

# Clinico-Bacteriological Study of Chronic Dacryocystitis Cases in Northern Karnataka, India

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## ABSTRACT

**Aims and objectives:** The aim of this study was to identify the organisms responsible and to determine the antibiotic susceptibility pattern of the bacterial isolates from conjunctiva and nasal mucosa in cases of chronic dacryocystitis and comparing with lacrimal sac specimen.

**Design:** Prospective longitudinal study.

**Methods:** A prospective analysis of 44 lacrimal sac contents of patients with chronic dacryocystitis conducted during the period from April 2012 to March 2013. Material was obtained directly from the lacrimal sac while making sac flap during external dacryocystorhinostomy for chronic dacryocystitis. Samples were also collected from ipsilateral conjunctiva and inferior meatus of nose. The specimens were cultured and results analyzed.

**Statistical Analysis:** The results were analyzed by using Chi-square ( $\chi^2$ ) test.

**Results:** All the patients were in age group of 30 and above. Gram positive bacteria i.e., Coagulase negative staphylococci and *Staphylococcus aureus* were the most common isolates (71% and 14% respectively). Vancomycin, amikacin, 3<sup>rd</sup> generation cephalosporins and amoxycylav were most sensitive antibiotics (100%, 89%, 83%, and 78% respectively). Comparison between lacrimal and nasal/conjunctival isolates showed high degree of identicalness between the isolates of two sites ( $p < 0.05$ ).

**Conclusion:** Majority of the chronic dacryocystitis cases are caused by Coagulase negative Staphylococci and *Staphylococcus aureus*. Amoxycylav and 3<sup>rd</sup> generation cephalosporins can be used to treat chronic dacryocystitis. Commensal flora of nose and conjunctiva have a direct role in pathogenesis of chronic dacryocystitis.

**Keywords:** Cephalosporins, Chronic dacryocystitis, Coagulase negative *Staphylococcus*, Nasolacrimal duct

## INTRODUCTION

Chronic dacryocystitis is an inflammatory condition of the lacrimal sac commonly associated with partial and total obstruction of the nasolacrimal duct, which affects patients of middle age. Several bacteria have been implicated as causative agents of chronic dacryocystitis [1]. Also, there is a change in the agents responsible for chronic dacryocystitis over the time [2,3]. Knowledge of the microbial organisms responsible for chronic dacryocystitis in a particular geographical area is essential in choosing the appropriate antibiotics [4]. Hence we aimed at finding out the bacteria responsible for lacrimal sac infections in the patients visiting this tertiary care hospital and study their antibiogram. We also compared the isolates from ipsilateral nasal mucosa and conjunctival specimens in order to verify the role played by the commensal bacterial flora in the causation of chronic dacryocystitis.

## MATERIAL AND METHODS

A total of 44 samples from 43 cases of chronic dacryocystitis, who attended the ophthalmology outpatient department of a tertiary care teaching institute in northern Karnataka during the period April 2012 to March 2013, formed the subject of study. One patient had bilateral chronic dacryocystitis.

**Inclusion criteria:** Clinically diagnosed cases of chronic dacryocystitis undergoing external dacryocystorhinostomy (Ext-DCR) were included in the study.

**Exclusion criteria:** The patients who had received either topical or systemic antibiotics in the past one week during their visit to the hospital were excluded.

The study was carried out in accordance with the ethical guidelines of the Declaration of Helsinki and institutional ethical committee

approval was obtained before the commencement of the study. An informed consent was obtained from all the patients. Clinically diagnosed cases of chronic dacryocystitis were operated for Ext-DCR after relevant investigations. Samples were collected directly from lacrimal sac during Ext-DCR. Preoperative nasal swab and conjunctival swab from the same side were also collected. The materials were collected with sterile cotton swabs and sent for culture to the microbiology laboratory. The specimens received at the laboratory were inoculated immediately on MacConkey agar, chocolate agar and thioglycollate broth. Organisms grown were identified using standard biochemical reactions and antibiotic sensitivity test was done by the Kirby-Bauer disc diffusion method as per the Clinical and Laboratory Standards Institute guidelines [5,6]. Chi-square ( $\chi^2$ ) distribution was used to test the qualitative distribution. A p (predictive) value of  $<0.05$  was considered indicative of significant association between the variables which were tested.

## RESULTS

Total of 43 adult patients were included in the study; (15 males and 28 females) [Table/Fig-1].

The bacterial pathogens grown from lacrimal sac, nasal and conjunctiva have been shown in [Table/Fig-2]. All the specimens yielded monomicrobial growth except one lacrimal sac specimen that yielded two pathogens.

In eight nasal and two conjunctival specimens organism identical to the lacrimal sac specimen was recovered.

A total of 21 isolates were recovered from 44 lacrimal sac specimens. The Gram positive bacteria (18/21; 85%) outnumbered the Gram negative bacteria. Coagulase Negative Staphylococci (CONS) were the predominant isolates (15/21; 71%) followed by *Staphylococcus aureus* (3/21; 14%) and one isolate each of *Escherichia coli*,

Age Group	No. of Cases
21-30	3
31-40	3
41-50	12
51-60	14
61-70	10
71-80	1

[Table/Fig-1]: Age wise distribution of cases

	Total	Growth	No Growth	% No Growth
Lacrimal	44	21	23	52
Conjunctival	44	15	29	66
Nasal	44	31	13	30

[Table/Fig-2]: Results of culture of nasal, conjunctival and lacrimal specimens

	R	S	Total	% S	% R
Amoxycillin- Clavulanic acid	4	14	18	78	22
Amikacin	1	8	9	89	11
Cefepime	3	15	18	83	17
Cefotaxime	3	15	18	83	17
Ceftazidime	3	15	18	83	17
Ceftriaxone	3	15	18	83	17
Cefuroxime	3	15	18	83	17
Ciprofloxacin	9	8	17	47	53
Clindamycin	5	12	17	71	29
Co-trimoxazole	9	8	17	47	53
Erythromycin	12	4	16	25	75
Gentamicin	6	12	18	67	33
Imipenem	3	15	18	83	17
Penicillin G	13	5	18	28	72
Piperacillin- Tazobactam	3	15	18	83	17
Vancomycin	0	16	16	100	0

[Table/Fig-3]: Antibiogram of CONS and *Staphylococcus aureus*  
R- Resistant, S- Sensitive, % S-Percentage sensitive, % R-Percentage Resistant.

*Moraxella catarrhalis* and *Citrobacter freundii*. As staphylococci constituted majority of isolates the antibiogram of these isolates is presented in [Table/Fig-3].

To ascertain the possibility of acquisition of pathogens causing chronic dacryocystitis from anatomically connected nasal or conjunctival colonizers, we compared the isolates from ipsilateral swab from these two sites. Comparing the isolates from these two sites with the pathogens by Chi-square test, p value indicative of significant association (<0.05) was obtained. In two cases identical isolates were grown in lacrimal sac and conjunctiva, p value 0.001044 (Very significant). In eight cases identical isolates were grown in lacrimal sac and nasal mucosa, p value 0.00002651 (Very significant).

## DISCUSSION

Chronic dacryocystitis is a commonly encountered but commonly mismanaged infection. It is more common in the age group above 30 years. Lacrimal apparatus contains lacrimal gland, punctum, canaliculi, lacrimal sac and nasolacrimal duct. Lacrimal apparatus is concerned with formation and draining of tears, which keep the cornea moist, protects against airborne pathogens and foreign bodies. Obstruction of the nasolacrimal duct results in stasis with accumulation of tears, desquamated cells and mucous secretions above the obstruction and creates a fertile environment for secondary bacterial infection.

In the present study, specimens were obtained directly from the lacrimal sac under the operating microscope while making the sac flap for Ext-DCR, which gives less chance for collection contamination compared to collection by applying pressure over the lacrimal sac or by allowing the purulent material to reflux through the lacrimal sac [1].

In pre-antibiotic era, Streptococci were very common causative agents of chronic dacryocystitis. However, after the discovery of effective antibiotics like penicillin and cephalosporins, Streptococci have been replaced by Staphylococci; notoriously known to acquire drug resistance [2,3]. Previous studies state that pathogens implicated in chronic dacryocystitis are more often Gram positive bacteria like CONS, *Staphylococcus aureus* and Streptococci [7]. Some studies have also reported Gram negative bacteria like *Pseudomonas*, *Enterobacter*, *Citrobacter* species [2]. Environmental factors in different geographical regions may have a role in determining the microbial pattern of chronic dacryocystitis [8].

In our study, we noted female preponderance (63.6%) which was also noticed in other studies 80.9% [7] and 61.04% [9]. All the patients were in the age group of 30 and above. Similar findings were reported in other articles [1, 7].

We isolated 15 CONS (71%) and three *Staphylococcus aureus* (14%) species. Many Indian studies have reported growth of Gram positive bacteria more frequently than Gram negative bacteria [7, 9,10–13]. CONS hitherto were considered as non-virulent or low grade pathogens. However, more evidence suggesting pathogenic potential of CONS is now coming forward [14]. However, we did not encounter any Methicillin Resistant *Staphylococcus aureus*. All the patients were admitted to the hospital one day prior to surgery. Thus the flora of the patients was community acquired and not hospital acquired.

Out of 44 cases, same organism with same antibiotic pattern had been isolated in both lacrimal sac and nasal specimen in eight cases. In two cases lacrimal and conjunctival samples showed similar pattern. This is probably because lacrimal apparatus is contiguous with nasal and conjunctival mucosal surfaces. Normal flora from these two sites, often enter into the lacrimal apparatus. Usually any small number of bacteria gaining entry into the lacrimal sac will be washed away by the flow of tears. When there is obstruction to the flow of the tears, then these bacteria will not be flushed and will get very good environment for the growth. Common normal flora of the conjunctiva and nasal cavity are CONS and *Staphylococcus aureus* respectively [15]. Hence these are the most common pathogens implicated as etiological agents of chronic dacryocystitis. After statistical analysis of the growth from lacrimal, nasal and conjunctival specimens, we found that there was a significant identicalness between lacrimal and nasal/conjunctival isolates. The statistical analysis pointed that lacrimal pathogens might have arisen from nose/conjunctiva. Bale et al., reported 50% correlation between lacrimal and nasal pathogens [10]. The identicalness of the isolates has been determined by matching the antibiogram. Though this is not a confirmatory method to type the bacterial species it is an easy and fairly reliable technique for preliminary comparison of the isolates [5]. Use of modern molecular methods like restriction fragment length polymorphism can provide precise matching of the isolates [15].

Vancomycin, amikacin, 3<sup>rd</sup> generation cephalosporins and amoxycylav were most effective antibiotics against the Gram positive isolates (100%, 89%, 83% and 78% sensitivity respectively). Penicillin and erythromycin are the commonly used agents against Gram positive pathogens. However, penicillin (72% resistance) and erythromycin (75% resistance) were the least reliable antibiotics among antibiotics tested. Vancomycin and amikacin being parenteral drugs can be reserved for severe cases. Amoxycylav and 3<sup>rd</sup> generation cephalosporins can be used as first line of antibiotics in the management of chronic dacryocystitis.

It must be noted that in our study, culture for aerobic organisms only was attempted. We did not do anaerobic culture of the specimens. Inclusion of anaerobic culture would be certainly a useful aid in similar studies. Inclusion of large sample size would have given us a better picture.

## CONCLUSION

Organisms responsible for majority of the chronic dacryocystitis cases are CONS and *Staphylococcus aureus*. Amoxyclav and 3<sup>rd</sup> generation cephalosporins can be used to treat chronic dacryocystitis cases. Organisms from nose and conjunctiva have direct role in pathogenesis of chronic dacryocystitis. Use of modern molecular methods for typing the isolates can provide a better picture of the scenario.

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