Case Report

Prosthodontic Management of Undercut Tuberosities: A Clinical Report

Dentistry Section

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ABSTRACT

The buccal undercut of the maxillary tuberosity, together with the reduced width of the buccal vestibule can complicate denture fabrication. This clinical report describes the treatment options which are available for this situation, the rationale for the design, the use of soft resilient denture flanges in the maxillary posterior buccal vestibule, and the chair-side permanent reline procedure for the incorporation of resilient denture flanges in the undercut area.

Key Words: Resilient liner, Bulbous tuberosity, Bilateral undercuts

INTRODUCTION

Unilateral or bilateral undercuts on the buccal aspect of the maxillary tuberosity are frequently encountered and these may complicate the successful fabrication of a complete maxillary denture. The management in these situations includes an alteration of the denture-bearing area, adaptation of the denture base, careful planning of the path of insertion, and the use of resilient lining materials. The alteration of the denture-bearing area refers to the elimination of the undercut by surgical reduction of the tuberosity. Following surgery, a good border seal can generally be attained [1]. If surgery is not an option, prosthodontic management of the bilateral undercuts can be done by blocking out the undercut on the cast and finishing the denture to the full available height of the vestibule. Alternatively, the height of the flange of the denture can be reduced to the crest of the undercut (to the survey line when the cast has been surveyed). A reduced border seal may accompany such a denture base adaptation.

A pre-planned rotational path of placement may be used when a unilateral undercut of the tuberosity occurs [2], thus allowing the buccal undercut to aid in the retention of the denture. A good border seal in this situation is generally achievable. Sectional lining of the denture base with a resilient lining material in the area of the undercut can allow the engagement of the undercut with resultant increased denture retention [3,4]. This procedure is usually limited to shallow undercuts which does not affect the border seal.

A novel means of managing the bilateral undercut areas in the posterior region without compromising on the border seal has been reported in the literature for the past 20 years. Abrams [5] reported on the use of resilient lining material which was supported by a harder but flexible base which was extended into the undercut area. Such a bilaminate periphery may be too thick in situations where the width of the vestibule is limited. Other methods of incorporating an undercut into the design of a denture include sectional dentures [6] or hinge mechanisms [7]. These options are complex and may require specialized technical skills. When the mouth is opened, the width of the posterior buccal vestibule is reduced by the movement of the coronoid process [8]. Where the maxillary tuberosity is bulbous; the width of this space is even more reduced. When a denture is designed to manage an undercut on the buccal aspect of the maxillary tuberosity, the available vestibular dimension should be considered.

This clinical report describes an alternative method of denture designing by using a resilient liner material. By using this technique, an optimal flange height, thickness, and an excellent border seal can be achieved in situations where the maxillary tuberosities are bulbous, where bilateral undercuts are present, and where the vestibular width is limited. This design is especially useful where surgical intervention has been contraindicated.

CLINICAL REPORT

A healthy 52-year-old woman who was being examined in the Department of Prosthodontics, Meenakshi University, India, was referred from the Department of Periodontics for the fabrication of dentures. Examination of the patient revealed a completely edentulous maxillary arch and 10 remaining mandibular teeth (the right second premolar to the left second premolar). The planned treatment was the placement of a maxillary complete denture and a mandibular cobalt chromium-based removable partial denture. The maxillary tuberosities were moderately enlarged and bulbous [Table/Fig 1]. These were covered by firmly attached and well keratinized gingival mucosa. The total amount of the undercut was 2 to 4 mm. When the mouth was open, the buccal vestibule was 3 mm wide, as it was reduced in width by the forward movement of the coronoid process of the mandible. The width reduction was the greatest in the depth of the vestibule. This reduced width prevented the extension of the flange to the full depth of the vestibule if the undercut was blocked out. With the aim of maximizing the border seal to ensure retention, the decision was made to incorporate resilient flanges in the undercut tuberosity region by using a permanent resilient lining material (Permasoft; DENTSPLY-Caulk, USA) [Table/Fig 2] to allow an optimal height (extension) and thickness (width) of the denture flange. The denture flange was designed to fill the entire available vestibular space. Preliminary impressions were made, and custom trays with 1.5-mm spacing were fabricated. In the area of the undercut, the tray was extended as far as the crest of the undercut. At the definitive impression

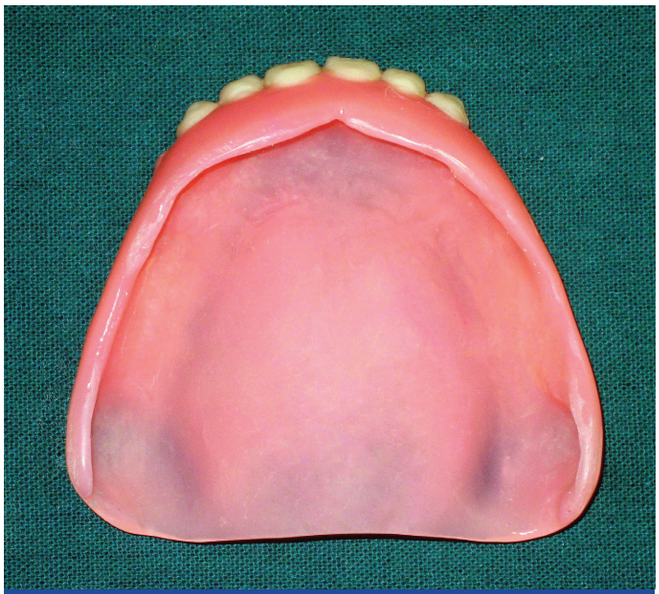
[Table/Fig-1]: Enlarged Maxillary Tuberosities

[Table/Fig-2]: Armamentarium for Permanent Lining material application

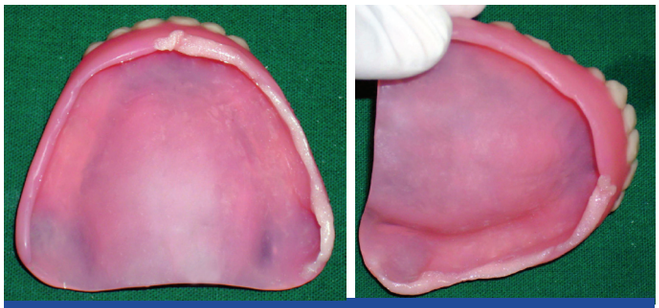
appointment, the entire border, except the undercut section of the maxillary tray, was border molded by using a modeling plastic impression compound (Green Impression Compound; DPI, India). The definitive impression material (Aquasil LV; DENTSPLY-Caulk, USA) was syringed into the undercut and the adjacent buccal vestibule and the loaded tray were placed and correctly positioned. Functional movements were performed by the patient while making the maxillary definitive impression, which included opening the mouth to allow the forward movement of the coronoid process to define the width of the posterior maxillary buccal flange. An accurate impression of the available vestibular space in the maxillary tuberosity area was thus achieved. Definitive casts were made to record the vestibular space. The casts were surveyed, and the crest of the undercut which was buccal to the maxillary tuberosity was marked. The undercuts were blocked out for the construction of temporary denture bases. The maxillo-mandibular relationship was determined. The final tooth arrangement was completed and invested in a conventional manner [9]. The flask was packed with heat-polymerized polymethyl methacrylate (PMMA) (Trevalon; Dentsply-India) and it was mixed according to the manufacturer's instructions and was trial closed. After processing, the denture was finished and polished in a conventional manner [Table/Fig 3]. The mandibular cobalt chromium-based RPD, which incorporated clasps and occlusal rests (Bio-dur Ni-free, [NIOM, DFS], GERMANY) was processed in the laboratory. It was fitted and placed during an appointment which was prior to the chair-side lining procedure.

The processed resin in the maxillary denture which filled the buccal undercut area (the area which was apical to the marked survey line) was carefully trimmed away by using an acrylic trimmer. The cut was angled to leave a long bevel which faced the intaglio surface of the denture. The feather edge of the bevel was trimmed. This bevel increased the area of bonding between the PMMA and the resilient permanent liner that was to replace the resin that was removed. The angulation of the bevel allowed the acrylic resin to support the flexible material on insertion of the denture, at which time these flanges would flex before seating in to the undercut. During the chair-side reline procedure, the resilient liner was packed in the areas from which the resin had been removed. The functional movements were performed. The P: L ratio which was used as per the manufacturer's recommendations was 2:1. After the initial set of the reline material, it was removed and polymerized in a hot water bath. After heat polymerization, the excess was trimmed by using scissors and it was then finished by using acrylic finishing burs. The sealer was then applied to the resilient surfaces of the new material and it was kept to air dry for 2 minutes [Table/Fig 4a and 4b]. The placement of the maxillary denture was uneventful [Table/Fig 5]. The previously fitted mandibular interim RPD was placed. The occlusion was evaluated for discrepancies and was corrected, and patient instructions were given. At the 24-hour follow-up appointment, redness was noted on the buccal side of the bulbous tuberosities. It was judged that this redness was due to the flexible flange which was being pressed against the tissues by the coronoid process of the mandible when the mouth was opened. The resilient silicone material was then removed from the buccal (external) surface of the flange to reduce the thickness of the flange. The patient reported improved comfort.

The further recall appointments were uneventful. On the recall appointment of one year, the resilient flanges, although slightly discoloured, were found to remain well adhered to the acrylic resin base.



[Table/Fig-3]: Maxillary Complete denture showing Bilateral undercuts



[Table/Fig-4 a & b]: Maxillary Complete denture showing Chairside permanent resilient lining material replacing one side of the undercut

[Table/Fig-5]: Post insertion

SUMMARY AND DISCUSSION

This clinical report presents a chair-side method for fabricating a flexible denture flange by using a resilient lining material. The flange extended into the bilateral tissue undercuts on the buccal aspect of the maxillary tuberosity area, an area that in the situation which has been presented, had limited width due to the anatomical dimensions and movement of the coronoid process. The rationale for using a resilient flanges [10, 11] was to aid retention by ensuring a seal around the entire border of the denture. Some authors [12] investigated and concluded that the peel strength of various silicone based soft liners on the denture base resin (PMMA) had been increased while the curing was done simultaneously.

Regarding the oral health related quality of life, denture relining with a soft liner also has been found to have a positive impact on the perceived oral health of edentulous patients [13]. Some authors [14] also investigated the colonization potential of the softliners by microorganisms. They concluded that the fewer adherences of microbes on the silicone based softliners over the PMMA based ones, were because of their surface roughness. Some investigators [14] also suggested the addition of silver nano particles to the softliners for increasing their anti-fungal activity.

It is also imperative to do a surface pre-treatment of the acrylic resin with a monomer prior to the resilient liner application. This has been found to be an effective method which increases the bond strength between the base and the soft liner. Sandblasting, on the contrary, has not been recommended as it weakens the bond between the two [15].

Finally, by using this technique, an optimal flange height, thickness, and an excellent border seal can be achieved in situations where the maxillary tuberosities are bulbous, where bilateral undercuts are present, and where the vestibular width is limited. This design is especially useful where surgical intervention has been contraindicated.

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