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Study of Bacterial Spectrum in Patients of Chronic Dacryocystitis, at a Tertiary Care Centre in Northern India

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Abstract

Purpose: To ascertain the current pattern of microbial isolates and their antibiotic sensitivity patterns in patients of chronic dacryocystitis seen at a tertiary care centre in North India.

Methods: A case record analysis was conducted on computerized data of 400 immune competent patients of chronic dacryocystitis in KGMC, Lucknow between Jan 2011-Dec 2015. The sample for purpose of microbiological isolate was collected from patients who ROPLAS +ve. The sample was collected under strict sterile control and culture was done on 5% sheep blood agar. Antibiotic sensitivity was done by Kirby Bauer disc diffusion method on Mueller Hinton agar.

Results: 400 samples were collected for bacterial culture and antibiotic sensitivity. 61% of these samples were sterile at 24 hrs and 72 hrs of culture. 39% were positive for microbial Agents. *Staphylococcus aureus* (54.6%) was the most common gram positive cocci followed by coagulase negative *Staphylococcus epidermidis* (19.4%), followed by *Streptococcus pneumoniae* (14%). Gram negative organisms in both group A and group B included *Pseudomonas aeruginosa* (6%) followed by *Klebsiella pneumoniae* (3%) and *Hemophilus influenzae* (3%). High sensitivity was seen towards vancomycin and fluoroquinolones in Gram positive bacteria and for Piperacillin/ Tazobactum in gram negative cases.

Conclusion: It is important to have knowledge of the microbial agent responsible for chronic dacryocystitis in a particular area to the choose the most appropriate antibiotic for the implicated organism.

Keywords: Chronic dacryocystitis; Microbial flora

Introduction

Chronic dacryocystitis, an inflammatory condition of the lacrimal sac is associated with nasolacrimal duct obstruction. The accumulation of tears in the lacrimal sac provides a good medium for bacteriological growth that leads to chronic inflammation of the ocular surface. Thus can be a threat to vision.

Staphylococcus epidermidis is the dominant organism of the normal lacrimal sac [1]. The bacterial spectrum of lacrimal sac isolates in chronic dacryocystitis differs from the normal in that it includes both Gram positive and Gram negative bacteria like *Staphylococcus aureus, Streptococcus sp., Pseudomonas aeruginosa and Hemophilus influenza [2]*. Changes in the spectrum of causative microbiological agents over time have been reported in published indexed English literature [3].

This knowledge impacts the choice of the appropriate antibiotics. Indiscriminate use of antibiotics has become a major issue of concern in the medical field [4].

The study centre is a tertiary care referral medical university of the state of Uttar Pradesh, providing service to patients from the state, the neighbouring Indian states and bordering Nepal. With this background, the authors proposed to study the bacteriological profile in patients of chronic dacryocystitis and ascertain their current antibiotic sensitivity. Thus provide a guideline for management.

Aim of the Study

To ascertain the current pattern of bacterial isolates and their antibiotic sensitivity patterns in patients of chronic dacryocystitis seen at a tertiary care centre in North India. The authors also attempted to look for causes that led to delay in consultation at a tertiary care center.

Study design and methods

The study was conducted according to the tenants of the Helsinki Declaration. A prospective analysis was conducted on lacrimal sac discharge of 400 immune-competent patients of chronic dacryocystitis that presented to the Oculoplastics and Orbit unit of the Department of Ophthalmology, King George's Medical University, between Jan 2011-Dec 2015. The study patients belonged to the geographic area including the state of Uttar Pradesh, bordering states of Bihar, Uttarakhand and neighbouring Nepal.

A written informed consent was taken from all the patients and the demographic details were noted according to a pre-designed questionnaire. The sample for purpose of bacteriological culture was collected from patients who had regurgitation from the lacrimal sac on

pressure (ROPLAS +ve). Cases of chronic dacryocystitis that were ROPLAS negative and those that had history of previous surgical intervention were excluded from the study. All patients who had history of prior antibiotic use (topical and/or oral) were asked to discontinue antibiotics for five days prior to sample collection.

The sample was collected under strict asepsis on a cotton swab and sent without delay to the university's microbiology laboratory for culture and sensitivity. Culture was done on 5% sheep blood agar. The anaerobic organisms were not included in our study. Culture plates were analyzed after 24 hours incubation at 37. The culture negative plates were re-evaluated after 72 hours of incubation. Antibiotic sensitivity was done by Kirby Bauer disc diffusion method on Mueller Hinton agar.

The antibiotic sensitivity tested was according to the Clinical and Laboratory standard Institute protocol of the laboratory. For the purpose of the study, patients whose first consultation was at our center were termed primary consultation (Group A) and all others were grouped as secondary consultation (Group B). Patients of group B have prior history of topical/oral antibiotic usage. Causes that led to primary and secondary consultation were identified and analyzed.

Results

Demographic data of 400 patients of chronic dacryocystitis that underwent treatment at the Oculoplastics and orbit unit of King George's medical university, Lucknow, between Jan 2011-Dec 2015 was analysed. Female predominance was noted (84 males, 316 females) with the mean age being 31.6 years. 150/400 patients had primary consultation (Group A). All others had been treated topically/orally or with combination of both, prior to their current consultation.

The commonest cause that led to secondary consultation was the greater distance to the tertiary health care center. Among group A, 69.5% patients were from urban areas, 94% used domestic toilets and 90.4% used soap for hand wash whereas in group B these values were 28.8%, 59% and 65% respectively (Table 1).

SNO	Residence		Hand Washing With		Sanitation (Type of toilets)		proximity to the tertiary centre	Trivial smptoms	Significant morbidity
	Rural	Urban	soap	ash	Domestic	Open			
Patients of primary consultation	30.5%	69.5%	90.4%	9.6%	94%	6%	76.4%	67%	33%
Patients of secondary consultation	71.2%	28.8%	65%	35%	59%	41%	45%	35%	65%

Table 1: Comparison of primary and secondary consultation patients.

Samples from all 400 patients of chronic dacryocystitis were collected for bacterial culture and antibiotic sensitivity. 61% (244/400) of these samples were sterile at 24 hrs and 72 hrs of culture. 39% (156/400) were positive for microbial agents at 24 hrs incubation. Among Group A patients, 71.7% (112/150) samples showed bacterial growth after incubation for 24 hours, while only 17.6% (44/250) samples of group B were positive for growth, even after 72 hours of incubation. Gram positive bacteria were isolated in 94.2% (106/112) of Group A and in 84% (37/44) of group B. Gram negative cultures were reported in 5.8% (6/112) of Group A and 16% (7/44) of Group B (Table 2).

Pattern of organisms in both the groups A and B was similar. Gram positive cocci were the most frequently isolated bacteria. Among them, *Staphylococcus aureus* (54.6%) was the commonest, followed by coagulase negative *Staphylococcus epidermidis* (19.4%) and *Streptococcus pneumoniae* (14%). Gram negative organisms in both group A and group B included *Pseudomonas aeruginosa* (6%), *Klebsiella pneumoniae* (3%) and *Hemophilus influenzae* (3%) (Table 3).

SNO.	Sterile	Gram Positive	Gram negative
Patients of Primary Consultation	38	106	6
Patients of Secondary Consultation	206	37	7

Table 2: Percentage of sterile and culture positive organisms.

Results of antibiotic sensitivity were also similar in both Groups A and B. Resistance to Penicillin and 3rd generation cephalosporin's was present among both Gram positive and Gram negative organisms.

All Gram positive cocci were sensitive to vancomycin. Additional sensitivity was observed for fluoroquinolones in Gram positive bacteria and for Piperacillin/Tazobactum in Gram negative organisms (Table 4).

Microbial organism	Group A	Group B	Total	Total %
Staphylococcius aureus	63	22	85	54.6%
Coagulase negative *staphylococcus*	21	9	30	19.4%
Streptococcus pneumoniae	15	7	22	14%
Pseudomonas aeruginosa	7	2	9	6%
Hemophilus influenzae	4	1	5	3%
Klebsiella pneumoniae	4	1	5	3%

Table 3: No. of various bacteria.

Antibiotics	Gram positive bacteria	Gram negative bacteria
Penicillin	R	R
Gentamycin	R	R
Amikacin	R	S
Levofloxacin	S	R
Vancomycin	S	S
Tetracycline	S	S
Erythromycin	S	R
Clindamycin	S	R
Septran	R	R
Cefotaxime	R	R
Pipercillin/Tazobactum	S	S
Imipenem	S	S
Cefepime	R	R
cefazoline	R	R
Chloramphenicol	S	S

Table 4: Antibiotic sensitivity patterns.

Discussion

The present study was a prospective analysis of 400 patients of chronic dacryocystitis who were treated at the Oculoplastics and Orbit unit, Department of Ophthalmology, King George's Medical University, Lucknow, over a period of 5 years. This specialty clinic of the medical university provides service to patients of the state, its neighbours and also those from bordering Nepal. The study wanted to confirm the existing pattern of bacterial flora in chronic dacryocystitis since it is dynamic and needs repeated evaluation. The mean age of the patients was 31.6 years and females were more affected (M:F ratio 1:3 (Table 1). Xugang et al. Reported mean age of 45.5 years in which males were 14.3% and females were 85.7%. Delia et al. in their study reported mean age of 42.7 years with female predominance of 61.04% [5]. The incidence of chronic dacryocystitis has been observed to be directly proportional to the age. The nasolacrimal duct is narrower and flatter against the nasal floor in females, thus predisposing to obstruction [6].

Group A included patients that had primary consultation at the study centre. All others were clubbed in Group B. The rationale for this grouping was to attempt to study the effect of indiscriminate antibiotic use on bacterial pattern and antibiotic sensitivity. Larger number of patients fitted into Group B (250/400) and their rate of culture positivity was lower (44/250). This implies that patients of primary consultation have a higher incidence of culture positive reports as compared to the patients who took secondary consultation in the tertiary care center. The most common reason for majority patients falling into Group B was the geographic distance from the tertiary care center. Non-relief of the symptoms by the primary treatment and associated significant morbidity formed the second cause. The latter may be contributed by initiation of broad spectrum antibiotics without evidence of proper sensitivity to the drug used.

69.5% of the Group A patients belonged to the urban areas as against 28.8% of the Group B patients. 90.4% of the Group a patients cared for their hygiene and washed hands with soaps and 94% used domestic toilets. These figures were lower in Group B where the majority of patients had rural dwelling. (65% washed hands with soap and 59% of the patients used domestic toilets)

Amongst all the culture positive samples of the current study, both groups revealed that Gram positive cocci were the commonest isolates. *Staphylococcus aureus* was most frequently grown. Other Gram positive organisms isolated included coagulase negative *Staphylococcus epidermidis* and *Streptococcus pneumonia* in order of decreasing frequency. *Pseudomonas aeruginosa*, *Klebsiella pneumoniae* and *Hemophilus influenzae* were the Gram negative organisms identified. The results are comparable to the results of the previous studies. Mandal et al. in their study on 56 patients in Kolkata showed similar results, Gram positive *Staphylococci aureus* being the most common implicated organism in their study [7]. In the same year, Das et al conducted a study in north eastern India and found that 75% of the culture positive organisms were Gram positive *Staphylococcus aureus* [8]. Shah and Santani in July 2011 reported from Jodhpur that the cultures showed equal number of Gram positive and Gram negative organisms [9]. Pradeep et al. observed in 2013 in Northern Karnataka, that 71% cultures were positive for coagulase negative *Staphylococci* and 14% were positive for *Staphylococcus aureus* [10]. Thus it is evident that a regional pattern of organisms does exist. In the last decade, the pattern of bacterial isolates shows that the Gram positive organisms are the commonest isolated microbial agents in most of the geographical areas, and there is an increasing trend towards coagulase negative *Staphylococci* [11].

Antibiotic sensitivity pattern suggested that fluoroquinolones, chloramphenicol, vancomycin, tetracycline, erythromycin and clindamycin were effective against Gram positive organisms whereas piperacillin/Tazobactam, imipenem, chloramphenicol and amikacin were effective against Gram negative organisms. Fluoroquinolones and 3rd generation cephalosporins were found ineffective against Gram negative organisms. Mandal et al. reported that almost all the organisms were resistant to penicillin. They also mentioned that chloramphenicol was effective against most of the Gram positive organisms. Gram negative organisms in their study were sensitive to fluoroquinolones [11]. Chaudhary et al. concluded in their study that Gram positive organisms were most sensitive to chloramphenicol and least to tobramycin. Gram negative organisms were equally sensitive to chloramphenicol and nalidixic acid [12]. In 2013, in a study in northern Karnataka by Pradeep AV et al. Gram positive organisms were found to be sensitive to vancomycin, amikacin, 3rd generation cephalosporins and amoxyclav [10]. Thus, there has been a growing resistance to flour quinolones and 3rd generation cephalosporin's among the Gram negative organisms. The Gram positive organisms have shown increased resistance to penicillin and cephalosporin's. This has to be kept in mind when treating the patients of chronic dacryocystitis. The antibiotic sensitivity pattern of the groups was similar. Maybe the Group B patients used antibiotics for causes other than chronic dacryocystitis. It must be noted that in our study, culture for aerobic organisms only was attempted.

Antibiotic misuse and/or overuse in the recent times is a cause of concern. Also, there may be an involvement of other etiological agents like viruses, anaerobic bacteria or fungi. Inclusion of anaerobic culture would be certainly a useful aid in similar studies. The authors wanted to confine the study to the aerobic organism's domain only since

anaerobic organisms have a relatively lesser role in chronic dacryocysititis as per the previous studies [8,13].

The authors suggest that in cases of chronic dacryocystitis, the discharge should be subjected to a culture and sensitivity evaluation at the point of first consultation. This knowledge is relevant to all medical care providers.

Conclusion

It is important to have knowledge of the microbial agent responsible for chronic dacryocystitis of the geographical area along with the antibiotic sensitivity pattern, to choose the most appropriate antibiotic for the implicated organism.

Gram positive are the most commonly involved agents and susceptible to vancomycin and fluoroquinolones whereas Gram negative have shown resistance to floroquinolones. There has been a growing antibiotic misuse among the population which has resulted in majority of the samples being sterile at the time of incubation. Also, maybe it's time to look for other etiologies of chronic dacryocystitis.

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