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NM Peter[1,2] and R Khooshabeh[1,2]

[1]Department of Ophthalmology, Stoke Mandeville Hospital, Aylesbury, UK
[2]Department of Ophthalmology, Wycombe General Hospital, High Wycombe, UK
E-mail: neenapeter@yahoo.co.uk

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Sir,

Analysis of inorganic elements in a dacryolith using polarised X-ray fluorescence spectrometry: a case report

A dacryolith extracted from the lacrimal sac of a patient undergoing endonasal dacryocystorhinostomy (DCR) was analysed using light microscopy and polarised X-ray fluorescence spectrometry (XRF). The main nature of the dacryolith was found to be inorganic, and XRF analysis demonstrated it was composed of calcium (Ca), potassium (K), iron (Fe), titanium (Ti), and manganese (Mn), and their oxidised forms (CaO, K_2O, Fe_2O_3, TiO_2, MnO).

Case report

The study was designed to investigate the chemical composition of a dacryolith using polarised X-ray flourescence spectrometry (P-XRF). It has not been used in any analysis of lacrimal sac calculi up to now, but is nowadays supposed to be a more convenient, practical, alternative multi-element analytical tool to analyse inorganic nature of substances. It preserves the material after the investigation, resulting in a non-destructive analysis.[1] A dacryolith extracted from the lacrimal sac of a patient undergoing endonasal dacryocystorhinostomy was analysed using P-XRF.[1] The main nature of the dacryolith was found to be inorganic, and XRF analysis demonstrated it was composed of calcium (Ca), potassium (K), iron (Fe), titanium (Ti), and manganese (Mn), and their oxidised forms (CaO, K_2O, Fe_2O_3, TiO_2, MnO). Chemical analysis of the dacryoliths in literature had revealed calcium, magnesium, potassium, sulphur, and some phosphorus.[2] High K^+ ratio may be attributed to the accumulation of tear K^+ in dacryolith by increased evaporation, resulting in unstable concentrations of electrolytes leading to crystal formation on the matrix. Additionally, Ti, TiO_2, Fe_2O_3, Mn, and Fe were detected in the dacryolith of our study.

Comment

We speculate that these elements and compounds may be originated from rich mineral composition of soil in Aksaray, which is a small town covered with volcanic tuff, resulting in chronic soil exposure of the patient in rural life as a farmer.[3–5] Our study is the first in literature that has investigated a dacryolith with XRF, and analysed multi-element concentration in a dacryolith in detail. XRF analysis presented in this report is an alternative multi-element analytical tool to analyse inorganic nature of dacryoliths and has similar costs to other analysis methods, such as atomic absorbsion spectrophotometry. Its great advantage is material preservation after the investigation, and researchers can easily access this method by contact with geological or mining engineering departments of faculties.

Conflict of interest

The authors declare no conflict of interest.

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Disclosure

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S Ozer[1], PA Ozer[2], Z Ortarik[3], SC Tuncer[4], B Gullu[5] and YK Kadioglu[5]

[1]Department of Otorhinolaryngology, Aksaray State Hospital, Aksaray, Turkey
[2]Department of Ophthalmology, Aksaray State Hospital, Aksaray, Turkey
[3]Department of Microbiology, Aksaray State Hospital, Aksaray, Turkey
[4]Department of Biochemistry, Aksaray State Hospital, Aksaray, Turkey
[5]Department of Mineralogy-Petrography, Ankara University Faculty of Geological Engineering, Ankara, Turkey
E-mail: drpinar@yahoo.com

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