

# Microbiologic spectrum of acute and chronic dacryocystitis

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## Abstract

• **AIM:** To report the microbiological spectrum of acute and chronic dacryocystitis.

• **METHODS:** Retrospective study on 100 patients who presented to the ophthalmic plastic clinic of a tertiary eye care center from May 2011 and April 2013 with acute and chronic dacryocystitis was reviewed for demographic and microbiological profile. The culture results and organisms isolated were recorded.

• **RESULTS:** Sixty patients had acute onset and the remaining 40 patients had chronic onset dacryocystitis. The female to male ratio was 1.78. The mean age of patients was 44y. Gram –positive organisms were the most commonly isolated accounting for 54% , and the commonest species isolated was *S. aureus* in 26% . Percentage of gram positive cultures was higher in chronic dacryocystitis than acute ones (82% vs 48% of positive cultures;  $P=0.003$ ). Also in culture positive acute dacryocystitis, gram negative species were found in 52% of eyes but only in 18% of chronic dacryocystitis.

• **CONCLUSION:** Gram negative bacteria, culture negative samples, unusual and more virulent organisms are more common in acute dacryocystitis than chronic ones. The results of this study have significant bearing on the treatment of patients with dacryocystitis.

• **KEYWORDS:** epiphora; dacryocystitis; acute; chronic; bacteriology

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## INTRODUCTION

Under normal conditions, the mucosa of the lacrimal sac is highly resistant to infection. However, infections of the sac and dacryocystitis can be triggered by distal obstruction of the nasolacrimal duct <sup>[1]</sup>. Dacryocystitis might present in two forms. Acute dacryocystitis is an acute inflammation of the lacrimal sac with tenderness and erythema of the overlying tissues and 23% of eyes might present with lacrimal abscess <sup>[1,2]</sup>. Chronic dacryocystitis is more common than acute dacryocystitis and has several stages of presentation like epiphora, mucoid discharge, conjunctival hyperaemia and chronic conjunctivitis <sup>[1]</sup>. The reason for different presentation may be related to microbial pathogenesis of dacryocystitis and there are patterns of geographical variation in the microbiology of acute and chronic dacryocystitis. Additionally, different nasal pathologies seem to have a crucial role in developing dacryocystitis <sup>[1-4]</sup>.

There are relatively few studies about the microbiologic characteristics of lacrimal sac infections. Most of them have studied a specific type of infection, and only few studies have compared acute and chronic infections. Gram positive organisms have been predominant in most studies, but some recent studies have suggested an increasing frequency in gram negative organisms <sup>[1,3,5-7]</sup>. Therefore, there are concerns about changing trends in the microbiologic spectrum of dacryocystitis <sup>[5,6]</sup>.

Untreated lacrimal abscess can progress and it is important for the ophthalmologists to know the presence of nasolacrimal obstruction and the potential organisms inoculated there before planning any intraocular procedure because of the potential risk of endophthalmitis. Therefore, it is important to know the underlying etiology, typical infectious organisms and the antibacterial treatment of dacryocystitis.

Hence, this study was conducted to understand the etiological organisms of these diseases to contribute to the choice of more effective antibiotics.

## SUBJECTS AND METHODS

**Subjects** In this retrospective study we included patients

with acute and chronic dacryocystitis who underwent microbiological evaluation presenting between May 2011 and April 2013 at a tertiary center, Farabi Eye Hospital, Tehran, Iran. The study was performed with the agreement of ethics committee and in accordance with the ethical guidelines of the Declaration of Helsinki. Written informed consents were obtained from all participants.

Patients were examined by an ophthalmologist, and cases of dacryocystitis were identified and categorized as acute or chronic, based on their history, signs and symptoms. Acute dacryocystitis was diagnosed in patients with pain, redness, and swelling in the lacrimal sac area. Chronic dacryocystitis was diagnosed in patients with persistent epiphora and regurgitation of mucoid or mucopurulent material on pressure over the sac area or during irrigation of the lacrimal drainage system.

All cases of pseudoepiphora and epiphora caused by diagnoses other than nasolacrimal duct obstruction, patients with any history of previous infection, maxillofacial surgery, or maxillofacial trauma and the patients who had received any topical or systemic antibiotics for the past one week during their visit to the hospital were excluded.

**Methods** After aseptically cleaning the surrounding area, specimens for microbiological analysis were obtained by sterile cotton swabs from the lacrimal sac, by applying pressure over the lacrimal sac and allowing the purulent material to reflux through the lacrimal punctum. In cases of acute dacryocystitis, along with the swabs, pus discharge following incision and drainage was also taken. We also cultured specimens from 40 people of normal population who had come to the clinic for evaluations other than nasolacrimal obstruction. The specimens were obtained by wiping a swab across the lower conjunctival cul-de-sac and punctum by applying pressure over the lacrimal sac area. Swabs were inoculated immediately on plates of 5% sheep blood agar, chocolate agar and Sabouraud's dextrose agar (SDA). Blood agar and chocolate agar were incubated at 37°C, while SDA was incubated at 25°C. The plates were observed daily for the presence of any growth up to 7d. The isolated organisms were identified by using standard procedures.

**Statistical Analysis** Chi-square ( $\chi^2$ ) distribution was used to test the qualitative distribution. A *P* value <0.05 was considered as a significant association between the variables which were tested.

## RESULTS

A total of 100 eyes from 100 patients were enrolled in this study. Sixty patients (60%) had acute onset and the remaining

**Table 1** Number of patients with acute and chronic dacryocystitis in different age groups

Age group (a)	Acute dacryocystitis	Chronic dacryocystitis	n(%)
5-30	21 (35)	1 (2.5)	
31-60	29 (48)	29 (72.5)	
61-90	10 (17)	10 (25)	

40 patients (40%) had chronic onset dacryocystitis.

There were 36 males (36%) and 64 females (64%). The female to male ratio was 1.78. Female predominance was observed in both acute (37 of 60; 61.7%) and chronic cases (27 of 40; 67.5%). Although the percentage of females was higher among chronic dacryocystitis, it was not significant. (*P*=0.554)

The mean age of patients was 44y (ranging from 5 to 86y). Fifty eight of total patient were between 30 and 60 years old (58%). Twenty one patients among the acute dacryocystitis group were younger than 30 years old but in chronic group, only one patient was younger than 30 (Table 1).

Fifteen patients (15%) had no growth in the cultures, 85% were culture positive with 54 patients (54%) gram positive, 24 patients (24%) gram negative, 6% mixed and one case of aspergillus. All the 15 culture negative cases were in the acute group. Of the 85 eyes with positive growth, in 69 eyes only one organism was isolated but in remainder 16 eyes, 2 organisms were isolated. Percentage of gram positive cultures was higher in chronic dacryocystitis (33 of 40; 82.5%) than acute ones (21 of 44 culture positive ones; 47.7%). The difference was statistically significant (*P*<0.05). There were 6 cultures of mixed gram positive and gram negative bacteria that 5 of them were in the acute group.

Of the total 85 culture positive cases 15 different organisms were isolated. The commonest organism was *S. aureus* that was isolated in 22 (26%) of positive cultures (17 cases of acute and 5 cases of chronic dacryocystitis). The second one was *S. epidermidis* 21 (24.7%) cultures (19 in chronic and 2 in acute dacryocystitis) and the third was *S. viridans* in 18 cultures (21.2%). These three organisms were 45 of 54 gram positive (83.3%) isolates detected in the cultures. The rest of gram positives isolated were *bacillus cereus*, *S. saprophyticus* and diphtheroid. The commonest gram negative organism isolated was klebsiella (9 cases; 11%). The other gram negative organisms were hemophilus, ecoli, neisseria, pseudomonas aeruginosa, citrobacter, enterobacter and non fermentated gram negatives (Table 2). In culture positive acute dacryocystitis, gram negative species were found in 52% of eyes but only in 18% of chronic dacryocystitis (*P*=0.000).

Parameters	Acute dacryocystitis	Chronic dacryocystitis	n(%)
Gram positive			
<i>S. aureus</i>	17 (35)	5 (10)	22 (22.5)
<i>S. epidermidis</i>	2 (4)	19 (38)	21 (21.5)
<i>S. saprophyticus</i>	0 (0)	3 (6)	3 (3)
<i>S. viridance</i>	8 (17)	10 (20)	18 (18.5)
<i>Bacillus cereus</i>	0 (0)	2 (4)	2 (2)
Diphtheroid	0 (0)	4 (8)	4 (4)
Gram negative			
Haemophilus	3 (6)	1 (2)	4 (4)
Neisseria	2 (4)	0 (0)	2 (2)
Klebsiella	4 (8)	5 (10)	9 (9)
Enterobacter	1 (2)	0 (0)	1 (1)
Pseudomonas aeruginosa	2 (4)	0 (0)	2 (2)
Citrobacter	4 (8)	0 (0)	4 (4)
Ecoli	2 (4)	1 (2)	3 (3)
Non-fermentative gram neg	2 (4)	0 (0)	2 (2)
Aspergillus	1 (2)	0 (0)	1 (1)
Total	48 (100)	50 (100)	98 (100)

In the group of normal population, we had 23 females (57.5%) and 17 males (42.5%). They were relatively similar in age to our dacryocystitis groups (ranging from 14 to 80 years old). In their cultures, 15 isolates of *S. epidermidis* (37.5%) and 2 isolates of *S. saprophyticus* (5%) were observed. The other 23 cases (57.5%) were culture negative.

## DISCUSSION

In this study we compared the demographic and microbial etiology of acute and chronic dacryocystitis. Acquired nasolacrimal duct obstruction usually occurs in middle-aged or older people with a 3:1 female preponderance [1,4,5]. Similarly in our study, 78% of all cases (97% of chronic and 65% of acute ones) were older than 30y, consistent with prior studies. In this study the patients younger than 30 years old were significantly more in acute dacryocystitis than in the chronic group (35% vs 2.5%, respectively). Almost similar results were also reported in Bharathi *et al*'s [4] study (23.6% vs 10% respectively).

The female-to-male ratio in this study was 1.78 without a significant difference in the ratio between acute and chronic groups. However, higher rates of both acute and chronic dacryocystitis have been reported in previous studies among women [1,3].

The spectrum of bacterial pathogens may differ from region to region, but the general trend in previous studies reflect the predominance of gram positive organisms in both acute and chronic dacryocystitis and the most common of them staphylococcal species (mostly *S. aureus*, *S. pneumoniae*, and

*S. epidermidis*) [3-8]. In our study gram positive cocci were found in 53% of all culture positive cases, that most of them (81% of them) were staphylococcus spp. Gram negative species accounted for 28% of culture positive cases, that one third of them (8 cases) were klebsiella spp. In the previous reports, there is a variable predominance in gram negative isolates like haemophilus, pseudomonas aeruginosa, ecoli and *corynebacterium diphtheria* [2,8-12]. We observed some unusual isolates like citrobacter, neisseria and enterobacter that most of them were found in acute dacryocystitis. In Eshraghi *et al*'s [13] prior study as well, neisseria, klebsiella and citrobacter were found in 2 cases of acute dacryocystitis with empyema.

The prevalence of organisms responsible for acute and chronic dacryocystitis was significantly different in our study. An analysis of bacterial spectrum of acute and chronic dacryocystitis suggests that more virulent organisms and those that are less common among nasolacrimal duct normal flora are responsible for acute onset of dacryocystitis. As it was observed in our study, *S. aureus* was significantly more prevalent in acute dacryocystitis (35% vs 10%) but *S. epidermidis* was more prevalent in chronic dacryocystitis (38% vs 4%). Also more gram negative species were found in culture positive acute dacryocystitis, compared to chronic dacryocystitis.

Almost similar results can be observed in some of previous studies [12,14-16]. Briscoe *et al* [12] exclusively studied acute dacryocystitis in 39 patients and found the predominance of gram-negative isolates (61%) with *P. aeruginosa* being the

commonest isolate. On the other hand another study found that chronic dacryocystitis in adults was associated with an increased proportion of Gram negative bacteria<sup>[17]</sup>. It might be an ethnicity difference in the bacteriology of dacryocystitis.

However, in our study there were 15 culture negative cases that all were in acute group. A similar result has been shown by Razavi *et al*<sup>[11]</sup> study (23.1% culture negative in acute vs 3.8% in chronic dacryocystitis).

There were also some limitations in this study. The first is that the true incidence and prevalence of bacterial pathogens in dacryocystitis could not be estimated in our study because only specimens sent to the laboratory for microbiological evaluation were included in this study. The second was that the specimens were not cultured in anaerobic media, and maybe it is responsible for some of the culture negative cases<sup>[8]</sup>. The other is the sample taking technique. It is a controversial issue in the literature, although puncture and aspiration of the lacrimal sac is considered as the technique of choice but other techniques like obtaining the sample from the mucopurulent discharge of lacrimal sac from punctum or irrigating the lacrimal duct have been used in previous studies as acceptable techniques<sup>[4,16,17]</sup>. In these studies similar to our study, specimens were obtained by wiping a broth-moistened swab across the lower conjunctival cul-de-sac after applying pressure over the lacrimal sac area and there is a possibility of contamination and inoculation of conjunctival flora along with the lacrimal secretions.

In conclusion, in our study the responsible organisms are significantly different in acute and chronic dacryocystitis. Gram negative bacteria, culture negative samples, unusual and more virulent organisms are more common in acute dacryocystitis than chronic ones. As it is necessary to treat acute dacryocystitis, appropriate coverage of these organisms should be considered especially in cases of lacrimal abscess<sup>[18-20]</sup>.

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