

DENTAL CALCULUS AS A PALAEOPATHOLOGICAL INDICATOR: A CASE STUDY FROM MEDIEVAL / EARLY MODERN PORTUGAL

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INTRODUCTION

In recent years, dental calculus – a mineralized form of dental plaque – has emerged as a valuable resource in bioarchaeological and palaeopathological research. Formed *in vivo* through the precipitation of calcium and phosphate from saliva, dental calculus is resistant to postmortem degradation and can persist for centuries after death. It entraps various microremains and microorganisms, including starch grains, pollen, plant fibres and textile fibres, offering direct evidence of dietary practices, and cultural behaviours. Additionally, it preserves ancient oral microbiome DNA, enabling the study of pathogen evolution and antibiotic resistance over time. The accumulation of calculus can contribute to oral diseases such as caries, periodontitis, and tooth loss, and may reflect individual health, oral hygiene, and access to healthcare. This study aims to investigate the causes of the severe dental calculus deposit in a middle-aged male individual, and to explore its palaeopathological significance

MATERIAL & METHODS

Individual 35 was exhumed from the necropolis of church of Nossa Senhora da Salvação, in Arruda dos Vinhos, dated from the 14th–16th centuries. Biological profile indicated that was a middle-aged male with approximately 172 cm. Dental macroscopic disease analysis covered 12 teeth, recording the occlusal wear, caries, periapical inflammations, periodontal disease and dental calculus. Scanning Electron Microscopy coupled with Energy Dispersive X-ray Spectroscopy (SEM-EDX) were used to assess the calculus’s elemental composition and morphology.



Figure 1: Maxilla teeth with calculus



Figure 2: Occlusal view of teeth 26 and 27



Figure 3: Interproximal view of teeth 26 and 27



Figure 4: Mandibular teeth with calculus

RESULTS

A greyish dental calculus deposit, approximately 9-12 mm thick, was observed on the left maxillary teeth (Fig. 1), including two molars (Fig. 2 and 3), premolars, and the canine. The deposit covered all surfaces except the occlusal surfaces of the premolars and canine. The lower anterior teeth (Fig. 3) exhibited smaller deposits on the lingual and buccal surfaces, with a particularly severe accumulation on the left second premolar. Across both upper and lower arches, five carious lesions, periodontitis, antemortem teeth loss and moderate dental wear were identified. SEM-EDX analysis (Fig. 5 and 6) revealed an elemental composition consistent with that of typical dental calculus. No microremains were detected. Diagenesis cannot be ruled out, given the burial context.

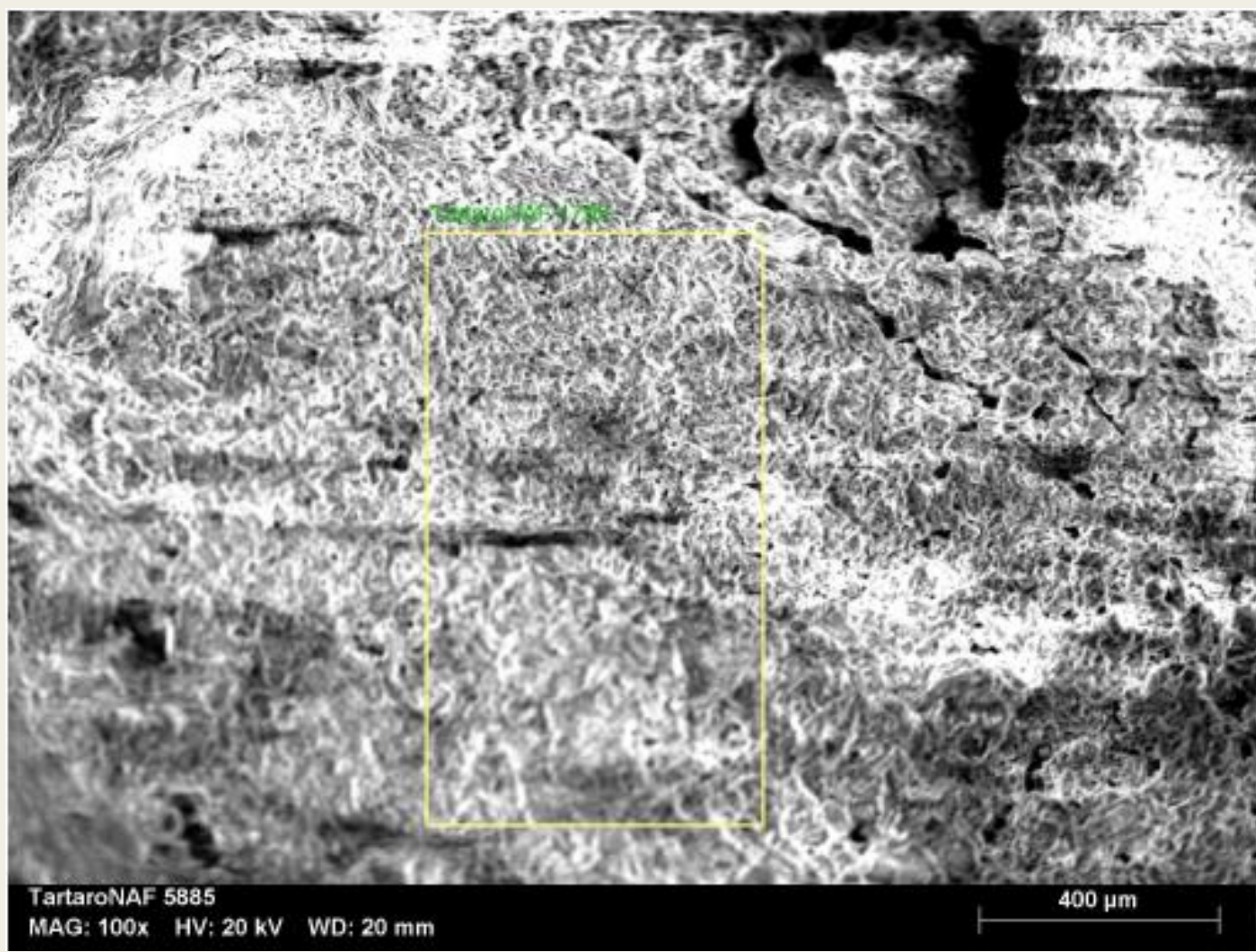


Figure 5: SEM-EDS micrograph of the calculus

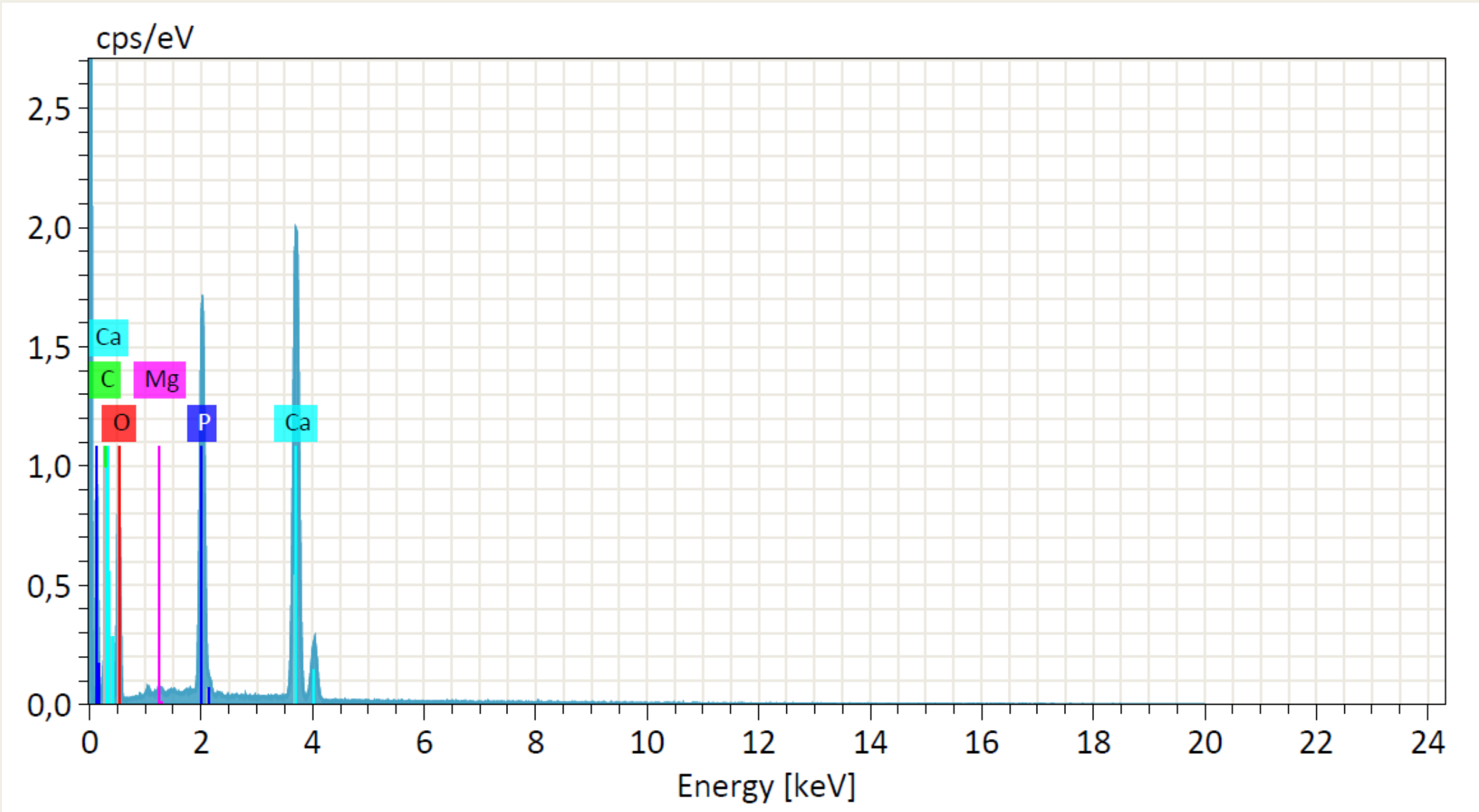


Figure 6: SEM-EDS spectrum of the calculus

DISCUSSION & CONCLUSION

The volume and asymmetrical distribution of the calculus deposits may reflect severely compromised oral hygiene, pain associated with facial or temporomandibular joint dysfunction, or even facial hemiparalysis. Although microbiological analysis has not yet been conducted, it remains a critical next step for identifying adhered microorganisms and evaluating their potential role in oral and systemic diseases. In conclusion, the pronounced accumulation of dental calculus in Skeleton 35 underscores its diagnostic and interpretive potential in palaeopathological research. Beyond reflecting oral health, calculus serves as a “biological archive”, preserving microscopic traces of the individual’s diet, health, environment, and behaviours. This case study highlights the value of integrating dental calculus analysis into bioarchaeological investigations and reinforces its role in reconstructing the lived experiences and health conditions of past populations.

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