Original article:

Clinical and Bacteriological Profile of Chronic Dacryocystitis in patients coming to PRH Loni

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Abstract

Aims and Objectives: The aim of this study was to identify the organisms responsible for chronic dacryocystitis and to compare them with those obtained from conjunctival mucosa and nasal mucosa in adults above 40 years of age. We also determined the antibiotic sensitivity pattern of the bacterial isolates from conjunctival sac, lacrimal sac and nasal mucosa in cases of chronic dacryocystitis.

Materials and Methods: Hospital based, observational, longitudinal study, in which samples from three sites were collected: 1) Conjunctival sac 2) Nasal mucosa 3) Lacrimal sac. Samples from conjunctival sac and nasal mucosa were collected at the time of presentation before initiation of local antibiotic therapy. Samples from the interior of lacrimal sac were collected after dacryocystectomy surgery and analyzed in the department of microbiology.

Results: All the patients were in age group of 40 and above. Majority of bacterial isolates from lacrimal sac were Gram negative bacteria like Klebsiella spp. (19.2%), Pseudomonas spp (15.3), Neisseria spp (7.6%), Citrobacter spp. (7.6%) and E. coli (1.9%). Gram positive bacteria isolated from lacrimal sac were Staphylococcus aureus (15.3%), Alpha haemolytic streptococci (13.4%) and Non-haemolytic Streptococci (13.4%) and Coagulase Negative Staphylococcus aureus (5.7%). Overall, Gram negative bacteria were found to be most sensitive to Ciprofloxacin (98%) and Gentamycin (96%). Gram positive bacteria were found to be most sensitive to Gentamycin (88%), followed by Vancomycin (84%) and Cefpodoxime (84%).

Conclusion: Gram negative bacteria were responsible for majority of cases of chronic dacryocystitis. Microorganisms from nasal cavity and conjunctival sac have direct role in pathogenesis of chronic dacryocystitis. Cefpodoxime, a third generation cephalosporin and Ciprofloxacin can be used for oral administration in case of chronic dacryocystitis. Vancomycin and Gentamycin being parenteral drugs can be reserved for severe cases.

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]Female sex and application of eye-liner/kajal over the margin of eye-lids are some of the predisposing factors for dacryocystitis. Obstruction of the lower end of the nasolacrimal duct due to pressure exerted by a large nasal polyp, hypertrophied inferior turbinate bone or extreme deviation of nasal septum can also give rise to dacryocystitis. [1] Patients with Chronic Dacryocystitis usually present with a persistant and troublesome epiphora, which may be associated with chronic or recurrent unilateral conjunctivitis. The epiphora may be associated with a painless swelling at the inner canthus caused either by a mucocele or pyocele. In some cases, obvious swelling may be absent, although pressure over the sac commonly results in reflux of mucopurulent material through the canaliculi.

Complications of chronic dacryocystitis include chronic conjunctivitis, acute dacryocystitis, corneal ulcers, endophthalmitis and even panophthalmitis [1]. Infection from dacryocystitis can spread to involve other adjoining structures

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either due to structural continuity or because of haematogenous spread to involve distant sites. This may give rise to orbital cellulitis, facial cellulitis or even cavernous sinus thrombosis. Dacryocystitis is the only inflammation in the body which starts as a chronic process and turns into acute if not treated in time.

As majority of population in India lives in rural areas where lack of awareness and neglect of the symptoms of watering and sticky discharge from the eyes is common, they mostly do not come in the uncomplicated stage. They frequently present to the hospital with complications of chronic dacryocystitis and a quick decision has to be taken regarding the institution of appropriate antibiotic therapy. Although treatment of chronic dacryocystitis is essentially surgical, knowledge of the microbial organisms responsible in a particular geographical area is essential for guiding the choice of appropriate antibiotics which are required for treating the complications of this disease. Therefore it becomes imperative to know the common micro-organisms involved and their sensitivity to antimicrobials which are available locally.

Aims and Objectives

- To identify the bacteria involved in chronic dacryocystis in adults.
- To determine the antibiotic sensitivity pattern of bacteria isolated from the lacrimal sac in patients of chronic dacryocystitis.

Materials and Methods

Present study was a hospital based prospective analytical study of 50 cases of chronic dacryocystitis, who were admitted in a tertiary care teaching institute in western Maharashtra during the period September 2015 to August 2016.

Inclusion criteria:

- Clinically diagnosed adult cases of chronic dacryocystitis having mucoid or purulent discharge, undergoing dacryocystectomy.

Exclusion criteria:

- Cases of congenital dacryocystitis were excluded.
- Patients who have received treatment in the form of either topical or systemic antibiotics during the past one week before presenting to the hospital were also excluded.

The patients were diagnosed to have chronic dacryocystitis on the basis of history of excessive watering from eyes with sticky discharge, discharge of pus, matted eye lashes or presence of swelling between the nose and eye. The cases were selected after carrying out complete eye examination with special importance to the fullness in the lacrimal sac area. Pressure was applied over the lacrimal sac area to study the nature of regurgitant. An informed consent was taken prior to carrying out investigations. Clinically relevant investigations like complete blood count, blood sugar levels (fasting and post-prandial) were carried out. Demographic factors like age and sex were noted.

Dacryocystectomy surgey of the selected cases was carried out. During the surgery, lacrimal sac was extirpated and placed over a sterile kidney-trey. The contents of the lacrimal sac were collected by using sterile swab sticks, using all aseptic precautions in order to avoid contamination of the sample. Preoperative conjunctival and nasal swabs from the same side were also collected using aseptic precautions. Each swab was placed in a separate sterile container and they were sent immediately for culture to the microbiology laboratory.

Each sample collected (on sterile swab-stick) from the lacrimal sac, conjunctival sac and nasal cavity was used for Gram's staining and also for inoculation into culture media like BHI broth, Blood Agar and Chocolate Agar plates. The inoculated BHI broth and Blood Agar were incubated at 37º C for 24 to 48 hours. Chocolate Agar plates were incubated at 37º C for 24 to 48 hours in the presence of 5-10 % carbon dioxide. After 24 hours of incubation, the plates were taken out from incubator and the colonies were examined for isolation and identification of organisms. In case of mixed growth, the Gram's stain was done separately from the morphologically-different colonies and the colonial characteristics were studied. The different colonies from

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which Gram's staining was done were further sub-cultured according to the Gram's staining nature and characteristics.

If the colonies were smooth, round and white/cream in color and Gram positive cocci in clusters then it was inoculated on Mannitol Salt Agar. If the colonies were rough, Gram positive and in short or long chains and haemolysis was produced, it was sub-cultured on Blood Agar. If the colonies were Gram negative, then it was sub-cultured on Mac-Conkey Agar.Identification of the micro-organisms was done using various biochemical as well as routine tests. Biochemical tests were included in order to identify Gram positive (Catalase, Coagulase, VP etc) and Gram negative bacteria (Catalase, Oxidase, SIM, TSI, Urease, O/F etc). The culture plates incubated for aerobic organisms were examined after overnight incubation. Identification of organisms was done by the standard microbiological technique which involves colony morphology, staining reaction and different biochemical properties. On staining reaction, Gram positive organisms appeared violet in colour while Gram negative organisms appeared pink in colour.The antibiotic susceptibility pattern was done by Kirby-Bauer disc diffusion method. Antibiotic discs were placed aseptically on a Muller-Hinton Agar (MHA) plate swabbed with test bacteria pre-grown to Mac-Farland Standard in nutrient broth (NB). The plate was then incubated at 37º C for 24 hours. The zone of inhibition (ZOI) around the disc was measured with a ruler and compared to standard interpretation charts. The quality of each test was maintained by using standard procedures. The quality of each agar plate prepared was ensured by incubating one plate of each lot in the incubator. Control strains of E. coli (ATCC 25922) and staphylococcus aureus (ATCC 25923) were used for the standardization of the Kirby-Bauer test and also for correct interpretation of the zone of diameter. The quality of the sensitivity tests was maintained by maintaining the thickness of MHA at 4 mm and the pH at 7.2-7.4. Strict aseptic conditions were maintained while carrying out all the procedures.

Results

Table No.1: Age and sex wise distribution of the cases:

Age in years	**Male**	**Female**	**Total**
41-50	2	7	**9(18%)**
51-60	1	6	**7(14%)**
61-70	8	20	**28(56%)**
71-80	2	4	**6(12%)**
Total	**13**	**37**	**50**
Mean ± SD	63.25±7.14	61.61±7.05	62.65±7.87

A total of 50 adult patients were included in the study, of which 13 were males and 37 were females. Age and sex distribution of cases is shown in Table 1.

The largest number of cases of chronic dacryocystitis were from the age group of 61-70 years. Second largest age group was 41-50 years. Age group with least number of cases was 71-80 years.

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Table 2: Distribution of affected side

Affected side	No. of cases (%)
Left	24(48%)
Right	26(52%)
Total	50

Majority of cases were having right sided chronic dacrycystitis as shown in Table 2.

Table 3: Distribution of kajal users among patients.

	No. of cases (%)
Kajal users	9(18%)
Non-Kajal users	41(82%)
Total	50

Nine out of 50 patients were kajal users [Table 4]. The kajal users were females and all of them were below 55 years of age.

Table 4: Distribution of culture positive samples.

	Total samples	**Culture Positive samples**	**Sterile samples**
Conjunctival sample	50	42 (84%)	8 (16%)
Lacrimal sample	50	47 (94%)	3 (6%)
Nasal sample	50	43 (86%)	7 (14%)

A total of 52 (87%) and 53 (88%) culture positive samples were obtained from each of conjunctival sac and nasal cavity respectively. Out of the 60 lacrimal swab cultures, no growth was obtained in three cultures, thus only 57 lacrimal sac cultures were positive for bacterial growth.

Table 5: Distribution of mono-microbial and bi-microbial growths

	Conjunctival Samples		**Lacrimal Samples**		**Nasal Samples**	
	Mono-microbial Growth	Bi-microbial Growth	Mono-microbial Growth	Bi-microbial Growth	Mono-microbial Growth	Bi-microbial Growth
Number of Samples	38	4	42	5	39	4

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In the present study, we have collected pre-operative samples from conjunctival and nasal mucosa and intra-operative samples from lacrimal sac. We have obtained 38 mono-microbial growths and 4 bi-microbial growths from conjunctival samples; 42 mono-microbial growths and 5 bi-microbial growths from conjunctival samples ; 39 mono-microbial growths and 4 bi-microbial growths from conjunctival samples. (Table 6)

Table 6: Distribution of Gram positive and Gram negative bacterial isolates from lacrimal sac.

Sr. no.	Type of Growth	Number of patients	Percentage distribution
1	Gram Positive	20	40%
2	Gram Negative	22	44%
3	Mixed	5	10%
4	Sterile	3	06%
	Total	**50**	**100.00%**

The Gram negative bacterial growths (44%) outnumbered the Gram positive bacterial growths (40%). Mixed growths were observed in 10% of samples and 6% of samples were found to be sterile.

In 24 cases, same organism with same antibiotic pattern had been isolated from both lacrimal sac and nasal mucosa of same side. In 20 cases lacrimal and conjunctival samples showed similar pattern. To ascertain the possibility of acquisition of pathogens causing chronic dacryocystitis from anatomically connected nasal or conjunctival colonizers, the isolates from ipsilateral swab from these two sites were compared to bacterial isolates from lacrimal sac. Comparing the isolates from these two sites with the pathogens by Z test of difference between two proportions, p value indicative of significant association (<0.05) was obtained.

Table 7: Distribution of bacterial isolates obtained from lacrimal cavity.

Sr. no.	Name of Bacteria	Growth Obtained
1	Alpha Haemolytic Streptococcus	7 (13%)
2	Non Haemolytic Streptococcus	7 (13%)
3	Staphylococcus aureus	8 (15%)
4	Coagulase Negative Staphylococcus	3 (06%)
5	Pseudomonas species	8 (15%)
6	Klebsiella species	10 (19%)
7	Citrobacter species	4 (08%)
8	Escherichia coli	1 (02%)
9	Neisseria species	4 (08%)

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Out of the 52 culture positive samples obtained from lacrimal sac, Klebsiella species (19%) was the most commonly found organism, followed by Staphylococcus aureus (15%), Pseudomonas species (15%), Alpha-haemolytic streptococcus (13%) and Non-haemolytic streptococci (13%). Other less common organisms were Citrobacter (8%), Neisseria species (8%), Coagulase negative staphylococcus aureus (6%) and Escherichia coli (2%).

Table 8: Antibitotic sensitivity pattern of Gram positive bacterial isolates from lacrimal sac.

Antibiotics	**Susceptibility of micro-organisms**				**Total**
	Staphylococcus aureus	**CONS***	**Alpha haemolytic Streptococcus**	**Non haemolytic Streptococcus**	
Cefpodoxime	50%	**100%**	**100%**	**100%**	84%
Chloramphenicol	75%	0%	85.7%	85.7%	72%
Ciprofloxacin	50%	66.6%	**100%**	**100%**	80%
Gatifloxacin	62.5%	**100%**	**100%**	71.4%	80%
Gentamycin	87.5%	66.6%	**100%**	85.7%	**88%**
Norfloxacin	62.5%	**100%**	71.4%	85.7%	76%
Ofloxacin	87.5%	66.6%	85.7%	**100%**	**88%**
Penicilline	50%	66.6%	**100%**	71.4%	72%
Polymyxin B	37.5%	0%	14.2%	0%	16%
Sparfloxacin	37.5%	66.6%	57.1%	85.7%	60%
Tobramycin	87.5%	66.6%	85.7%	**100%**	**88%**
Vancomycin	**100%**	66.6%	85.7%	71.4%	84%

*CONS: Coagulase Negative Staphylococci

Staphylococci aureus was found to be 100% sensitive to Vancomycin, and 87% sensitive to Gentamycin, Ofloxacin and Tobramycin.

Coagulase Negative Staphylococci was found to be 100% sensitive to Cefpodoxime, Gatifloxacin and Norfloxacin.

Alpha Haemolytic Streptococci was found to be 100% sensitive to Cefpodoxime, Ciprofloxacin, Gatifloxacin, Gentamycinand Penicilline.

Non Haemolytic Streptococci was found to be 100% sensitive to Cephodoxamine, Ciprofloxacin, Ofloxacin and Tobramycin.

Overall, Gram positive bacteria were found to be most sensitive to Gentamycin (88%), followed by Vancomycin (84%) and Cefpodoxime (84%).

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Table 9: Antibitotic sensitivity pattern of Gram negative bacterial isolates from lacrimal sac.

Antibiotics	**Susceptibility of micro-organisms**						**Total**
	Pseudomonas spp.	**Neisseria spp**	**Klebsiella spp.**	**Escherichia coli**	**Citrobacter spp.**	**Proteus mirabilis**	
Cefpodoxime	26.6%	**100%**	75%	50%	50%	**100%**	59%
Chloramphenicol	33.3%	**100%**	81.2%	**100%**	66.6%	**100%**	67%
Ciprofloxacin	**100%**	**100%**	**100%**	**100%**	83.3%	**100%**	**98%**
Gatifloxacin	93.3%	25%	**100%**	**100%**	**100%**	**100%**	91%
Gentamycin	**100%**	**100%**	**100%**	**100%**	66.6%	**100%**	96%
Norfloxacin	86.6%	**100%**	**100%**	**100%**	83.3%	66.6%	91%
Ofloxacin	86.6%	**100%**	**100%**	**100%**	66.6%	**100%**	91%
Penicilline	0%	75%	81.75%	0%	0%	33.3%	15%
Polymyxin B	60%	**100%**	50%	50%	16.6%	0%	50%
Sparfloxacin	80%	**100%**	93.7%	**100%**	83.3%	**100%**	89%
Tobramycin	86.6%	**100%**	**100%**	**100%**	83.3%	**100%**	93%
Vancomycin	13.3%	**100%**	0%	0%	16.6%	0%	15%

Pseudomonas species was found to be 100% sensitive to Ciprofloxacin, Gentamycin and also 93% sensitive to Gatifloxacin.

Neisseria species was found to be 100% sensitive to Cefpodoxime, Chloramphenicol, Ciprofloxacin, Gentamycin, Norfloxacin, Ofloxacin, Polymycin B , Sparfloxacin, Tobramycin and Vancomycin.

Klebsiella species was found to be 100% sensitive to Ciprofloxacin, Gatifloxacin, Gentamycin, Norfloxacin, Ofloxacin and Tobramycin.

Escherichia coli was found to be 100% sensitive to Chloramphenicol, Ciprofloxacin, Gentamycin, Norfloxacin, Ofloxacin, Sparfloxacin and Tobramycin.

Citrobacter species was found to be 100% sensitive to Gatifloxacin and 83% sensitive to Ciprofloxacin, Norfloxacin, Sparfloxacin and Tobramycin.

Proteus mirabilis was found to be 100% sensitive to Cefpodoxime, Chloramphenicol, Ciprofloxacin, Gatifloxacin, Gentamycin, Ofloxacin, Sparfloxacin and Tobramycin.

Overall, Gram negative bacteria were found to be most sensitive to Ciprofloxacin (98%) and Gentamycin (96%).

Discussion

Chronic dacryocystitis is a commonly encountered infection in practice of ophthalmology. It is commonly seen in patients above 40 years of age. 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. 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.A total of 50 adult patients were included in

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the study. The largest number of cases of chronic dacryocystitis were from the age group of 61-70 years. Second largest age group was 41-50 years. Age group with least number of cases was 71-80 years. Pradeep et al. [7] found the maximum number of patients suffering from chronic dacryocystitis were from age group of 51-60 years. [7] Bhuyan et al. recorded most cases from 4th decade (23.3%) of life, followed by 5th decade (21.6%); while Patel et al. reported the majority of cases from the age group of 50-60 years (43%).[10,11]

The mean age of our patients was 61.3 years. Imtiaz et al. recorded the mean age to be 50.5 (age range: 16-91 years); Chaudhary M. et al. [9] recorded a mean age of about 46.7 years; while Sarkar et al. recorded the mean age to be 49.8 years.

In our study females were more commonly affected than males. Male to female ratio in our study was found to be 1:2.84 . Thirteen of our patients were males while thirty seven were females. Sarkar et al. [13] reported this ratio to be 2.1**:**1 in their study. In our study 73% of cases were females and only 27% were males. Fairly similar results were found in the study conducted by Bhuyan et al., [8] who reported 76.6% of their cases to be females and 23.3% were males. Many other studies conducted by Delia et al., Imtiaz et al., Pradeep et al., Chaudhary M. et al. and Patel et al. also showed female preponderance. [5,6,7,9,11] Traquair mentions two forms of chronic dacryocystitis, primary and secondary. The primary form is common and it is characterized by pronounced sex predilection, occurring in women to the extent of 80% or more. Heridity appears to be the most important factor in its causation; while the secondary form is rare and occurs approximately equally in two sexes and it is due to injury or disease of neighboring parts. [2]

Sarkar et al. [13] suggested that narrow nasolacrimal canal, hormonal factors, pond bathing and applying Kajal/Surma might be responsible for female predilection of the disease. In our study, 18% female patients used to apply home-made kajal/surma, all of whom were below 55 years of age. The kajal was made at home using the soot collected by placing an oiled metal plate over a burning candle. The larger soot particles might have blocked the lacrimal drainage system, which in turn might have given rise to chronic dacryocystitis. Also, the use of finger tips of unwashed hands used to apply kajal might have given rise to the infection.

Hidayat et al. [3] published a case report of 10 patients using eye-liner/kohl/surma, who were having abnormal pigmentation of the conjunctiva and lacrimal sac. The median age of nine women and one man was 52 years (range 40–64 years). All patients had used surma for many years. The two patients with conjunctival pigmentation had bilateral, diffuse pigmentation of the fornicial and tarsal conjunctiva of the upper and lower eyelids in the form of discrete, punctate black deposits. The other eight patients presented with epiphora and had chronic dacryocystitis associated with obstruction of the lacrimal passages, including the lacrimal canaliculi and common lacrimal canaliculus. 52% of our patients had right sided dacryocystitis, while 48% patients had left sided dacryocystitis. Sood et al. noticed no significant difference in the involvement of the right or left lacrimal sacs. Studies conducted by Chaudhary et al. and Patel et al. showed that left sided dacryocystitis to be more common than right sided dacryocystitis. [7,9]

In our study, none of the patients had bilateral dacryocystitis, which correlates with studies conducted by Imtiaz et al, Bhuyan et al. and Patel et al. [6,10,11] Pradeep et al. [7] reported only one case of bilateral dacryocystitis in their study. Badhu et al. and Chaudhary M. et al reported bilateral dacryocystitis in 10% and 17% of cases respectively. [8,9] Delia et al. reported bilateral dacryocystitis to be present in 29% cases. [5]

In the present study, specimens were obtained directly from the lacrimal sac after performing dacryocystectomy in operation theatre itself, 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.

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In the present study, we have collected pre-operative samples from conjunctival and nasal mucosa and intra-operative samples from lacrimal sac. We have obtained 38 mono-microbial growths and 4 bi-microbial growths from conjunctival samples; 42 mono-microbial growths and 5 bi-microbial growths from conjunctival samples ; 39 mono-microbial growths and 4 bi-microbial growths from conjunctival samples.

The Gram negative bacterial growths (44%) outnumbered the Gram positive bacterial growths (40%). Mixed growths were observed in 10% of samples and 6% of samples were found to be sterile. We isolated 10 Klebsiella species (19%), 8 Pseudomonas species (15%), 8 *Staphylococcus aureus* (15%), 7 Alpha haemolytic Streptococci (13%) and 7 Non haemolytic Streptococci (7%). Many Indian studies have reported growth of Gram positive bacteria more frequently than Gram negative bacteria [7]. However, in our study Gram negative bacteria (44%) were more commonly isolated than Gram positive bacteria.(40%). 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.

In 24 cases, same organism with same antibiotic pattern had been isolated from both lacrimal sac and nasal mucosa of same side. In 20 cases lacrimal and conjunctival samples showed similar pattern. This was 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 are not washed out and also they get a good environment for their growth. After statistical analysis of the growth from lacrimal, nasal and conjunctival specimens, we found that there was a significant identicalness between lacrimal, nasal and conjunctival isolates. The statistical analysis pointed that lacrimal pathogens might have arisen from nose or conjunctiva. 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. Use of modern molecular methods like restriction fragment length polymorphism can provide precise matching of the isolates.

In our study, majority of bacteria isolated from lacrimal sac were Gram negative but previous studies state that pathogens implicated in chronic dacryocystitis were more often Gram positive bacteria like CONS, *Staphylococcus aureus* and Streptococci [5-13]. Some studies have also reported Gram negative bacteria like *Pseudomonas*, *Enterobacter*, *Citrobacter* species [14]. Environmental factors in different geographical regions may have a role in determining the microbial pattern of chronic dacryocystitis [5].

Conclusion

Gram negative bacteria were responsible for majority of cases of chronic dacryocystitis. Microorganisms from nasal cavity and conjunctival sac have direct role in pathogenesis of chronic dacryocystitis. Cefpodoxime, a third generation cephalosporin and Ciprofloxacin can be used for oral administration in case of chronic dacryocystitis. Vancomycin and Gentamycin being parenteral drugs can be reserved for severe cases.

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