Computed tomography to quantify tooth abrasion

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Cone-beam computed tomography, also termed digital volume tomography, has become a standard technique in dentistry, allowing for fast 3D jaw imaging including denture at moderate spatial resolution. More detailed X-ray images of restricted volumes for post-mortem studies in dental anthropology are obtained by means of micro computed tomography. The present study evaluates the impact of the pipe smoking wear on teeth morphology comparing the abraded tooth with its contra-lateral counterpart. A set of 60 teeth, loose or anchored in the jaw, from 12 dentitions have been analyzed. After the two contra-lateral teeth were scanned, one dataset has been mirrored before the two datasets were registered using affine and rigid registration algorithms. Rigid registration provides three translational and three rotational parameters to maximize the overlap of two rigid bodies. For the affine registration, three scaling factors are incorporated. Within the present investigation, affine and rigid registrations yield comparable values. The restriction to the six parameters of the rigid registration is not a limitation. The differences in size and shape between the tooth and its contra-lateral counterpart generally exhibit only a few percent in the non-abraded volume, validating that the contralateral tooth is a reasonable approximation to quantify, for example, the volume loss as the result of long-term clay pipe smoking. Therefore, this approach allows quantifying the impact of the pipe abrasion on the internal tooth morphology including root canal, dentin, and enamel volumes.
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