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A Novel Methodology for Evaluating the Wear of Stud Attachments

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Objectives Retention loss and stud attachment wear of the two implant-retained mandibular overdentures are still considered the main treatment complications. Recently, wear-resistant stud attachment systems have been proposed. However, an objective methodology to clinically evaluate the abutment wear of novel stud attachments is still needed. The presented pilot study aimed to introduce and test a potential methodology for objectively assessing the surface wear of a stud attachment.
Methods Ten patients rehabilitated with mandibular implant-supported overdentures on two Novaloc attachment abutments were annually monitored. Micro-computerized tomography (m-CT) was used to quantitatively evaluate the amount of wear and wear characteristics when the abutment surface wear was clinically detected. After the image reconstruction and segmentation, surface models of the worn and referential (intact) abutment were obtained. The maximum distance between the surface models, volume loss, and the significantly worn surface area were assessed. Further, laser confocal profilometry and scanning electron microscopy (SEM) of the worn abutment surface were performed to determine the wear pattern. The fit of the prosthesis intaglio surface was assessed using a silicone material.
Results One abutment wear was clinically detected and further evaluated using the proposed methodology. The evaluated parameters from the analyzed m-CT images indicated significant attachment surface wear. The maximum deviation was 28 µm, with a significantly worn surface area of 0,88 mm^2, representing 7% of the region of interest (ROI). Volume loss was 0.081 mm^3. SEM and confocal laser profilometry suggested a wear pattern possibly associated with prosthesis rotational movements around the attachment. This may have resulted from the increased gap between the prosthesis intaglio surface and mucosa in the left posterior area.
Conclusions The presented methodology could be regarded as a future state-of-the-art approach for objectively evaluating stud attachment system wear.