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Original Research Paper

Ophthalmology

BACTERIOLOGICAL PROFILE OF THE LACRIMAL SAC IN DACRYOCYSTITI

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ABSTRACT

In our routine ophthalmology practice it is very common to come across lacrimal sac infections. Lacrimal sac infections most commonly presents with watering from the eye either associated with or without discharge, which can be assessed by applying pressure over the lacrimal sac.1 It is important to analyse the microbial spectrum in cases of lacrimal duct obstruction along with sac infection. It was noted that gram positive organisms are the most common source of infection. Among the gram positive organisms it is the Staphylococcal species mainly the Staphylococcus aureus which is responsible. Other gram positive organisms include Staphylococcus epidermis and Streptococcus pneumonia. Among the gram negative organisms the most common ones are the Pseudomonas aeruginosa, Hemophillus influenza, and Klebsiella. Anaerobic organism like Propionibacterium and fungi like Candida are very rare. It is equally important to assess the sensitivity of the organism to various drugs. A better understanding of the drug sensitivity is important in the management of lacrimal sac infections. It was found out that gram positive organisms are sensitive to vancomycin,ofloxacin, gatifloxacin and chloramphenicol while gram negative organisms showed sensitivity to mainly tobramycin.

KEYWORDS : lacrimal sac, dacryocystitis, microbial analysis.

INTRODUCTION

It is very common to come across lacrimal sac infections in one's day to day practice as an ophthalmologist. Among the entire lacrimal system , infection of the lacrimal sac is the most common and is known as dacryocystitis. It is of two types- acute and chronic. Acute dacryocystitis often presents with pain, fever, and periocular swelling and shows signs of inflammation. Whereas in chronic dacryocystitis the patient complains of constant watering from the eye associated with or without regurgitation of mucoid or mucopureulent discharge. The patency of the lacrimal duct can be tested by applying pressure over the lacrimal sac area or by irrigating the lacrimal drainage system. The discharge that we obtain from the lacrimal puncta is then taken for microbial analysis. Multiple studies have been done in various parts of the world to get a better understanding of the bacteriological spectrum after taking swab culture from the conjunctiva and the lacrimal sac.

MATERIALS AND METHODS

A meta analysis and review of literature on various studies which were previously done regarding the microbial analysis and the drug sensitivity and resistance was performed. Various search engines and thesis were also evaluated in detail to get a better understanding of the current status.

ANATOMY

LACRIMAL SAC

The lacrimal sac is situated in the lacrimal fossa. The lacrimal fossa is bonded in front by the frontal process of the maxillary bone and behind by the lacrimal bone. The thickness of the lacrimal bone can vary from one individual to another but in most cases the lacrimal bone is thinner than the maxillary bone. [2]The lacrimal bone can be visualized intranasally as it lies anterior to the uncinate process of the ethmoid bone. The lacrimal sac is lined by a double layered epithelium and it is divided into two parts –a fundus superiorly and a body inferiorly. The fundus starts 3 to 5 mm above the superior part of the medial canthal tendon while the body starts around 8 - 10 mm below the fundus to the osseous opening of the nasolacrimal canal. Near the posterior lacrimal crest ,the orbital periostum splits and encloses the lacrimal sac and forms the lacrimal fascia. The larimal fascia is surrounded by the fibres of the orbicularis oculi muscle .Between the lacrimal sac and the lacrimal fascia lies a rich venous plexus. The mucosa which lines the lacrimal sac helps to prevent colonization of microorganisms and thereby infections. The epithelial cells bind tightly to one and another and protect the underlying tissues from the invading organisms .These epithelial cells also protect the sac by secreting immunoglobulin A, anti-infection peptides and mucins. Apart from these primary defense mechanism ,the lacrimal drainage associated lymphoid tissue (LDALT)[3] also protects the sac and forms the second line of defense.

NASOLACRIMAL DUCT.

The lacrimal sac continues downwards into a duct called the nasoclarimal duct. The NLD has a intraosseous part which lies superiorly and is about 12 mm and an inferiors 5 mm membranous portion. The diameter of the bony canal is 1 mm. The bony part travels posterolaterally within the maxillary bone while the membranous part runs through the nasal mucosa. The nasolacrimal duct finally opens into the inferior meatus under the inferior nasal turbinate. At the opening of the NLD lies the valve called the valve of Hasner. Similar to the double layer epithelium of the lacrimal sac, the NLD also has two layer lining. The mucin of the epithelial lining influences the tear fluid seceretion and also acts as an antimicrobial protective agent apart from helping in the transport of the tear fluid.

MICROBIOLOGY

A study of the patients having chronic dacryocystitis among adults was done to understand the bacterial growth. It was seen that gram positive organism were the most common ones. Among the gram positive organisms, Staphylococcus aureus (42%) was most common followed by Staphylococcus epidermis (10%) and then Staphylococcus pneumoniea(10%). With regards to gram negative organisms Pseudomonas aeruginosa(18%) was very common. It was seen that chronic dacryocystitis was more prevalent among females compared to males and it was more common in the left eye. It was also more commonly seen among lower socioeconomic strata with poor hygienic conditions. Nasal pathologies like hypertrophied inferior turbinates, deviated nasal septum, nasal polyp and allergic rhinitis were also attributing factors. In a study done by Das et al, among the 500 samples that he took 93% were positive for bacteria and most of them were gram positive organisms(77%) with a predominance of staphylococcus species and a 23% showing gram negative species with predominance of pseudomonas aeruginosa.

Another study conducted in Southern India showed that coagulase negative staphylococci and staphylococcus aureus to be most common isolates(73% and 12%

respectively) . A study done by Bharathi Et al in Tamil Nadu showed that coagulase negative staphylococci (44%%), S aureus (11.2%) and S pneumonia(7%%) as the most common causative organism for chronic dacryocystitis. In a study done among the population in Nepal having chronic dacryocystitis, it was seen that there was an equal proportion among both gram positive and negative organisms. However a study done by Badhu et al from Northern India showed that S pneumonia was the most frequently isolated organism. An Egyptian study showed that Coagulase negative staphylococci (53%%) and Klebsiella pneumonia (18%5) were the common isolates. Sun et al study which was done in China reported that staphylococcus species contributed majorly to the bacterial profile in chronic dacryocystitis (76%).An Iranian study showed that the prevalence of gram positive, gram negative and culture negative samples were 77%, 19.2% and 3.5 % respectively and staphylococcus epidermis was the most common one.

In the lacrimal duct the oxygen supply was mainly consumed for the growth of aerobic and facultative bacteria. This in fact led to an anaerobic condition for the anaerobic bacteria like Propionibacterium. In the previous studies it was seen that anaerobic bacteria accounted for 8 % of the entire growth. A multicentered prospective study was done in the US in order to assess the microbial growth and it was performed in 17 centers and the acute and chronic groups of dacryocystitis were compared. There was a total of 90 culture isolates with 67% gram positive isolates,27% gram negative isolates and 3% mycobacterium isolates. In the acute group, 77% were gram positive, 22% were gram negative whereas in the chronic group 66% were gram positive and 32% were gram negative and 3% were mycobacterium isolates. The proportions between gram positive and negative among the groups revealed no statistically significant difference.

In a study done by Kuchar et al in congenital NLD obstruction, the spectrum of microorganisms mainly included S pneumonia having a 36% of the isolates followed by Haemophillus influenza with 21%. In a study done by Usgha et al 250 samples were evaluated with congenital NLD obstruction among which 83% had a gram positive culture with S pneumonia being the most prevalent and Haemphilus influenza being the most frequent among gram negative organism. They also reported a single case of fungal isolate of candid species.

Congenital NLD obstruction usually starts in the neonatal period and is more common among female. The clinical manifestation ranges from pediatric acute dacryocystitis to meningitis[4]. It is seen that S aureus is the most common isolate. Some of the rare organisms that are seen Pantoea species, Epstein barr virus and sporothrix.

For the microbiological analysis the samples are usually taken from the conjunctival sac, lacrimal sac and in some cases from the intraoperative lacrimal sac fluid. The discharge can be obtained by either applying pressure over the lacrimal sac and allowing the purulent discharge to regurgitate through the lacrimal puncta or it can also be collected by irrigating the lacrimal drainage system with sterile saline and collecting the sample from the reflux material. The samples are collected with the help of a sterile cotton swab ensuring that the lid margins or the conjunctiva are not touched. The specimen which is collected is then inoculated on a solid media like sheep's blood agar, chocolate agar, sabouraud's dextrose agar or liquid media like brain heart infusion agar or thioglycolate media. The sample which is collected is also smeared onto a clean sterile glass slide for 10% potassium hydroxide wet mount, gram stain, zeihl-neelson acid fast stain. All the inoculated media are incubated aerobically.

The sabouraud' s dextrose agar is incubated at 27^0 C, and is examined on a day to day basis and is finally discarded after 3 weeks if no growth is noticed. Similarly the blood agar, chocolate agar, thioglycolate broth, brain heart infusion agar is incubated at $37\ ^0$C, examined daily and then is discarded if no growth is noticed after a period of 7 days. The cultures that have been inoculated should be considered significant if [5]

1) The growth of the same particular organism is seen on more than one solid phase medium.
2) If there is a presence of confluent growth at the site of inoculation on one solid medium
3) The growth on one of the medium is consistent with the microscopic findings like appropriate staining and morphology with gram stain.
4) If the same organism is seen in more than one specimen.

The identification of the species should be made based on the microscopic morphological findings, staining properties and the biochemical properties according to the standard laboratory criteria.

For each inoculation the susceptibility testing has to be done according to the standardized methods. As in case for blood agar, the susceptibility is measured by measuring the area of where hemolysis had not occurred. For each antimicrobial agent the zone diameter is measured and it is then converted into the sensitivity and resistant categories by referring an interpretation chart according to the National committees for clinical laboratory standards, USA.

In a study done by Mandal et al, it was seen that chloramphenicol is effective against most of the gram positive organisms while for S epidermis drugs like aminoglycosides and tobramycin were effective. For P aeriginosa and klebsiella pneumonia, fluoroquinolones mainly the ciprofloxacin and ofloxacin are found to be beneficial. A study conducted by Chaudhary et al reported that a very high rate of microorganisms were seen in the lacrimal sac and hence it is mandatory to treat them before any intraocular surgery is conducted to rule the potential risk of postoperative infection. A study conducted by Amin et al to evaluate the sensitivity and resistance of the microorganism to the various drugs showed that majority of the bacterial isolates were susceptible to vancomycin (96%), gatifloxacin(92%) cefotaxime(89%) amikacin (93%) tobramycin(89%) and ofloxacin(83%). And they were mainly resistant to macrolides (43%) and amoxicillin (38%).It was seen that among all the drugs gatifloxacin and ofloxacin showed the least resistance to the bacterial isolates in both acute and chronic infections of the Lacrimal sac (8% and 11.3 % respectively). A study done by Ponpanich et al showed that ciprofloxacin was the most effective drug against all gram positive and gram negative organisms. Mills et al showed that the frequency of Methicilin resistant S aureus in the acute group was certainly more when compared to the chronic group and they also revealed that ofloxacin and tetracycline is the most effective drug as monotherapy. They also proved that when acitracin and neomycin was used as the initial mode of therapy, it was successful in curing dacryocystitis in nearly 85 % of the patients. When compared to other developing countries, India is labeled as one of those counties that has a rampant usage of antibiotics. Inappropriate use of topical drugs can increase the resistance to the bacterial flora and eventually be less effective in the further management. The usage of broad spectrum antibiotics is also considered as a risk factor for developing resistance and hence it needs to be used with at most care and concern[6]. The diagnosis of dacryocystitis is further confirmed with the laboratory findings. Unlike previously where S pnemoniae was more common currently S aureus has become the prominent organism in lacrimal sac infections. The emergence of new rare species, resistant microbes may also be seen in the future causing lacrimal sac infections.

CONCLUSION

Obstruction of the NLD leads to colonization of the bacteria and thereby leading to infection in majority of the patients. Gram positive organisms are more commonly seen compared to gram negative organisms. The infections needs to be treated based on the sensitivity of the organism. It is very crucial for the early diagnosis and immediate treatment of the infection as sometimes it can be a threaten to the vision due to its untoward complications and sequel. However in the past few decades, accurate diagnosis along with medical management and surgical management if required has provided a good outcome in the management of lacrimal sac infections.

REFERENCES

1. Perra M, Serra A. An immunochemical study of the defense mechanism in the human Lacrimal sac. Arch Histo Cytol. 1995;(58): 517-526
2. Mauriello J,De Luca J. Clinico- pathological study of the lacrimal sac with nasolacrimal duct obstruction. Ophthal Plast Reconstr Surg. 2002;(8): 13-21
3. KnopE. Lacrimal drainage associated lymphoid tissue. Invest ophthalmol Vis Sci. 2001;(42): 566-574
4. Paulsen F, Corfield A .Impact of mucins and TFF peptides. Ophthalmologe. 2006;(101): 12-20
5. Mandal AR, Banerjee TT.Clinicobacteriological study of chronic dacryocystitis in adults. J Indian Med Assoc .2008;(106):296-312
6. Das JK,Deka AC.Bacteriology of chronic dacryocystitis .India J Clin Diagn Res. 2014 ;(24) 322-345