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Case Report

Lacrimal sac dacryolith

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Abstract

Dacryolith are concretions observed in any part of nasolacrimal system, but stones within the lacrimal ductules are rare. Dacryolith are usually comprised of organic material, proteins and mucoproteins with approximately 20% amino acid content, epithelial cells and other debris. The clinical presentation and chemical composition of the dacryolith are variable. We report the case of lacrimal ductular dacryolith in a 10-year-old girl who presented with complaints of discharge of hard stone like material from the left eye. Sodium dodecyl sulphate-polyacrylamide gel electrophoresis (SDS-PAGE) and scanning electron microscopy with energy dispersive spectroscopy (SEM-EDS) analysis were carried out to find the chemical composition of the stone. The results showed 65 kDa protein indicating the presence of albumin and high amount of calcium carbonate in the stone substantiating the presence of albumin in lacrimal sac.

Keywords: Calcium carbonate, dacryolith, lacrimal gland

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INTRODUCTION

Stones (dacryolith or lacrimal calculus or ophthalmolith) in the lacrimal drainage system might be relatively common. However, stones in the lacrimal gland itself are very rare. Their clinical presentation and chemical composition are variable.[1] Several factors had been suggested to predispose to dacryolith formation.[2] Dacryoliths are the calculi of the lacrimal system observed mostly during a dacryocystorhinostomy.[3] Dacryoliths are also the secondary products resulting from a lacrimal pathway obstruction and accumulation of debris.[4] Other factors that could contribute to dacryolith formation are abnormalities anywhere along the outflow pathway, including punctal disorders, canalicular deficiencies, lacrimal sac or duct abnormalities or intranasal pathology. Lacrimal sac diverticula, alterations in the channel wall, flow, or fluid, chronic obstruction and inflammation of the sac and Hasner valve abnormalities mostly result in dehydration and denaturation of proteins in the tear ducts.[5] Some other predisposing factors listed in the literature are patient's age <50 years, female sex, cigarette smoking, previous attacks of dacryocystitis and facial sinonasal trauma.[6] Dacryoliths can arise de novo or by the precipitation of calcium, silicon, phosphate, magnesium, potassium, sulphur, sodium and chlorine salts on foreign material.[7] For better understanding of the physicochemical principles underlying the formation of calculus and chemical composition of dacryoliths, the present study intends to report a case of lacrimal ductular dacryolith.

CASE REPORT

A 10-year-old female child presented with complaining of discharge of hard stone-like material from the left

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eye in the Ophthalmology Out-patient Department. The patient had no previous history of infection. She had presented with similar episode 5 months earlier for which she has not undergone any treatment. At the time of presentation, discharge of the stones is associated with pain and itching. Her ocular examination revealed normal. The puncta, canaliculus, lacrimal sac and anterior segment were normal. She was diagnosed as a case of dacryolith of the left eye. The child was managed with hydroxypropmethyl cellulose, glycerine, dextran-70 and capsule omega-3 fatty acid for 20 days. One week later, she was again presented with the discharge of similar stones from medial canthus of the left eye. The stones were removed, and the eye drops were continued for two more weeks. The removed dacryoliths were analysed with combined qualitative and quantitative analysis for the biochemical composition of the stone. Histopathological examination revealed amorphous inorganic material and culture of the dacryolith showed cocci. Sodium dodecyl sulphate-polyacrylamide gel electrophoresis (SDS-PAGE) showed 65 kDa of the protein indicating the presence of albumin in the stone [Figure 1]. To identify the chemical compounds in the stones, the scanning electron microscope with energy dispersive spectrometry (SEM-EDS) was performed. Initially, the stone sample was fixed on glass slide with 3% glutaraldehyde at 37°C for 1 h. The slide was then treated with 1% osmium tetroxide followed by gradual dehydration using ethanol for 10 min. Finally, the sample was mounted on aluminium slab with two-sided adhesive tape coated with 2-nm gold/palladium (Au/Pd) and examined in a field emission SEM (EVO MA15, Carl Zeiss, Germany). The results showed the presence of calcium carbonate ($CaCO_3$) as 71.19%, silicadioxide (SiO_2) as 26.70% and potassium chloride (KCl) as 1% indicating the high amount of calcium carbonate and thus confirming the presence of albumin [Figure 2a and b].

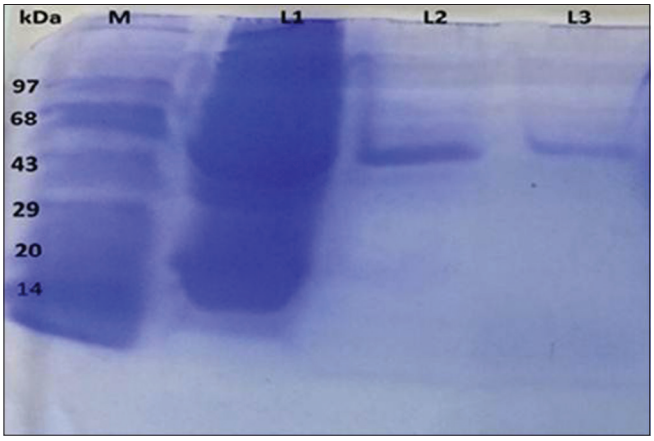

Figure 1: Sodium dodecyl sulphate-polyacrylamide gel electrophoresis analysis of human lacrimal sac dacrolythis: Lane M: Molecular-weight marker (Merck Biosciences Pvt, Ltd., Bengaluru, India), Lane L1: Crude human serum, Lane L2: Positive control, Lane L3: Test (human lacrimal sac dacrolythis)

DISCUSSION

Although dacryoliths within the lacrimal drainage system are relatively common, stones in the lacrimal ductules had been reported rarely. Lacrimal ductular dacryoliths have various clinical presentations along with its variable chemical composition.[8] In the present study, the patient lacrimal gland stone was homogenised and analysed for the presence of albumin. The SDS-PAGE analysis showed 65 kDa of protein from the stone which confirms the presence of albumin. Further, SEM-EDS analysis of stone revealed CaCO3-71.19%, SiO2-26.70% and KCl-1%, which indicates a high amount of calcium carbonate and confirming the presence of albumin. Because there was no preceding trauma or inflammation, we suspect that the albumin may have been a condensate from the normal tear secretions, of which it is a component and that most of the stones are composed of calcified carbonates or phosphates. The pathogenesis of lacrimal gland dacryolith formation is obscure. One theory suggested is that chronic inflammation coupled with the precipitating factors as described above can cause lacrimal wall changes, membrane formation and accumulation of debris with alteration of microbial flora leading to microbial and fungal colonisation. These changes could precipitate dacryolith formation.[9] It has been proposed that lacrimal gland dacryoliths are formed around epithelial debris and are mycelial in origin. In our case, no epithelial debris was observed histopathologically and fungi were not identified on staining or in culture. Membrane formation that allows movement of the dacryolith or fragmentation of the dacryolith could improve fluid flow through the lacrimal sac and duct,

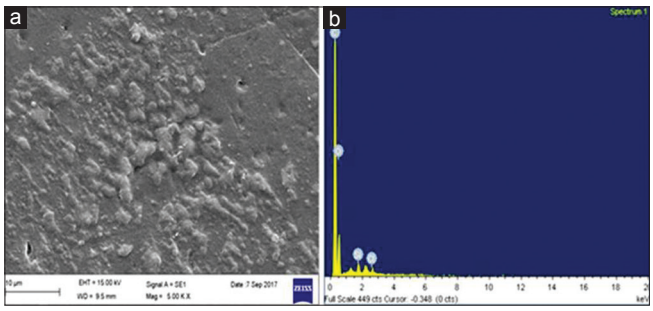

Figure 2: (a) Scanning electron microscopy analysis demonstrating the morphology of Lacrimal SD at 5K magnification. (b) Energy dispersive spectrometry analysis showed $CaCO_3$ 71.19%, SiO_2 26.70%, KCl 1%, which indicates high amount of calcium carbonate confirms the presence of albumin lacrimal sac

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which may explain the intermittent symptoms in some patients.[10] Lacrimal ductular dacryolith represents a physiologic blockage of the ductule drainage, but lacrimal gland ductular cyst formation might occur after many years of the dacryolith was removed, and it might be secondary to the initial surgical trauma.[11] Treatment of lacrimal ductule dacryolith depends on the clinical presentation and location of the stones. Chronic unilateral conjunctivitis has a well-described differential diagnosis. Although the results of laboratory investigations such as cultures and cytologic studies to evaluate chronic unilateral conjunctivitis are often found to be negative, such studies should be done to exclude potentially treatable infectious causes.[12] Dacryolithiasis of the lacrimal gland ductules is an infrequently described and probably undersuspected disorder. Although unusual, stones of the lacrimal ductules should be added to the differential diagnosis of chronic unilateral conjunctivitis.

CONCLUSION

Further investigations about the organic and inorganic compounds of dacryoliths and the correlation of composition of dacryolith chemicals to tear film minerals might lead to clarification of the pathogenesis of dacryoliths and improve to the treatment for nasolacrimal obstruction.

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Conflicts of interest
There are no conflicts of interest.

REFERENCES

1. Yazici B, Hammad AM, Meyer DR. Lacrimal sac dacryoliths: Predictive factors and clinical characteristics. Ophthalmology 2001;108:1308-12.
2. Dhillon N, Kreis AJ, Madge SN. Dacryolith-induced acute dacryocystitis: A reversible cause of nasolacrimal duct obstruction. Orbit 2014;33:199-201.
3. Wilkins RB, Pressly JP. Diagnosis and incidence of lacrimal calculi. Ophthalmic Surg 1980;11:787-9.
4. Aydin U, Hastar E, Yildirim D. Dacryolith: Two case reports. Dentomaxillofac Radiol 2007;36:237-9.
5. Rosen WJ, Rose GE. Intranasal passage of dacryoliths Br J Ophthalmol 2000;84:799-800.
6. Komínek P, Cervenka S, Doskárová S, Heiderová D, Slabík D, Husek P, *et al*. Dacryolithiasis – Analysis of 15 cases. Cesk Slov Oftalmol 2002;58:205-11.
7. Daxecker F, Philipp W, Müller-Holzner E, Tessadri R. Analysis of a dacrolith. Ophthalmologica 1987;195:125-7.
8. Repp DJ, Burkat CN, Lucarelli MJ. Lacrimal excretory system concretions: Canalicular and lacrimal sac. Ophthalmology 2009;116:2230-5.
9. Iliadelis E, Karabatakis V, Sofoniou M. Dacryoliths in chronic dacryocystitis and their composition (spectrophotometric analysis). Eur J Ophthalmol 1999;9:266-8.
10. Paulsen FP, Schaudig U, Fabian A, Ehrich D, Sel S. TFF peptides and mucins are major components of dacryoliths. Graefes Arch Clin Exp Ophthalmol 2006;244:1160-70.
11. Andreou P, Rose GE. Clinical presentation of patients with dacryolithiasis. Ophthalmology 2002;109:1573-4.
12. Linberg JV. Discussion of lacrimal sac dacryoliths. Ophthalmology 2001;108:1312.