Original Article

Bacteriology of Chronic Dacryocystitis in Patients Coming to a Tertiary Care Hospital

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Purpose: To determine microbiology of dacryocystitis in patients coming to a tertiary care hospital of Pakistan and to find out bacterial sensitivity of different antibiotics towards causative organisms.

Study Design: Cross sectional observational study.

Place and duration of study: Ophthalmology Department, Abbassi Shaheed Hospital, Karachi from January to December 2017.

Material and Methods: Total 100 patients were enrolled by non-probability consecutive sampling technique. Patients with chronic dacryocystitis, primary or acquired nasolacrimal duct blockage were included. Acute dacryocystitis, canaliculitis, mucoceles and who had used topical or systemic antibiotics within 48 hours were excluded from the study. Detail history, ocular adnexal examination and regurgitation test was performed. Specimen was collected with a soft cotton tip applicator under sterile aseptic conditions. Gram staining and culture was done. Data was collected and analyzed on Statistical package for Social Sciences (SPSS) version 16.

Results: Mean age of the patients was 29.8 years ± 19.6 SD with 75% females. Mean duration of symptoms was 5.9 years ± 10.5. Right eye was affected in 58% of patients. Culture was positive in 83% and gram positive organisms were seen in 52% of cases. The most common pathogen was staphylococcus aureus 21%, than pseudomonas 18% of cases. Gram positive and negative both were most sensitive to Moxifloxacin 66% and 57% respectively.

Conclusion: The most common pathogen in chronic dacryocystitis is gram positive organism Staphylococcus aureus followed by gram negative Pseudomonas. Both gram positive and gram negative organisms are most sensitive to Moxifloxacin.

Keywords: Antibiotic, Bacteriology, Chronic Dacryocystitis, Gram Negative Bacteria, Gram Positive Bacteria.

Inflammation of the lacrimal sac due to nasolacrimal duct obstruction or secondary to trauma or neoplasm is called dacryocystitis. This obstruction of the canal leads to stagnation of tears and creates a pathological environment. This accumulates material within lacrimal sac thereby exacerbating infection, more stasis and beginning of a vicious circle. Normal flora of the eye acts as an opportunistic pathogen there by producing infection of lacrimal sac[1].

Dacryocystitis is the most common disease of the lacrimal drainage system[1]. Chronic dacryocystitis is chronic inflammation of the lacrimal sac due to obstruction of lacrimal sac and most common cause of epiphora[2,3].

Pathologically within the sac there is inflammation, hyperemia, edema, and hypertrophy of mucosal epithelium. Accumulation of mucoid and mucopurulent exudates cause the sac to dilate,

ultimately leading to pyocele[4]. This acts as a potential nidus for the organisms to proliferate within the 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[1]. It can also give rise to vision threatening complications like corneal ulcer and endophthalmitis following any intra ocular surgery[5]. Therefore, a delay in management may lead not only to secondary infection in the remaining years of life but also eventually to blindness[1]. Retrograde spread of infection from the conjunctiva to nasal cavity, paranasal sinuses, allergic rhinitis and deviated nasal septum have also been reported[6].

Dacryocystitis can develop at any age but it is much more frequent in infants, young adults and elderly. Incomplete canalization of the nasolacrimal duct, nasolacrimal atresia, facial cleft, and dacryocystocele may lead to infantile dacryocystitis[7]. Some studies suggest it is significantly more frequent in the age above 30 years and globally much more common in females with female to male ratio of 3.99:1[3]. This disease is more prevalent in persons belonging to low socioeconomic background and poor personal hygiene[3].

Microbiology may vary in acute and chronic infections. Single infection predominates in severe acute dacryocystitis often involving gram-negative rods. Multiple other species of bacteria could be involved in the pathogenesis of chronic dacryocystitis[8]. These patients usually harbor multiple microorganisms[8].

Since various studies on microbial analysis of dacryocystitis and their sensitivity pattern towards different antibiotics are published internationally but the data is scarce at local level. The objective of the study is to determine the frequency of bacterial organisms responsible for causing dacryocystitis in patients coming to a tertiary care hospital and to determine different antibiotic sensitivity pattern toward gram negative and positive organisms. This hospital caters to patients belonging to lower middle class so our study will help to identify bacterial pathogens representing that class. It will also help us in treating the disease with sensitive drug and to avoid unnecessary medications.

MATERIAL AND METHODS

This study was conducted in the department of ophthalmology, Abbasi Shaheed Hospital, Karachi, a tertiary care hospital. The study was carried out in accordance with guidelines of Declaration of Helsinki. It was a Cross sectional observational study started in January 2017 till December 2017. Total of 100 patients presented in eye Out Patient Department (OPD) were enrolled in the study. Sample was collected by non-probability consecutive sampling technique. Patients presenting with epiphora due to chronic dacryocystitis, primary or acquired nasolacrimal duct blockage were included. Patients with acute dacryocystitis, canaliculitis, mucoceles and who had used topical or systemic antibiotics within 48 hours of presenting were excluded from the study.

Patients with complaints of epiphora, based on inclusion and exclusion criteria were selected from an eye OPD. Verbal informed consent was obtained from all the enrolled patients after explaining the procedure to them. Detail history of the patients regarding their bio data, symptoms and duration of the symptoms were taken. Ocular adnexal examination was carried out with help of slit lamp to rule out other causes of epiphora. Diagnosis of chronic dacryocystitis was established based on history and examination. Regurgitation test was performed in every patient. Specimen was collected from the puncta after applying pressure on lacrimal sac by an ophthalmologist. It was collected with a soft cotton tip applicator under sterile aseptic conditions taking care not to touch surrounding skin, lashes and lid. The specimen was sent to the standard microbiology lab of the same tertiary care hospital. Gram staining was done to identify gram negative and gram-positive bacteria. Specimen was cultured in blood agar, chocolate agar specifically for gram-negative organisms, MacConkey's agar for further identification of bacteria and for antibiotic sensitivity pattern. The specimen was incubated for 24 hours at 37 degree centigrade and in case of no growth; it was further incubated for 48 hours. Biochemical tests were performed to identify bacteria in case of colonies formation on the media. After 48 hours if there was no growth the sample was declared culture negative. Final report was issued after 3 days.

Data was collected and analyzed on Statistical package for Social Sciences (SPSS) version 16. The continuous data like age and duration of disease are presented by means and range. The categorical data like gender, symptoms, diagnosis, organisms, culture positive and negative, sensitivity of various antibiotics are represented as the frequencies and percentages.

RESULTS

The mean age of the patients was 29.8 years ± 19.6 SD, median was 32 and mode was 50 years of age. Minimum age was 11 months and maximum was 62 years of age. Mean duration of the symptom was 5.9 years ± 10.5 SD. Females were 75% out of 100 patients and 57% of them were housewives. All (100%) patients presented with watering and 20% with discharge. Right eye was involved in 58% of patients and 73% had chronic dacryocystitis. Culture was positive in 83% of patients. Gram positive organisms including both rods and coccis were seen in 52% of cases. Other demographic features of the patients are given in table one (1).

Table 2 demonstrates frequencies of various organisms. The most common pathogen identified is staphylococcus aureus in 21%, followed by pseudomonas in 18% of cases. The least common is enterobacter seen in 1% of patient.

Table 3 shows sensitivity of commonly used antibiotics against gram negative and positive organisms.

Table 1: Demographic characters of patients.

Variables	Frequencies (%)
Males	25 (25%)
Females	75 (75%)
Pre-school children	20 (20%)
Student	10 (10%)
House wives	57 (57%)
Employed	13 (13%)
Retired	20 (20%)
Watering	100 (100%)
Discharge	20 (20%)
Chronic conjunctivitis	24 (24%)
Right eye	58 (58%)
Left eye	42 (42%)
Chronic dacryocystitis	73 (73%)
Congenital nld block	27 (73%)
Culture +ve	83 (83%)
Gram + organisms	52 (52%)
Gram – organisms	31 (31%)

Table 2: Frequency of organisms.

Variables	Frequency (%)
None	17 (17%)
Staphylococcus aureus	21 (21%)
Pseudomonas	18 (18%)
Streptoccocuspneumo	16 (16%)
Streptococcus virdans	16 (16%)
E coli	5 (5%)
Moraxella	2 (2%)
Mixed	2 (2%)
Klebsella	2 (2%)
Enterobacter	1 (1%)
Total	100

Table 3: Common antibiotic sensitivity pattern.

Sensitivity of Medicines	Gram Positive Organisms (%)	Gram Negative Organisms (%)
Amoxicillin	34%	22%
1st generation cephalosporin	45%	18%
2nd generation cephalosporin	25%	33%
3rd generation cephalosporin	52 %	43%
Tobramycin	21%	31%
Gentamycin	19%	25%
Vancomycin	57%	35%
Flouroquinolones	19%	34%
Moxifloxacin	66%	57%
chloramphenicol	37%	45%

DISCUSSION

Microorganisms responsible for causing acute or chronic dacryocystitis differ from place to place or with geographical location. Culture was positive in 83% of patients in our study and 9 different species of bacteria have been isolated. Gram positive organisms predominate (52%) in our study. If we compare our results with other studies they have also reported more frequent gram positive pathogens, 61% by Aseefa et al[9], 94.2% by Ahuja et al[10], 78.6% by Sarkar I

Table 4: Comparison of Results from International Studies.

Study	Place	Organism	Bacteria
Assefa Y et al 9	North west Ethiopia	Gram +	Staph epidermidis (17.6%)
Ahuja et al. 10	Northern India	Gram +ve	Staph aureus (54.6%)
Pornpanich K et al 20	Thailand	Gram +ve	Coagulase-negative staph (27.8%)
Chang Hoon Lee et al	Korea	Gram+ve	Staph epidermidis (33.8%)
Eshraghi et al 12	Tehran, Iran	Gram +ve	S. aureus in 26%.
Briscoe D et al 16	Kfar Saba, Israel	Gram -ve	Pseudomonas (22%)
Ali MJ et al13	India	Gram +ve	Staph aureus (25%)
Sharat et al. 20	South India	Gram +ve	Strep pneumone (40%)
Sun X et al 14	China	Gram +ve	Staphy aureus (34.5%)
DM Mills et al 15	USA	Gram +ve	Staph aureus (78.3%)
Chaudhry et al 17	Saudi Arabia	Gram +ve	Coagulase negative staphylococci (33.9%)

et al[11]. Most common gram positive organism isolated in this study was staphylococcus aureus (21%) followed by gram negative organism pseudomonas (18%). Studies conducted at various hospitals in different countries[9-17] have also reported staphylococcus particularly aureus species to be more frequent. One of them collected pus from acute cases of dacryocystitis[15]. These countries have different geographical location including USA and mostly Asian countries summarized in table 4. Briscoe et al, reported the only study among Asian countries, conducted in Israel, in which Gram negative organisms mostly Pseudomonas (22%) were more frequently seen than gram positive organisms in cases of dacryocystitis[16]. in this study, swabs were taken from both dacryo abscess and chronic dacryocystitis. It can be deduced that these organism do not follow any particular pattern of geographical location.

Rare pathogens were enterobacter (1%), Moraxella (2%) and Klebsiella (2%). These pathogens do not specifically target any age group or gender.

Staphylococcus epidermidis is a dominant normal flora of lacrimal sac[18]. Healthy individuals also possess microbial flora on their ocular surfaces and it includes small amount of coagulase-negative staphylococci. Under normal circumstances, this bacterial flora helps to eliminate harmful pathogens, starts an immune response to injury and maintains a peaceful eco system on ocular surfaces[19]. Once this equilibrium is disturbed by lacrimal duct obstruction this starts a cascade of reactions. It destroys tear film dynamics, delays microbial clearance, changes the normal microbial flora on ocular surfaces[14]. There might be a change in pH which leads to proliferation of other pathogens. The source of infection could be from conjunctival cul de sac or nasal cavity if duct is partially open. These pathogens are then involved not only in causing dacryocystitis but to preseptal cellulitis, orbital abscess, corneal ulcer, endophthalmitis, panophthalmitis and eventually blindness. Classically it is staphylococcus aureus which is associated with chronic dacryocystitis but fungus have also been reported[14]. Changes in the spectrum of causative microbiological agents over time have been reported in published indexed English literature[13].

Male to the female ratio in our study was 1:3 which is comparable with other studies[3,13]. Narrow nasolacrimal duct, smaller nasolacrimal fossa, hormonal factors, unhygienic or dusty working conditions and use of cosmetics including surma and kajal are known multiple factors responsible for causing dacryocystitis in females[15,16]. In our study, 57% of these female patients were house wives and 20% were retired personnel. Mean age for presentation in our patients was 29.8 years. Other studies had reported mean age of 50 years[20-23]. Possible reason for early presentation and more common in females is their involvement in cooking and the use of cosmetics, not only kajal or surma on eyes but also use of poor quality face powder and talcum powder on face. All of these fine particles reach conjunctival sac, then mix in tears and settle in lacrimal sac or duct finally blocking it. Right eye was more commonly involved i.e. 58% of cases as compared to left eye. Laterality has no association with age or gender of patients. Every patient had complained of watering in which 24% had developed chronic conjunctivitis and 20% with discharge on compressing.

Primary surgical treatment option for patients

with chronic dacryocystitis is dacryocystorhinostomy (DCR) with intubation once an acute episode has settled with a course of antibiotics, anti-inflammatory and warm compresses. Therefore, it is very essential to know about the sensitivity and resistance pattern of a drug. We have shown various commonly prescribed antibiotics with their sensitivity pattern in table 3. Gram positive organisms are most sensitive to Moxifloxacin (66%) and Vancomycin (57%). Cephalosporin and amoxicillin also have better sensitivity pattern. Gram negative cocci and bacilli are most sensitive to Moxifloxacin (57%) and chloramphenicol (45%). Sensitivity pattern are low if compared with other studies[3,9]. Patients presenting in our clinic had mean duration of symptoms of 5.9 years. These patients already had multiple visits to general practitioners, quacks and over the counter prescriptions before coming to an ophthalmologist. On top of that they keep delaying surgery by injudiciously using multiple antibiotics for treatment of dacryocystitis and its prophylaxis. Such ignorant practices in our part of the world are alarmingly increasing the already existing natural antibiotic resistance mechanisms of bacteria and might be responsible for the relatively higher prevalence rate of their resistance[9].

This study is a small, single center study but it has contributed significantly in representing local data and validating the most common pathogen isolated for causing chronic dacryocystitis.

There are few limitations of our study. There is lack of local data regarding prevalence, incidence and comparison of bacteriology in chronic dacryocystitis. Culture negative specimens could have been fungus or anaerobes as they were not stained and cultured.

CONCLUSION

We conclude that chronic dacryocystitis is more frequent in females, among 3rd to 4th decade; the most common isolated pathogen was a gram positive organism staphylococcus aureus. Second most common pathogen was gram negative Pseudomonas. Both gram positive organisms and gram negative organisms are most susceptible to Moxifloxacin.

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