Lec. Prosthodontic

Digital partial dentures and rapid prototyping procedure

The fabrication of computer-aided dental prostheses has become common practice in dentistry.

Computer-aided design and computer-aided manufacturing (CAD-CAM) technology have been applied to the fabrication of not only inlays and crowns but also complex fixed and removable dental prostheses.

For a removable prosthesis, due to the nature of the mode of an intraoral scanner that stitches narrow areas, it is difficult to scan the distally extended flat and broad edentulous area, and a functional impression is not possible as the technique is image-based. Therefore, at present, a digital concept in which the metal structure for a partial denture is designed in a virtual space based on the data obtained by scanning a definitive cast fabricated with a conventional functional impression is used.

Unlike the existing method, where a wax pattern is made on a definitive cast, a removable partial denture (RPD) is designed on a computer.

Based on this design, a 3-dimensional (3D) pattern is printed using rapid prototyping, with a resin that can be eliminated. The pattern subsequently undergoes investment, elimination, and casting, thereby completing the fabrication of a digital RPD framework.

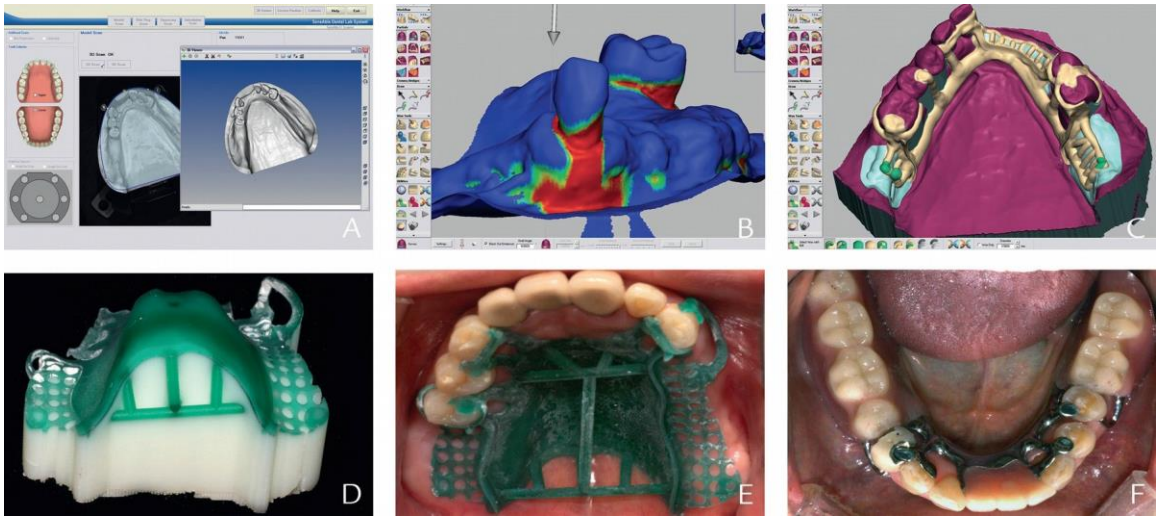
A digital fabrication method has various advantages over conventional methods. In particular, electronic surveying performed in the virtual space,

the scan data, may determine the path of insertion and removal and control the undercut amount through computation in a more straightforward and accurate way than the conventional surveying.

Thus, an undercut with a desired gauge may be formed quantitatively at the position where the end of a retaining arm will be positioned. This information can be used for the fabrication of surveyed crowns and the framework of the RPD. Additionally, the design data may be saved for future use should there be a need to refabricate or modify the prosthesis. In addition, the total time of prosthesis fabrication is substantially reduced by eliminating some processes, including cast duplication and investment cast fabrication. In addition, multiple prosthesis patterns may be simultaneously produced in a short time frame. These advantages highlight the benefits of the digital over the conventional method.

Although different methods to generate a digital RPD have been described,8-11 studies to evaluate whether such methods can produce sufficient accuracy for clinical use have been limited. A previous study and analyzed the errors generated in the design process of a digital RPD and the accuracy within the oral cavity after completion of the prosthesis; however, that was a preliminary study performed in a small number of participants. Thus, its clinical effectiveness and accuracy could not be assessed, and an analysis of the accuracy of the digital RPD on a larger number of participants was needed.

on the basis of Intraoral functional impressions, including border molding, were made, on the basis of which a definitive cast was obtained Subsequently, the cast was scanned using a laboratory scanner files were extracted and loaded onto the CAD software



The framework of the RPD was designed by setting a surveying axis and computing the undercut to determine an ideal path of insertion and removal, the appropriate components, including the major connector, clasps, rests, proximal plates, and finish line, were designed.

Based on the completed design, a pattern was printed in resin (VisiJet M3 Dentcast; 3D Systems) using a rapid prototyping machine (ProJet DP 3000; 3D Systems); the pattern was invested, eliminated, and cast to generate the RPD framework.

The RPD was completed by using the conventional method, using heat polymerized resin and artificial teeth. After adjustments were made to ensure that the rests were seated on the rest seats of the abutment teeth, the denture was delivered to the participant.

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