

Morphological study of dental abrasion: Theo - Basle pipe smoker

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INTRODUCTION



“Theo, the pipe smoker – destiny of a Lesser Basle” is a multidiscipline project concerned with an unknown man deceased around 1800. Interestingly, he has two pipe smoker’s wears on his dentition. From this point of view this project should not only contain the social and medical history, the anthropology, demography and iconography. This study attempts to cross disciplines and provide to describe the morphological impacts of the pipe smoking wear by comparing the abraded and its contralateral tooth. The study is enhanced by 15 other cases of pipe smoker of the 19th century from two former graveyards of Basle. The morphological changes of the teeth are analyzed by using Cone Beam Computer Tomography (CBCT) and Micro Computed Tomography (μ CT). Further, the work comprehends the dental indices and the anamnesis of the pipe smokers.

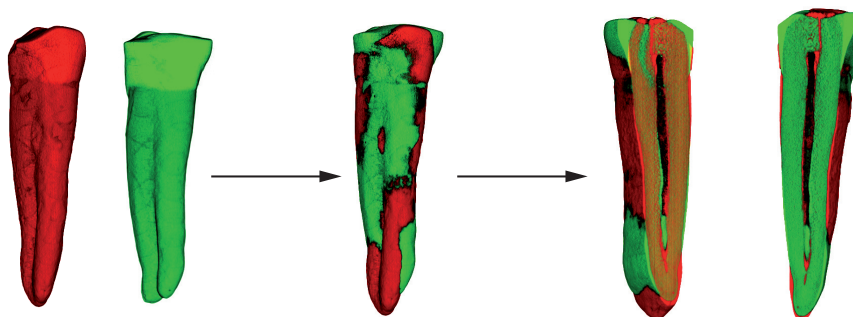
SAMPLE PREPARATION AND CBCT

The pipe smokers dentitions show characteristic abrasion marks which could not be related to normal chewing. These abrasions marks result from the habitually smoking of clay pipes. In the time, clay pipes consisted almost entirely of aluminium silicate and sand. Holding the clay pipe habitually at the same position in the mouth produced on one or more circular abrasions in the teeth.



REGISTRATION

We aim to characterize the volume loss due to pipe abrasion. As the original shape of the worn tooth is unknown, we have chosen to use the contralateral tooth as the counterpart. The volumetric digital datasets of the teeth were registered using a cross correlation algorithm. Although differences in shape and size between pipe-tooth and its contralateral are clearly visible, the overall shapes do match quite well.



TOMOGRAPHY

Micro computed tomography and cone beam computed tomography equipment allow the accurate visualisation of internal dental structures. CBCT and μ CT are becoming widely used in dental anthropology. To quantify the tooth volume loss due to abrasion, 31 damaged teeth and their respective contralaterals were scanned using a Skyscan 1174 microCT (Skyscan, Belgium) and a Accuitomo 60 CBCT (JMorita, Japan).

Micro-tomography measurements were performed at the maximal acceleration voltage of 50 kV and current of 800 mA.



As dentin and especially enamel are highly x-ray absorbing materials, a 0.5 mm aluminium filter was used to harden the radiation. 900 projections were acquired each scan with an exposure time of 3.5 s, resulting in a total scan time of 55 min per tooth.

Not all required teeth could easily extracted from the dentitions. By using the CBCT it was possible to segment the teeth from the digital dataset without to damage the alveolar bone. We used the accelerating voltage of 70 kV and cathode current of 4 mA.

CONCLUSION

The contralateral tooth is an acceptable model to evaluate the volume loss due of the pipe abrasion. The differences of the teeth and its conralateral counter part show only a few percent. Consequently, one can determine the impact of the pipe abrasion on the internal tooth structure. This includes the influences on the root canal, dentin and enamel volumes.