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REHABILITATION OF KENNEDY CLASS I PATIENTS WITH IMPLANT-ASSISTED REMOVABLE PARTIAL DENTURES: A FINITE ELEMENT STUDY

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Summary: Mandibular distal extension conventional removable partial dentures are associated with progressive resorption of the residual ridge, which compromises the stability and masticatory efficiency of the prosthesis and subsequent impairment of the oral health-related quality of life. The installation of two implants to support and/or retain the prosthesis has been suggested as a viable option to improve the prognosis of removable rehabilitations in Kennedy class I patients.
The main goal of this work was to compare conventional and implant-assisted mandibular distal extension removable partial dentures in terms of displacements, stress and pressure distributions in the underlying edentulous bone.Three finite element models were built using the CBCT data and plaster models scan of a patient with mandibular bilateral posterior edentulism missing 3 teeth per edentulous site considering: 1. Rehabilitation with conventional removable partial denture (CONVENTIONAL RPD); 2. Rehabilitation with a removable partial denture assisted with 2 implants in the premolar region (IARPD PM); 3. Rehabilitation with a removable partial denture assisted with 2 implants in the premolar region (IARPD M). Loading was applied as homogenous pressure over the acrylic portion of the prosthesis equivalent to 120N force. The CONVENTIONAL RPD model revealed the highest vertical and anterior-posterior displacements of the prosthesis. The displacements of the IARPD PM and IARPD M prosthesis is 1000 to 10000 times lower, respectively.
The highest stresses were registered in the region of the direct retainers (clasp and occlusal rest) of the CONVENTIONAL RPD framework. In the implant-assisted frameworks, the highest stresses were located in the region of the connection to the implant (matrix) but well within the elastic limit of the material. The CONVENTIONAL RPD and IARPD PM models revealed similar negative pressure distribution, corresponding to compressive stresses in the bone underlying the unsupported portions of the prosthesis (distal edentulous area). In the IARPD M model negative pressure was almost inexistent but some positive pressure, corresponding to tensile stresses was notorious surrounding the implants.
Both implant-assisted models appear to be suitable to provide support for a RPD. The IARPD M model is more favourable biomechanically than the IARPD PM model.