac, nasolacrimal duct

Introduction

Dacryocystitis is the most frequent disease of the efferent lacrimal system. Dacryocystitis is the inflammation of the lacrimal sac which is usually because of nasolacrimal duct obstruction (Iliff 1996). The obstruction of the canal leads to a stagnation of tears and creates a pathological environment (Bharathi et al 2007). It builds up material within the sac leading to an exacerbated infection and more stasis. The normal flora of the eye and nose acts as an opportunistic pathogen and causes infection of the lacrimal sac. The infection in dacryocystitis can spread to the anterior orbit causing marked edema of the eyelids or can develop into a pre-septal or orbital cellulitis (Scott et al 2007). A delay in management may lead not only to secondary infection in the remaining years of life but also ultimately to blindness. Knowledge of the bacteriology of dacryocystitis contributes significantly to the proper choice of prophylactic antimicrobial agents. Though various regional studies on microbial analysis of dacryocystitis and their sensitivity pattern towards different antibiotics are

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available, there is still a considerable scope in these studies to document the change in pattern, if any, of the pathogens in dacryocystitis according to the age group, gender, type of dacryocystitis; and this will help reduce the unnecessary load of antibacterial agents. Further, this will also help in enhancing the understanding of the interrelationships between humans and microorganisms and of the virulence of specific microbial pathogens.

Hence, this study was planned to find out the bacterial aetiology of dacryocystitis among a population in a tropical climate and the antibacterial sensitivity pattern of the bacterial pathogens to various antibiotics so that exclusive management protocols may be formulated.

Patients and methods

Patients: The study was conducted on 100 eyes of cases of dacryocystitis. Patients less than eight years were not included in the study. At the first visit, patients were examined on the slit-lamp binocular microscope by an ophthalmologist, and cases of dacryocystitis were identified and categorized as acute or chronic, based on their signs and symptoms. They were then instructed to stop massage and antibiotic instillation for at least 48 hours before the collection of the samples.

Sample collection: The material for bacterial analysis was taken from the affected eye, either in the form of a discharge regurgitating from the lacrimal sac or the pus from a burst abscess in a sterile transport swab (HiMedia). Some samples were also collected after punctum dilation with a punctum dilator and then syringing was done with the help of a curved cannula.

Bacterial isolation: After the collection of the samples, they were immediately sent to the microbiology laboratory to carry out the isolation and identification of the pathogens. The study was limited to studying aerobic to facultative anaerobic bacteria. On the first day, the specimen was streaked on Nutrient agar plate (HiMedia) and MacConkey's agar plate (HiMedia), maintaining aseptic conditions and in a manner so as to get well-isolated colonies the next day and were incubated overnight at 37^0 C. On the second day, colony and cultural characteristics were studied from the incubated plates. The Gram's staining was performed. Various biochemical media - selective and differential - were inoculated and incubated overnight at 37^0 C depending upon the Gram reaction and lactose fermenting nature of the organisms. On the third day, cultural characteristics from the selective and differential media were observed. Also, results of different biochemical media were observed after adding the biochemical reagents wherever necessary. The organisms were identified on the basis of morphological, cultural, biochemical and colony characteristics observed throughout the three-day experiment.

In vitro antibacterial susceptibility test

The antibiotic susceptibility test was carried out by Kirby Baur method (Monica, 2000). The sterile Mueller Hinton agar plates were inoculated with the test pathogens ($1.5x\ 10^8$ cells/ml) using a sterile swab (HiMedia). The antimicrobial discs were evenly distributed on the inoculated plates. The plates were incubated for 16 - 18 hours at 37^0 C. After incubation the zone of inhibition around the disc was measured and compared to the standard interpretative chart.

Results

The history of 100 patients suffering from dacryocystitis was srudied. Nine of them (82 %) gave the history of prior treatment from an ophthalmologist before visiting to the center. Two subjects had used traditional medications. From 100 samples, 45 patients had acute onset of dacryocystitis and the remaining 55 had chronic onset (Table 1). The prevalence of Gram negative organisms was more than Gram positive organisms in actue dacryocystitis with E. coli as the most commonly associated bacteria (Table 2). Whereas in chronic dacryocystitis, the Gram positive

organisms predominated over the Gram negative ones with S aureus as the most frequently associated bacteria. In the present study 64 samples were collected from the females and 36 from the males (Table 3). Thus, a higher rate of infection was found in females than in males. Female predominance was more common among the cases of acute infection than the chronic infection (Table 4). The lacrimal sac inflammation commonly occurred among the patients between the age group of 41-50 years (27%) followed by 21 - 40 and 51 - 60 years (Table 5). In females, the Gram negative organisms were more commonly found than the Gram positive ones. It was observed that coagulase negative staphylococci were the most common causative agent in female patients and S. aureus was frequently associated in males (Table 5). It was observed that all the cases were unilateral and no bilateral cases were found.

From the total 100 samples, all yielded a positive culture results, 9.1 % had mixed cultures with two or more organisms. Altogether 122 organisms were isolated (Table 6). The most frequently cultured species was Gram positive bacteria, Staphylococcus aureus. A total of 29 isolates of S. aureus were obtained from the 122 isolates. The second common Gram negative bacteria was Pseudomonas aeruginosa (25 isolates). E. coli (20 isolates) and Coagulase negative Staphylococci (17 isolates) were also observed. Lastly, Klebsiella species was found in 16 isolates, whereas streptococci species in the 15 isolates. There was equal distribution of Gram positive and Gram negative bacteria.

Table 1
Distribution of types of dacryocystitis among patients and number of positive samples

Type of dacryocystitis	No. of cases	No. of Organisms
Acute dacryocystitis	45	48
Chronic dacryocystitis	55	74
Total	**100**	**122**

Table 2
Pattern of bacterial isolates among acute and chronic dacryocystitis patients

Name of the organisms	Acute dacryocystitis	Chronic dacryocystitis
Gram positive organisms	23	38
S. aureus	9	20
Coagulase negative staphylococci	8	9
Streptococci species	6	9
Gram negative organisms	25	36
E. coli	11	9
Klebsiella species	5	11
P. aeruginosa	9	16
Total	**48**	**74**

Table 3
Distribution of gender among patients and number of positive samples

Gender	No. of cases	Total no. of organisms
Female	64	71
Male	36	51
Total	100	122

Table 4
Pattern of type of dacryocystitis among male and female patients

Type of dacryocystitis	Female	Male
Aute dacryocystitis	45	-
Chronic dacryocystitis	19	36
Total	64	36

Table 5
Pattern of bacterial isolates among male and female patients

Name of the organisms	Female	Male
Gram positive organisms	27	34
S aureus	7	22
Coagulase negative staphylococci	16	1
Streptococci species	4	11
Gram negative organisms	44	17
E. coli	13	7
Klebsiella species	11	5
P aeruginosa	20	5
Total	71	51

Table 6
Bacterial types isolated from patients with dacryocystitis

Name of the organisms	Total
Gram positive organisms	61
S aureus	29
Coagulase negative staphylococci	17
Streptococci species	15
Gram negative organisms	61
E coli	20
Klebsiella species	16
P aeruginosa	25
Total	122

Bacterial pathogens isolated from the patients suffering from dacryocystitis were tested for their susceptibility against ten different antibiotics (Table 7). The Gram positve organisms showed more sensitivity than the Gram negative ones. The pathogens were sensitive to the antibiotics in the following manner: S aureus > P aeuginosa > Coagulase negative Staphylococci > E coli > Streptococci spp > Klebsiella spp. It was also observed that norfloxacin was the most effective antibiotic and penicillin was the most resistant antibiotic against the isolated pathogens. Sensitivity pattern of various antibiotics toward isolates was in the following manner: Norfloxacin > Ciprofloxacin > Cephalexin > Streptomycin > Amoxycillin > Ampicillin > Chloremphenicol > Kanamycin > Erythromycin > Penicillin.

Table 7
AntibioGram of various antibiotics against bacterial isolates causing dcryocystitis*

Name of the organisms	Number of susceptible bacterial isolates/number of tested isolates (% of isolates)									
	A	Am	C	E	P	K	S	Nx	Cf	Cp
1	34/61	33/61	29/61	28/61	25/61	34/61	37/61	39/61	34/61	35/61
	(55.7)	(54.0)	(47.5)	(45.9)	(40.9)	(55.7)	(60.6)	(63.9)	(55.7)	(57.3)
2	19/29	16/29	12/29	10/29	11/29	15/29	18/29	15/29	12/29	17/29
	(65.5)	(55.1)	(41.3)	(34.4)	(37.9)	(51.7)	(62)	(51.7)	(41.3)	(58.6)
3	8/17	8/17	9/17	10 /17	7 /17	9 /17	10/17	11 /17	13 /17	10/17
	(47)	(47)	(52.9)	(58.8)	(41.1)	(52.9)	(58.8)	(64.7)	(76.4)	(58.8)
4	7/15	9/15	8/15	8/15	7/15	10/15	9/15	13/15	9/15	8/15
	(46.6)	(60)	(53.3)	(53.3)	(46.6)	(66.6)	(60)	(86.6)	(60)	(53.3)
5	26/61	28/61	30/61	29/61	18/61	24/61	28/61	43/61	40/61	32/61
	(42.6)	(45.9)	(49.1)	(47.5)	(29.5)	(39.3)	(45.9)	(70.4)	(65.5)	(52.45)
6	8/20	9/20	13/20	11/20	10/20	7/20	11/20	5/20	7/20	10/20
	(40)	(45)	(65)	(55)	(50)	(35)	(55)	(25)	(35)	(50)
7	12 /25	12/25	10/25	10/25	8/25	9 /25	11/25	16/25	14/25	13 /25
	(48)	(48)	(40)	(40)	(32)	(36)	(44)	(64)	(56)	(52)
8	6 /16	7/16	7/16	8/16	5/16	8/16	6/16	12/16	13/16	8/16
	(37.5)	(43.7)	(43.7)	(50)	(31.2)	(50)	(37.5)	(75)	(81.2)	(50)

*A =Ampicillin, Am = Amoxycillin, C = Chloremphenicol, E = Erythromycin, P = Penicillin, K = Kanamycin, S = Streptomycin, Nx = Norfloxacin, Cf = ciprofloxacin, Cp = Cephalexin, 1 = Gram positive bacteria, 2 = S. aureus, 3 = Coagulase negative staphylococcci, 4 = Streptococci species, 5 = Gram positive bacteria, 6 = E. coli, 7 = P aeruginosa, 8 = Klebsiella species

Discussion

Dacryocystitis is an important cause of ocular morbidity in India. The present study demonstrated more prevalence of chronic dacryocystitis than acute dacryocystitis. This result confirms the earlier findings of Hartikainen et al 1997, where the prevalence of chronic dacryocystitis was 76%. The prevalence of bacterial isolates responsible for acute and chronic dacryocystitis differed from each other. Gram negative E. coli were frequently isolated in acute dacryoyctistis, whereas Gram positive S. aurues were frequently isolated in chronic dacryocystitis. In the present study, the female predominance was observed with female to male ratio being 1.78 : 1. This may be either due to obliteration of lumen (Chaudhary et al 2010) or use of cosmetics especially *kajal* in their eyes which may lead to partial or complete blockage of drainage system. Similar results were observed by other authors (Bharathi et al 2007).

Altogether, 122 bacterial isolates were obtained from 100 samples of dacryocystitis. The most frequent bacteria associated with the chronic dacryocystitis was S aureus. These results are similar to other findings (Cohen, 1992; Sainju et al 2005; Thicker et al 1993). Though Staphylococcus species is a resident microbe in normal conjunctival sac (Stenson et al 1981; Levin et al 1996), sporadic reports of being pathogenic in many postoperative infections of the eye have appeared recently (Ghose, 2005; Asbell et al, 1982). So these organisms should not be ignored as a commensal as they may be opportunistic pathogen. The most common Gram negative bacteria was found to be P. aeruginosa in the present study.

Both Gram positive and Gram negative bacteria were equally distributed in the study. This is in contradiction to the reports available by other authors where the proportion of either Gram negative bacteria or Gram positive bacteria is higher than the other (Daniel et al 2005; Bareja et al 1990).

In antibiogram of the bacterial isolates of dacryocystitis, it was found that norfloxacin was the most effective antibiotic among all the tested antibiotics. The possible explanation for higher sensitivity may be that it is not frequently used in our community. Penicillin was found to be the most resistant antibiotic. This may be due to either frequent use of it in our population or its prolonged use (Gaynor et al 2005). Gram positive S aurues was the most sensitive organism among all the other organisms and Klebsiella species was the most resistant one. This may be due to difference in cell wall permeability of the Gram positive and Gram negative bacteria.

Conclusion

Both Gram positive and Gram negative organism are associated with with chronic dacryocystitis. Knowledge of the bacteriology of dacryocystitis and the susceptibility of the bacteria towards antibiotics will better guide a clinician in the choice of the medication for the most appropriate drug for the treatment.

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