

Bacteriology and antibiotic susceptibility of chronic dacryocystitis

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Abstract

Introduction: Chronic dacryocystitis is an inflammation of lacrimal sac usually diagnosed clinically. It is an important cause of ocular morbidity. It is a constant threat of infection to orbital soft tissues and cornea as it acts as a reservoir of infection.

Objectives:

- To identify the current spectrum of bacterial isolates from lacrimal sac mucosa in cases of chronic dacryocystitis and to
- Determine the antibiotic susceptibility pattern of the isolates.

Design: Hospital based cross sectional study.

Materials and Methods: The study was conducted at a tertiary care teaching hospital in North Karnataka. Bacteriological profile of chronic dacryocystitis was evaluated from April 2014 to October 2016. A total of 108 patients with chronic dacryocystitis were evaluated. Sample were taken directly from the lacrimal sac while making posterior flap of the lacrimal sac during external dacryocystorhinostomy (Ex DCR) and excised sac during dacryocystectomy (DCT) for chronic dacryocystitis was directly inoculated on culture plates for identification and sensitivity of the pathogens.

Results: All the patients were in age group of 30 and above. Male to female ratio was 1:2. Out of 108 patients, 42.6% were culture positive. The most common isolates were Coagulase negative staphylococci (67.39%) followed by *Staphylococcus aureus* (17.39%).

Conclusion: Majority of the chronic dacryocystitis cases were caused by Coagulase negative staphylococci followed by *Staphylococcus aureus*. Isolation of Methicillin Resistant Coagulase Negative Staphylococci was noteworthy and may be indicative of a trend in lacrimal sac infections in this area. These findings will help us to revise the pre and post-operative antibiotic usage protocols at our institute.

Keywords: Chronic dacryocystitis, Coagulase negative Staphylococci (CONS), DCR, DCT, Methicillin resistant coagulase negative staphylococci (MRCONS), Nasolacrimal duct.

Introduction

Chronic dacryocystitis is an inflammatory condition of the lacrimal sac commonly associated with partial or total obstruction of the nasolacrimal duct. It primarily affects female patients of middle age. The blockage leads to stagnation of debris in the lacrimal sac which acts as a nidus for organisms to colonize the sac leading to inflammation. Several bacteria have been implicated as causative agents of chronic dacryocystitis.⁽¹⁾ Due to inadvertent use of antibiotics and microbiological resistance, there is a change in the spectrum of agents responsible for chronic dacryocystitis.⁽²⁾ Knowledge of the microbial organisms and bacteria responsible for chronic dacryocystitis in a particular geographical area is essential in choosing appropriate antibiotics.^(3,5,13) There will be fivefold risk of soft tissue infection after open lacrimal surgery.⁽¹²⁾ This shows that, evidence based antibiotic use for prophylaxis as well as therapeutics is essential to prevent failure of lacrimal surgery. Moreover, the emergence of antibiotic resistance becomes a challenge for management of dacryocystitis. Hence we aimed at finding common bacterial isolates responsible for lacrimal sac infections in our patients and also to study their anti-biogram.

Materials and Methods

Study setting: A hospital based cross sectional study was conducted during the period of April 2014 to October 2016 at SDM Medical College and Hospital, Dharwad, North Karnataka.

Study population: We included clinically diagnosed cases of chronic dacryocystitis undergoing external dacryocystorhinostomy (Ext-DCR) or dacryocystectomy (DCT) during study period. Patients who had received topical or systemic antibiotics and congenital dacryocystitis were excluded from the study.

Study protocol: The study was begun after Institutional Ethical Committee permission. An informed consent was taken from all the patients. Clinically diagnosed cases of chronic dacryocystitis were operated for Ext-DCR/ DCT after relevant investigations. The lacrimal sac flap (posterior flap in DCR and complete excised sac in DCT) was directly inoculated on chocolate agar, MacConkey's agar and thioglycollate broth in the operating room and media were sent to Dept. of Microbiology. The growth was identified using standard biochemical reactions and antibiotic sensitivity test was done by the Kirby-Bauer disc diffusion method as per the CLSI guidelines.⁽⁴⁾

Statistical Methods: For data analysis continuous variables like age were summarized as mean (SD), categorical variables like laterality of eye, type of organism and antibiotic sensitivity were summarized as proportions.

Results

Out of the 108 patients included in the study, 36 (33.3%) were males and 72 (66.7%) were female patients giving the male to female ratio of 1:2. Majority of the patients belonged to the age group of 40 to 60 years (63.9%) with the mean age of 54.8 years. Right eye was involved in 59 (54.6%) patients whereas left eye was involved in 49 (45.4%) (Chisq= 0.29, df=1, p=0.58, NS).

On lacrimal sac syringing, 69.4% patients had clear fluid regurgitation while 30.7% had mucopurulent or purulent regurgitation. However, there was no correlation between the nature of regurgitation and culture results.

Of 108 lacrimal sac samples 46 (42.6%) gave 49 isolates while 62 (57.4%) samples did not show any growth. Of the 49 isolates 40 were Gram positive cocci, 8 were Gram negative bacilli and one was a fungus. Among the Gram-positive organisms, Coagulase negative Staphylococci (CONS) (67.3%) were the most common organisms next common being Staphylococcus aureus (17.39%). Of the Gram positive isolates 18.4% (9/49) were methicillin resistant. Staph. aureus isolates which showed excellent sensitivity to the commonly used antibiotics except ciprofloxacin (50%). (Table 1)

Table 1: Isolates from 108 cases of chronic dacryocystitis

Organism	Number	%
CONS	23	46.9
MRCONS	8	16.3
S. aureus	8	16.3
MRSA	1	2.0
Pseudomonas spp.	2	4.1
Klebsiella spp.	1	2.0
E. coli	1	2.0
Citrobacterfreundii	1	2.0
Enterobacter cloacae	1	2.0
NFGNB	1	2.0
Verticellium	1	2.0
Total	49*	100.0

*few samples showed mixed growth

All the CONS isolates were sensitive to ceftazidime, doxycycline, linezolid, tigecycline and vancomycin. The MRCONS were sensitive to linezolid and vancomycin. (Table 2) However, for the other antibiotics the MRCONS showed lower sensitivity. For chloramphenicol and gentamicin 80% and 70% of the CONS showed sensitivity respectively. For other

commonly used systemic as well as topical antibiotics these isolates were largely sensitive.

Table 2: Antibiotic susceptibility of CONS

CONS	
Antimicrobial	S%
Ceftazidime	100.0
Doxycycline	100.0
Linezolid	100.0
Tigecycline	100.0
Vancomycin	100.0
Amikacin	91.7
Tetracycline	88.2
Amoxycillin- Clavulanic acid	87.5
Cefepime	81.8
Chloramphenicol	80.0
Cefotaxime	76.9
Ceftriaxone	71.4
Amoxicillin	70.0
Gentamycin	70.0
Co-trimoxazole	60.0
Erythromycin	57.9
Ciprofloxacin	55.0
Penicillin	22.2

However the popular agent ciprofloxacin was found to be less trustworthy as only 55% CONS were sensitive to it.

Our Gram positive isolates showed 50-60% resistance to ciprofloxacin, gentamicin and cotrimoxazole. The Gram negative isolates were isolated infrequently.

Discussion

Dacryocystitis is a commonly encountered condition and needs surgical intervention in most cases. Women are more prone to this condition compared to men. In the current study, majority of the patients were in the age group of 40-60 years (63%), followed by over 60 years (24%). This pattern of distribution is observed by other workers.^(3,10,11) Females showed a higher incidence than males which was similar to study conducted by Hartikainen et al. in 1997, Badhu et al and Chaudhar et al.^(6,7) In general, the disease is more common, in females, because of narrow bony canal. Our patients were from rural area where females work in smoky kitchen and also busy in agriculture work where hygiene might be poor. Additionally, females will be using cosmetics like 'Kajal' which may lead to partial or complete blockage of nasolacrimal duct causing epiphora.⁽³⁾

Prior antibiotic therapy, faulty collection of samples, inadequate sample size, transportation problems etc. influence the culture sensitivity results adversely. To avoid this we collected samples from sac

during operative procedure and directly inoculated on culture plate in operating room itself.

The infected lacrimal sac acts as a reservoir of infection for ocular infections like keratitis, endophthalmitis, preseptal and orbital cellulitis etc. It needs to be treated prior to any intraocular surgery and antibiotics are important in the treatment. Emergence of resistant or multi-resistant bacterial strains has become a common problem because of the indiscriminate use of antibiotics.

The bacteriological profile of the isolates from chronic dacryocystitis changes from place to place. In the study by Kebede et al (2007) commonest isolate was *Streptococcus pneumoniae* and was showing maximum sensitivity to chloramphenicol.⁽¹²⁾ This was also the commonest isolate in various other studies.^(9,10,18,6) Reports from Saudi Arabia (Chaudhary et al (2005),⁽⁷⁾ Toronto,⁽¹⁵⁾ Finland,⁽⁵⁾ China⁽¹⁶⁾ and Australia⁽¹⁷⁾ have showed predominance of staphylococcal species. A study from Israel showed a predominance of the *Pseudomonas* species in their isolates.⁽²⁾ Recent reports from the southern India^(10,19) have shown CONS as the most common isolate followed by *S. aureus* and *S. pneumoniae*. We, therefore, need to know the common causative organisms for chronic dacryocystitis in particular geographical area and their sensitivity pattern to enable us to institute evidence based antibiotic therapy.^(3,5,13) In the present study the commonest isolate was CONS (63.3%) followed by *S. aureus* (16.3%). In a study conducted in Northeast India, *S. epidermidis* (40%) was the most common Gram positive organism, followed by *S. aureus* (35%) and *S. pneumoniae* (10%). Prakash et al (2012), in a similar study, found that *S. aureus* (26), *S. pneumoniae* (22) and *P. aeruginosa* (9) as the most common isolates.

The CONS in the present study were completely sensitive to ceftazidime, doxycycline, linezolid, tigecycline and vancomycin followed by Amikacin (91.7%), Tetracycline (88.2%) and Amoxicillin-Clavulanic acid (87.5%). The MRCONS also showed 100% sensitivity to linezolid and vancomycin. (Table 2) As expected the overall sensitivity of MRCONS to other antibiotics was lower compared to CONS. For the topically used antibiotics, chloramphenicol and gentamicin, 80% and 70% of the CONS were sensitive respectively. However, it was seen that 50% of the CONS were resistant to the popularly used ciprofloxacin. The only MRSA isolated was sensitive to amikacin, chloramphenicol and ciprofloxacin but was resistant to ceftazidime, penicillin and cotrimoxazole. Assefa et al (2013) from Ethiopia have also reported one methicillin resistant *S. aureus* among their 31 isolates.⁽¹¹⁾

In a similar study at this centre Pradeep et al (2013) have reported CONS in 71% and *S. aureus* in 14% cases⁽¹⁰⁾ which is consistent with the present study. An important observation was that in 2013 methicillin resistant Staphylococci were not encountered.

However; in the present work we found nine methicillin resistant staphylococci (MRCONS – 8 and MRSA –1). The emergence of methicillin resistance in CONS may pose therapeutic problems. If the incidence rises further, it may warrant use of newer and expensive antibiotics for empirical therapy to be deescalated after the sensitivity report.⁽²⁰⁾ Subjecting all the dacryocystitis samples to culture and sensitivity is certainly warranted in this scenario.

The study yielded only eight Gram negative isolates belonging to eight different species and therefore the species were not subjected to statistical analysis. However, the overall sensitivity of these isolates to a variety of commonly used antibiotics was very high. This phenomenon was noteworthy as the Gram negative isolates from other samples in our hospital are showing alarming resistance to various antimicrobials. Isolation of sensitive Gram negative isolates from dacryocystitis has been reported by other workers also.^(8,9,11,13)

Conclusion

Chronic dacryocystitis was commoner in females than males and CONS were the commonest isolates from this lesion. Knowledge of sensitivity of the pathogen is essential as indicated by emergence of MRCONS in our area. Data on the regional distribution of pathogens and their sensitivity causing chronic dacryocystitis is imperative to design empirical antibiotic therapy for this condition. Evidence based antibiotic therapy may help to prevent failures of DCR.

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References

1. Pinar-Sueiro S, Sota M, Lerchundi T, Gibelalde A, Berasategui B, Vilar B, Hernandez J. Dacryocystitis: Systematic Approach to Diagnosis and Therapy. *Curr Infect Dis Rep* 2012;14:137-46.
2. Briscoe D, Rubowitz A, Assia EI. Changing bacterial isolates and antibiotic sensitivities of purulent dacryocystitis. *Orbit*. 2005;24:95-98.
3. Chaudhary M, Adhikari SK, Bhatta DR. Bacteriology of chronic dacryocystitis. *Nep J Oph*. 2010;2(4):105-13.
4. Clinical Laboratory Standards Institute (CLSI) guidelines. Performance standards for antimicrobial susceptibility testing: Twentieth informational supplement. Document M100-S20. Wayne, PA: Clinical and Laboratory Standards Institute; 2010.
5. Hartikainen J, Lehtonen OP, Saari KM. Bacteriology of lacrimal duct obstruction in adults. *Br J Ophthalmol* 1997;81:37-40.
6. Badhu B, Dulal S, Kumar S, Thakur SK, Sood A, Das H, et al. Epidemiology of chronic dacryocystitis and success rate of external dacryocystorhinostomy in Nepal. *Orbit* 2005;24:79-82.

7. Chaudhary IA, Shamsi FA, Al-Rashed W. Bacteriology of chronic dacryocystitis in a tertiary eye care centre. *Ophthalmic Plast Rec* 2005;21:207-10.
8. Mandal R, Banerjee AR, Biswas MC, Mondal A, Kundu PK, Sasmal NK. Clinico-bacteriological study of chronic dacryocystitis in adults. *J Indian Med Assoc* 2008;106:296-8.
9. Prakash R, Girish Babu RJ, Nagaraj ER, Prashanth HV, Shah J. A bacteriological study of dacryocystitis. *J Clin Diagn Res* 2012;5:652-5.
10. Pradeep AV, Patil SS, Koti SV, J S A, Garag SS, Hegde JS. Clinico-bacteriological study of chronic dacryocystitis cases in northern Karnataka, India. *J Clin Diagn Res*. 2013Nov7(11):2502-4.
11. Assefa Y, Moges F, Endris M, Zereay B, Amare B, Bekele D, Tesfaye S, Mulu A, Belyhun Y. Bacteriological profile and drug susceptibility patterns in dacryocystitis patients attending Gondar University Teaching Hospital, Northwest Ethiopia. *BMC Ophthalmol*. 2015 Apr 2 15:34.
12. Kebede A, Adamu Y, Bejiga A. Bacteriological study of dacryocystitis among patients attending in Menelik II Hospital, Addis Ababa, Ethiopia. *Ethiop Med J*. 2010 Jan;48(1):29-33.
13. Das JK, Deka AC, Kuri GC, Bhattacharjee K, Das D, Gogoi K. Bacteriology of chronic dacryocystitis in adult population of northeast India. *Orbit*. 2008;27(4):243-7
Med J. 2010 Jan;48(1):29-33C
Ophthalmol. 2015 Apr 2;15:34.
14. Birtukan Shiferaw, Baye Gelaw, Abate Assefa, Yared Assefa, and Zelalem Addis. Bacterial isolates and their antimicrobial susceptibility pattern among patients with external ocular infections at Borumeda hospital, Northeast Ethiopia. *BMC Ophthalmol*.2015;15:103.
15. De Angelis D, Hurwitz J, Mazzulli T. The role bacteriological infection in the etiology of nasolacrimal duct obstruction. *Can J Ophthalmol* 2001;36:134–139.
16. Sun X, Liang Q, Luo S, et al. Microbiological analysis of chronic dacryocystitis. *Ophthalmic Physiol Opt* 2005;25:261–263.
17. Sainju R, Franzco A A, Shrestha M K, Ruit S. Microbiology of dacryocystitis among adult population in southern Australia. *Nepal Med Coll J*. 2005;7:18–20.
18. Usha K, Smitha S, Shah N, Lalitha P, Kelkar R. Spectrum and susceptibilities of microbial isolates in cases of congenital nasolacrimal duct obstruction. *J AAPOS* 2006;10:469–472.
19. Bharathi M, Ramakrishnan R, Maneksha V, Shivakumar C, Nithya V, Mittal S. Comparative bacteriology of acute and chronic dacryocystitis. *Eye* 2007;29.
20. Khasawneh FA, Karim A, Mahmood T, Ahmed S, Jaffri SF and Mehmood M. Safety and feasibility of antibiotic de-escalation in bacteremic pneumonia. *Infection and Drug Resistance*,2014;7:177–182.