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Clinical Evaluation of Novel Stud Attachment Wear Using Micro-Computerized Tomography

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Objectives The study aimed to evaluate the surface wear of novel stud attachments for the retention of mandibular implant-supported prosthesis using a micro-computerized tomography (m-CT).

Methods A prospective randomized controlled study compared the wear properties of a novel Novaloc attachment system to the conventional Locator system. Twenty edentulous patients requiring overdentures were included, and 20 implant-supported mandibular prostheses were randomized into two groups: Locator (n=9) or Novaloc (n=11). At annual follow-ups, the abutments were unscrewed and extraorally recorded using m-CT. After the image reconstruction and segmentation, mesh surface models of the abutment at each time point were obtained. The root mean squared error (RMSE), maximum distance, volume change, and percentage of worn surface (Spct) in the region of interest (ROI) were measured for each model at the initial and subsequent time points. To evaluate the wear pattern, the Shape Index (SI) – a measure of local curvature – was calculated for each mesh point. The Mann-Whitney U test was used to analyze the differences in m-CT measurements between both experimental groups (P<0.05).

Results After 2 years, both groups exhibited minimal surface changes. In the Novaloc group, the wear of one abutment was clinically observed. However, no significant differences were found between the groups. The RMSE was between 2 and 4 µm for most specimens, while for the abutment with clinically observed wear, the RMSE exceeded 8 µm, with a maximum deviation of 28 µm. The Spct of the ROI ranged from 0 to 3% and increased to 7% with a volume loss of 0.079 mm³ in the case of clinically observed abutment wear. In addition, the minimum SI decreased from 0.65 to 0.57, indicating a loss of convexity of the abutment head.

Conclusions After 2-years of clinical service, the Novaloc attachment system showed comparable wear properties to the conventional Locator system.