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Spectrum of aerobic bacterial pathogens causing chronic dacryocystitis and their antibiotic sensitivity patterns

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Abstract

The studies have shown that bacterial pathogens differ in chronic and acute dacryocystitis. Acute dacryocystitis is caused by gram negative rods. In chronic dacryocystitis mixed flora is isolated. The percentage of culture positive was found to be higher in chronic dacryocystitis with single or mixed growth. All patients included in the study underwent basic evaluation as mentioned in the standard proforma after obtaining written informed consent. Routine ophthalmic examination was conducted by the investigator, including slit lamp examination, paying special attention to the presence of discharge and epiphora. In the present study bacterial growth was seen in 42 (84%) cases. Gram positive organisms were isolated in 27 (54%) cases and Gram negative organism in 13 (26%) cases. 2 (4%) cases showed mixed growth pattern. *Staph Aureus* and *CONS* accounted for 22% each and *Streptococcus* 10% cases. Among Gram negative organisms *Klebsiella* was isolated in 10% cases. *Citrobacter* and *Pseudomonas* were isolated in 6%.

Keywords: Aerobic bacterial pathogens, chronic dacryocystitis, antibiotic sensitivity patterns

Introduction

Dacryocystitis is inflammation of the lacrimal sac and nasolacrimal duct. It is a common and unpleasant disease, partly because of the troublesome and conspicuous symptoms it may cause, partly because it has little tendency to resolve and its adequate treatment presents considerable problems. The disease is known from the earlier times owing to its grosser manifestations involving abscesses and fistulae on the face [1].

In a proportion of cases of dacryocystitis, the aetiology is obvious; these arise secondarily from spread of infections from nose, sinuses, from such conjunctival diseases as trachoma, from traumata and pericystic inflammations and from specific infections as tuberculosis, leprosy, syphilis and so on. In vast majority of cases of dacryocystitis, the cause of inflammation is less clear, for clinically it appears to start primarily in the lacrimal system [2].The healthy lacrimal passages when function normally are resistant to infective organisms due, partly to the resistance of the mucosa itself and partly to the bacteriostatic influence of the tears; hence it is rare for a conjunctival infection to spread down to a healthy sac, even though it may be virulent and of long standing. Similarly it is seen that an unpleasant nasal infection need cause no lacrimal involvement. However, it is probable that the essential prerequisite for the development of infection is the occurrence of stasis of the contents of the sac, which may or may not be due to an actual obstruction, but frequently by a boggy and swollen or congestive condition of the mucosa. The numerous folds and valves in the mucus membrane, on slight provocation can swell sufficiently to dam back fluid; moreover the submucosa is very vascular, almost cavernous, and unusually rich in lymphatics so that it forms a ready site for congestion and an ideal nidus wherein a slight infection once established will settle. In the presence of stasis, the resistance falls and a vicious cycle sets in [3, 4].

The studies have shown that bacterial pathogens differ in chronic and acute dacryocystitis. Acute dacryocystitis is caused by gram negative rods. In chronic dacryocystitis mixed flora is

isolated. The percentage of culture positive was found to be higher in chronic dacryocystitis with single or mixed growth. This infection should be treated prior to intraocular or lacrimal surgery. Post-operative infections after lacrimal surgery can be minimised.
There are distinct patterns of geographical variation in terms of aetiology according to the local climate in infective keratitis and also in microbial conjunctivitis. Hence an understanding of the region wise etiological agents is important in the management of these diseases. Hence this study is conducted in isolating the bacterial agent causing chronic dacryocystitis.

Methodology

Inclusion criteria

- Age >15years.
- Patients with epiphora.
- Patients with purulent or mucopurulent regurgitation.
- Samples processed under aerobic conditions.

Exclusion criteria

- Age < 15 years.
- Patients with acute dacryocystitis.
- Patients with other ocular infection.
- Patients on antibiotics since past one week.

All patients included in the study underwent basic evaluation as mentioned in the standard proforma after obtaining written informed consent. Routine ophthalmic examination was conducted by the investigator, including slit lamp examination, paying special attention to the presence of discharge and epiphora. The presence of any anomaly of eye lids and other ocular adnexa were noted. Any coexistent ocular infection or inflammation was specifically looked for and cases excluded if did not meet the inclusion criteria. Routine ENT examination was also conducted, specifically to diagnose nasal pathology.
Importance was stressed for detailed Nasal Examination in ENT department to detect any nasal or paranasal sinus pathology. Anterior rhinos copy examination was done.

Collection of sample

The selected eye of the patient was painted with betadine and spirit. Sample fluid was collected by:
Applying pressure over the lacrimal sac and allowing the fluid/purulent material to reflux through the lacrimal punctum. OR Irrigating the lacrimal drainage system with sterile saline and collecting the sample from the refluxing material.
The samples were collected with 2 sterile cotton wool swabs, ensuring that the lid margins or the conjunctiva were not touched. No antibiotics, systemic or topical were used before sample had been collected. The samples were immediately transferred to sterile bottles and sent for direct smear examination and inoculation into the culture media to microbiology department microbiology laboratory for isolation of the aerobic bacterial pathogens and their sensitivity patterns. Further microbiological examinations were done only for isolating bacterial agent. One sample was used to prepare slide for Gram's staining.

Results

Table 1: Bacteriological Pattern of chronic dacryocystitis

Sl. No.	Organisms isolated	No of cases	Percentage
1.	Gram + ve organisms	27	54%
	Staphylococcus aureus	11	22%
	Streptococcus	5	10%

	CONS	11	22%
2.	Gram-ve organisms	13	26%
	Pseudomonas	3	6%
	Klebsiella	5	10%
	E. coli	1	2%
	Citrobacter	3	6%
	NF Gram-ve bacilli	1	2%
3.	Mixed Growth	2	4%
4.	No Growth	8	16%

In the present study bacterial growth was seen in 42 (84%) cases. Gram positive organisms were isolated in 27 (54%) cases and Gram negative organism in 13 (26%) cases. 2 (4%) cases showed mixed growth pattern. *Staph Aureus* and *CONS* accounted for 22% each and *Streptococcus* 10% cases. Among Gram negative organisms *Klebsiella* was isolated in 10% cases. *Citrobacter* and *Pseudomonas* were isolated in 6%.

Table 2: Antibiotics sensitivity to Gram positive Bacteria

Sl. No.	**Organisms**	**Amp/clox/methicillin**	**amox/clav**	**CF**	**CXN**	**CLN**	**PIP/TN**	**TOBA**	**G**	**A**	**C**	**CoT**	**E**	**CPZ**
1.	STAPHA	6	4	2	1	2	1		3	1	1	1	5	2
2.	STREPT	2	3	1	I	1				1			1	1
3.	CONS	4	4	1	1	2	1	3	1		10	3	4	1

This study showed increased sensitivity of gram positive bacteria to Cloxacillin, Amoxicillin/ Clavulanic acid, Erythromycin and Clindamycin and Ceftazidime. Also*CONS* showed sensitivity to Ciprofloxacin.

Table 3: Antibiotics sensitivity to Gram negative Bacteria

Sl. No.	**Organisms**	**Amp/clox**	**amox/clav**	**CF**	**CXN**	**CLN**	**PIP/TZ**	**TOBA**	**G**	**A**	**C**	**CoT**	**E**	**CPZ**
1	PSEUDO			1			1			3	1			3
2	KLEB	2	1	2				5	5	2	1			
3	E. Coli	1						1	1	1	1			
4	CB	1		1				1	2		2			

Among Gram negative organisms isolated, increased sensitivity to Gentamicin, Amikacin and Fluoroquinolones like Ciprofloxacin. Also*Pseudomonas* showed sensitivity to Chloramphenicol.

Table 4: Associated Rhinological conditions

Sl. No.	Nature of lesion	No of cases	Percentage
1.	DNS	19	38%
2.	Atrophic Rhinitis	1	2%
3.	Sinus affections	4	8%
4.	URI	4	8%
5.	Hypertrophied turbinate	4	8%
6.	No nasal pathology	16	32%
7.	Failed EN DCR	2	4%

Above table shows associated nasal and paranasal pathologies in 68% cases. Deviated nasal septum (DNS) was found in 38%, URI and sinus infections in 8% each, turbinate hypertrophy in 8%. Failed endonasal DCR (EN-DCR) was noticed in 2 cases (4%). Atrophic rhinitis was found in 2% cases. No nasal pathology was seen in 32% of patients.

Discussion

The present study shows positive culture positive in 84% cases, 80% cases showed pure growth, 4% mixed growth pattern and no growth was seen in 16% cases. Anaerobic growth too has been documented in many studies with Hartikainen*et al*. documenting a highest incidence of 20%. The presence of anaerobic organisms as sole etiological agents could explain the negative aerobic cultures in several studies [2].

Among culture positive 54% were Gram positive and 26% were Gram negative. Coden[63] *et al*. found *Staph aureus* in 22.1% and *S. epidermidis* in 27.3% and 27% were Gram negative organisms. He found 52.5% culture positive of which 71% were in pure culture and 29% were mixed growth. Similar results were seen in series of studies.

Bharti M.J [5] *et al*. 2007 reported *CoNS*to be present in 44.2%, *Staph aureus* in 10.8% *Streptococcus* 10% in chronic dacryocystitis. Sainju*et al*. [64] reported *Staph aureus* in 34.2% cases among Southern Australia. *Staphylococcus* has been shown to be the predominant species in the bacterial isolates of several studies all around the world [44]. Contrary to many older studies our study did not find *Staphylococcus pneumonia* in any of the growths [6].In our study 26% of the cultures positive for growth yielded Gram negative organisms. Of these, growth of *Pseudomonas aeruginosa* (3 Cases) and *Klebsiella pneumonia* (5 Cases) was seen. Single samples showing growth of each of *E coli*, and 3 samples of *Citrobacter* were also obtained. Varied results have been obtained by different studies regarding the incidence of Gram negative bacterial isolates, with incidence ranging from 20% to nearly 60% [2, 5]. Most of them have described incidence of Gram negative organisms in 20 to 25 % of the total isolates [2, 5]. While most studies have found *Haemophilus influenzae* as the most common gram negative bacterial isolate, recent studies have documented other bacteria which are normally present neither in the conjunctiva or in the nose. Among these are *Pseudomonas, E coli*, *Enterococci*, *Proteus* and *Citrobacter*. Several studies have quoted *Pseudomonas* as most frequent Gram negative bacteria isolated with incidence varying from as low as 8% to as high as 22%.

The documented incidence of mixed bacterial isolates varies from 18% to as high as 66% in different studies [2]. Mixed Growth included S*taphylococci* and NF Gram negative bacilli in 1 case and *E. coli* and NF gram negative bacilli in 1 case. Among NF Gram negative bacilli, most common in this region are *Acinetobacter*

In the present study, Gram positive organisms showed sensitivity to Amoxicillin, Cloxacillin, Clavulanic acid, Erythromycin, Clindamycin. Bareja U [8] series exhibited 93.3% sensitivity to Cloxacillin and is comparable to the present study and found an excellent response to 1% to

2.5% drops depending on child's age. It could act as topical drug of choice in case of *Staphylococcal aureus* and *epidermidis* infections. According to Bareja U [8] nasal flora has no role in causation of congenital dacryocystitis. In the present study increased sensitivity of Gram positive organisms to Clindamycin was seen, did not correlate with the study by Chaudhary M [9] *et al*. and Das D [10] *et al*. (2008) which says Chloramphenicol is the most effective drug for chronic dacryocystitis. Prakash R [11] found Gram positive organisms were sensitive to Vancomycin (100%) followed by Tobramycin and Linezolid (99.3%) and Gram negative to Gentamicin (100%), Cefepime (98.79%) and Chloramphenicol (97.14%).This is comparable to present study in which Gram negative organisms are sensitive to Gentamicin, Amikacin, Tobramycin and Fluoroquinolones like Ciprofloxacin [12]. Also*Pseudomonas* showed sensitivity to Chloramphenicol. The antimicrobial sensitivity pattern changes from community to community and also in the same area. This necessitates careful individual culture and sensitivity of each affected eye more than once during the course of treatment.

Conclusion

To conclude, multiple organisms harbour in lacrimal sacs of chronic dacryocystitis. Bacterial examination is necessary to identify aetiological agent and its antibiotic sensitivity to treat with appropriate antibiotics in catarrhal stage of the disease and aid efficient diagnosis and management of these cases including proper antibiotic prophylaxis for lacrimal sac surgeries, hence preventing antibiotic resistance caused due to injudicious use of antibiotics.

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