Accelerated denture base festooning using a free 3D modeling computer program: A dental technique

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Denture bases should be contoured to recreate the natural contours of the tissues being replaced to ensure optimum phonetics, esthetics, and function.[1] Several suggestions have been given regarding the desired shape and contours of the artificial root eminences, denture base extension contours, and surface characterization of the denture base.[2-4] Traditionally, achieving these contours was a time-consuming process done manually during the wax-up stage of denture fabrication, requiring significant skill and artistry.[2]

With the introduction of computer-aided design and computer-aided manufacturing (CAD-CAM) technologies in dentistry, it has become possible to design and manufacture removable dental prostheses more efficiently and predictably.[5,6] Contemporary CAD computer programs permit designing surface details and contours of the denture base using three-dimensional (3D) modeling functions that can be defined by the operator. However, frequently edited areas such as the root eminences, are most often defined by increasing or decreasing their volume using the pointer with an editable selection diameter, and usually require continually modifying the regions being edited until the desired volume is achieved.

The technique presented depicts an alternative approach to digitally defining denture base contours using a free 3D modeling computer program. This approach allows for the simultaneous selection of all desired areas and the definition of the contours of the cameo surface denture base using minimal modeling functions, potentially streamlining the process, and improving efficiency at the design stage.

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Technique

1. Import the digital file of the denture base to be festooned to the recommended CAD computer program (Meshmixer; AutoCAD) (Fig. 1)
2. Select the areas to be contoured using the selection tool (S). Using the "Smooth Boundaries" (Ctrl+B) option to define the borders of the selected areas of the denture base. Ensure the "border rings" parameter is set at 0. Adjust the "Iterations" option until the selected areas are clearly defined (Fig. 2)
3. Select the areas previously defined and use the "Replace" (F) tool to fill the selected area. Adjust the "Bulge" parameter to a negative value to create a concave cameo surface, define the root eminences, and improve the definition of the gingival margins (Fig.3)
4. Use the sculpting brush set with the "Robust Smooth" tool (2) to create a smoother surface, when necessary. Use the "Thickness" tool in the "Analysis" tab to evaluate the thickness of festooned area.
5. After completing the festooning and denture base design, export the digital file to the CAM computer program of your preference. Subsequently, manufacture the prosthesis using the desired subtractive or additive manufacturing method (Fig. 4).

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FIGURES

Figure 1. Digital file of complete denture used for demonstration purposes. Note flat cameo surface without root eminences and poorly defined gingival margins.

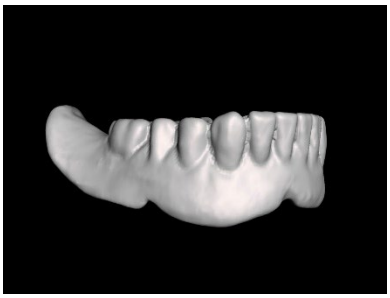

Figure 2. Selection parameters and areas planned for festooning.

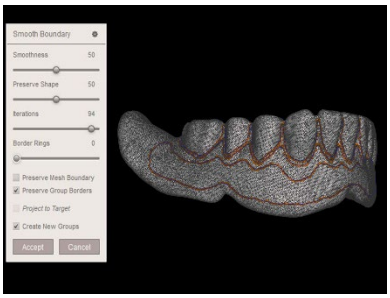

Figure 3. Accelerated festooning using replace function.

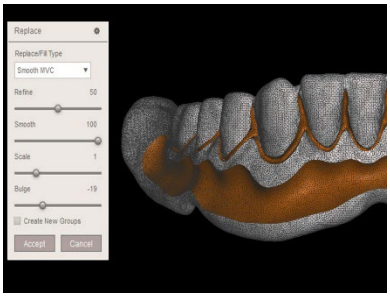

Figure 4. Cameo surface after accelerated festooning. Note well-defined root eminences, gingival margins, and improved cameo surface contours.