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Frequency of Bacterial Samples from Patients with Chronic Acquired Nasolacrimal Duct Obstruction

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ABSTRACT

Introduction: Dacryocystitis is an infection of lacremical sac due to obstruction of nasolacrimal duct which has primary or secondary causes. Idiopathic inflammatory obstruction is the primary cause. Trauma, infection, inflammation, neoplasia, and mechanical obstruction are secondary one. **Aim:** The objective of this study is determination of bacterial samples from patients with chronic acquired nasolacrimal duct obstruction. **Methods:** This cross-sectional study was contained 90 patients with dacryocystitis from 2010 to 2011, in Besat hospital. Convenience sampling in sterile condition sampling was performed by sterile swab from the pus out of the lacrimal sac. Blood agar, EMB, chocolate agar, and thioglycolate broth were used for bacterial cultivation. Various antibiotics were used for antibiotic resistance study. Finally, statistical analysis was done by SPSS ver. 15. **Results:** In this study, the mean age of participants was 49.36 ± 12.18 years. Number of male and female patients was equal and Sampling was performed in 53.3% of patients from the right eye. The most frequent bacteria were *Staphylococcus*, *E. coli*, and *Enterobacteriaceae*, respectively. Also, our results show most of bacteria obtained from patients eye pus are sensitive to chloramphenicol and the most antibiotic resistance was for co-trimoxazole. **Conclusion:** Our results illustrated gram-positive bacteria have an important role in dacryocystitis which is confirm previous studies. Although our results indicated chloramphenicol is the best choice for treatment process, but it is notable due to the variety of bacteria which can cause this disease, identification of bacterial contamination can be a great help to choose the best treatment process.

Keywords: Dacryocystitis, Lacremical sac, Antibiotics, Gram-positive bacteria, Patient.

1. INTRODUCTION

Dacryocystitis is an infection of lacremical sac due to obstruction of nasolacrimal duct which has primary or secondary causes. Idiopathic inflammatory obstruction is the primary cause. Trauma, infection, inflammation, neoplasia, and mechanical obstruction are secondary one (1).

Clinical features of this disease is pain, swelling, redness over the lacrimal sac at medial canthus, tearing, crusting, fever, digital pressure over the lacrimal sac may extrude pus through the punctum. It is notable that, in chronic cases, tearing may

be the only symptom. About 60 percent of initial attacks of dacryocystitis will recur. Individuals with a poorly functioning immune system (immunocompromised) may develop orbital cellulitis, which may lead to optic neuritis, proptosis, motility abnormalities, or blindness (2, 3).

Stopping the flow of tears due to obstruction cause accumulation of debris in lacremical sac which can be a suitable place for the growth of microorganisms (4). Congenital dacryocystitis can be seen in 2-6% of infants due to absence of nasolacri-

mal canal. Also it can be adventitious in older ages which are acute or chronic (5).

Chronic dacryocystitis is usually because of complete or partial obstruction in a single location of lacrimal sac or nasolacrimal duct (6). Infection of lacrimal sac commonly occurs in two separate age groups, infants and adults more than 40 years old. Chronic dacryocystitis is more common in women. Studies show 70-83% of adventitious dacryocystitis is occurred in women and this is while there is no difference in gender for congenital one. Dacryocystitis microbiological studies have shown variety of bacteria in chronic dacryocystitis which *Streptococcus pneumonia* and *Staphylococcus* spp. are the most common of them (7). Also fungal infection by *Candida albicans* and *Aspergillus* spp (8) have been reported in rare cases. Fungi are almost separated in 5% of adventitious dacryocystitis patients and in 15% of congenital. Studies on fungal infection of chronic dacryocystitis do not show any specific results (9).

It is important to note that, the number of fungal infections of lacrimal system has increased rather than the past. One thing that can explain this phenomenon is that the numbers of patients suffer from immune system weakness and HIV has been increased. Immune response to the fungal infection is related to innate immune system (neutrophils and monocytes) which is weak in this type of diseases. In addition, the use of broad-spectrum antibiotics increased fungal infection and changed microbial flora (10).

On the other hand, timely and appropriate treatment of lacrimal system infection is important to prevent complications such as endophthalmitis after cataract and glaucoma surgery which are the most common intraocular surgery in the world. It is notable that the surgery should be postponed, if there is obvious infection in ocular adnexal and lacrimal system. Also, obstruction of lacrimal system is more common with age. These patients suffer from symptoms such as epiphora and pus draining from lacrimal sacs but by became older and gradual decline in tear secretion these symptoms will be seen less. Even sometimes lacrimal duct obstruction occurs without any obvious clinical symptoms. So it is important to have an attention to preoperative history of these patients to reduce the risk of postoperative endophthalmitis (11-13). The incidence of endophthalmitis after cataract surgery in adults is 60-70 cases in 1000 surgery and 0.35% has been reported as its average that will be increased after glaucoma surgery (14, 15).

Dacryocystorhinostomy is a surgical procedure to restore the flow of tears into the nose from the lacrimal sac and one of the main therapeutic procedures in adults (16). The operation can be performed endoscopically through the nose where an opening is fashioned in the lacrimal sac from within the nose. The advantages include lesser peri-operative morbidity, and no scar. Data suggests a slightly lower success rate than the "traditional" technique. With the advent of nasal endoscopes, endoscopic dacryocystorhinostomy is becoming popular. In this procedure, a nasal endoscope is used to visualize the lacrimal sac through the nasal cavity. The bone cov-

ering the lacrimal sac is nibbled out. The medial wall of the sac is incised or excised, facilitating drainage of tears into the nasal cavity (17). It should be noted that it is necessary to use an antibiotic and anti-fungal coating after surgery to prevent recurrence (18).

Considering the importance of the lacrimal system infections, especially in patients with chronic obstructive acquired nasolacrimal duct and identification of bacteria which are involved in this disorder to provide appropriate therapeutic strategy, this study designed to study the frequency of bacteria in these patients.

2. MATERIALS AND METHODS

In these cross-sectional study 90 patients with infection of lacremical sac, dacryocystitis, from 2010 to 2011, in Besat hospital, were recruited. Convenience sampling in sterile condition from lacrimal sac was used in this study. Having diabetes or immunodeficiency in addition to dacryocystitis and using no antibiotic 2 weeks before sampling were this study's inclusion criteria.

After registration of demographic data, sampling was performed by sterile swab from the pus out of the lacrimal sac. The exact time of sampling were recorded. Various media was used for bacterial cultivation. These media were blood agar, EMB, chocolate agar, and thioglycolate broth.

Blood agar and EMB media were incubated in 37°C for 24 h and chocolate agar medium was incubated in specific CO₂ concentration. Thioglycolate broth medium was used for anaerobic bacteria that may cause infection in 37°C incubator for 72 h. Biochemical tests were performed to identify bacteria in the case of colonies formation on the media. Various antibiotics such as amikacin, chloramphenicol, cefazolin, co-trimoxazole, vancomycin, doxycycline, tetracycline, erythromycin, and gentamycin were used for studying the bacteria antibiotic resistance.

SPSS ver. 15 was used for statistical analysis. Kolmogorov-Smirnov test for quantitative variables and chi-square test was used to evaluate the qualitative variables.

3. RESULTS

In this study, the mean age of participants was 49.36 ± 12.18 years which min and max ages were 19 and 66 respectively. Number of male and female patients was equal (45 patients for each gender). Sampling was performed in 53.3% of patients from right eye.

Studying the type of obtained smear from pus of patients eyes in sterile condition was shown 46.7%, 6.7%, 16.7%, and 30% of smears were negative (normal), gram

Bacterial species	Number of female patients	Number of male patients	Frequency in female (%)	Frequency in male (%)	Frequency in all patients (%)
Staphylococcus	24	24	53.3	53.3	53.3
E. coli	12	9	26.7	20	23.3
Enterobacteriaceae	3	9	5.7	20	13.3
Pseudomonas	6	0	13.3	0	6.6
Streptococcus	0	3	0	6.7	3.3

Table 1. Bacterial species frequency

Antibiotic	Resistance frequency		Relative resistance frequency		Sensitivity frequency		Experimental error frequency	
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
Amikacin	36	40%	-	-	54	60%	-	-
Chloramphenicol	9	10%	12	13.3%	69	76.7%	-	-
Cefazolin	39	43.3%	9	10%	39	43.3%	3	3.3%
Co-trimoxazole	75	83.3%	6	6.7%	9	10%	-	-
Vancomycin	33	36.7%	9	10%	45	50%	3	3.3%
Doxycycline	42	46.7%	36	40%	12	13.3%	-	-
Tetracycline	63	70%	21	23.3%	6	6.7%	-	-
Erythromycin	39	43.3%	12	13.4%	39	43.3%	-	-
Gentamycin	15	16.7%	12	13.3%	60	66.7%	3	3.3%

Table 2. bacterial antibiotic resistance results

positive coccus, gram negative bacillus, and gram positive coccus with gram negative bacillus, respectively. The frequency of bacterial species was studied. Table 1 shows this frequency according to gender of patients.

Various antibiotics were used for bacteria antibiotic resistance test and the results can be seen in the Table 2. Results show most of bacteria obtained from patients eye pus are sensitive to chloramphenicol and the most antibiotic resistance was for co-trimoxazole.

4. DISCUSSION

Dacryocystitis is an infection of the lacrimal sac, secondary to obstruction of the nasolacrimal duct at the junction of lacrimal sac. It causes pain, redness, and swelling over the inner aspect of the lower eyelid and epiphora. When nasolacrimal duct obstruction is secondary to a congenital barrier it is referred to as dacryocystocele. (19) The mainstays of treatment are oral antibiotics, warm compresses, and relief of nasolacrimal duct obstruction by dacryocystorhinostomy. Considering to the main cause of this disease which is a bacterial infection, bacterial identification and their antibiotic resistance have special importance for treatment and preventive treatment of dacryocystorhinostomy (20).

Our results show the mean age of patients were 49.36 ± 12.18 and there was not any special differences between patient's gender and the affected eye side. Smear results showed negative results (normal) in 46% of samples which means smear results are not useful for diagnosis, but bacterial cultivation results were positive for all patients.

Mj Bharathi et al. (2007) reported that the most common bacteria in chronic dacryocystitis are *Staphylococcus epidermidis* (42.2%), *Staphylococcus aureus* (10.8%), and *Streptococcus pneumonia* (10%) which are all gram-positive bacteria (21). This results repeated in our study too. Our results showed staphylococcus species and gram-positive have the most frequency in patient's eye pus. The results of Chaudhry et al in 2005 showed same bacterial frequency too. They stated that gram-positive bacteria especially staphylococcus species had the most frequency in their patients (22).

DM Mills et al designed a research on 16 ophthalmology center in USA. Their research contained 89 participants. Their results illustrated gram-positive bacteria

especially *Staphylococcus* were more frequent on pus of chronic and acute dacryocystitis eyes rather than gram-negative. They showed that the methicillin-resistant *Staphylococcus aureus* was more frequent in acute dacryocystitis (1).

Like our results, in a research that was conducted in 1992 by Huber-Spitzy et al in Australia, it was shown that staphylococcus species have the most frequency among bacteria obtained from patient's lacremical sac and between gram-positive bacteria. They also found a significant amount of gram-negative bacteria in which *E.coli* was the most common bacterium among them (10). While, Chaudhry et al, reported *Haemophilus influenza* as a most common gram-negative bacterium obtained from their patients in Saudi Arabia (22).

In this study various antibiotics were tested for studying the bacteria antibiotic resistance. Our results demonstrated the highest percentage of microorganism's sensitivity to antibiotics was for Chloramphenicol (76.7%), Gentamycin (66.7%), and Amikacin (60%), respectively, and these microorganisms had more resistance to Co-trimoxazole (83.3%) and Tetracycline (70%).

Mj Bharathi et al showed that their bacterial samples form lacremical sac had more sensitivity to Gatifloxacin (96.5%), Ofloxacin (94.8%), and Amikacin (91.1%). They also illustrated that bacterial from chronic dacryocystitis have more resistance to antibiotics rather than bacterial from acute one (21).

In contrast to the results obtained in this study and other studies, D Briscoe et al, (2005) in a study in Israel found more gram-negative bacteria. Their study showed obtained bacteria has more sensitivity to Ceftazidime (95%), Ciprofloxacin (86%), and Cefuroxime (50%), respectively (23).

5. CONCLUSION

In, the results obtained in this study show that gram-positive bacteria are the majority of bacteria causing dacryocystitis, which is confirming previous studies. Although there is some results from other studies in contrast to our results regarding the prevalence of bacteria. It can be concluded that the type of bacterial infection can be linked to environmental conditions. On the other hand, this study showed that the best antibiotic for treatment of dacryocystitis is Chloramphenicol. It should be noted that due to the variety of bacteria which can cause this disease, identification of bacterial contamination can be a great help in the treatment process.

• **Conflict of interest:** none declared.

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