A Technique for Using Maxillary Anterior Soft-Tissue Undercuts in Denture Placement: A Case Report

· Stephen Abrams, DDS ·

Abstract

Restoring a large edentulous space in the anterior maxilla presents many challenges, including how to utilize and manage a deep anterior soft tissue undercut. In the case reported here, a partial denture was constructed that incorporated a semi-rigid exterior flange and a soft liner to help the denture to engage the depth of the undercut. The denture was placed after extraction of the anterior teeth, and there was very little postoperative tissue trauma. With this combination of materials, known as "triple lamination," the prosthesis was able to engage the soft-tissue undercut, the undercut was actively involved in retaining the prosthesis, the denture could be placed immediately, and the prosthesis was very comfortable. Triple lamination should be considered when a deep soft-tissue undercut must be engaged to ensure retention of a prosthesis.

MeSH Key Words: *denture design; denture liners; denture, partial, removable*

© J Can Dent Assoc 2002; 68(5):301-4
This article has been peer reviewed.

Restoring a large edentulous space in the anterior maxilla presents many challenges. Retention of the prosthesis is of greater concern when the abutment teeth are located in the posterior maxilla. If the only viable abutment teeth remaining are first and second molar teeth, then the placement of a complete maxillary denture might be contemplated so as to achieve adequate adhesion and retention. A previously described technique involves use of large mandibular tori for retention of the prosthesis.[1] With this technique, a series of soft flanges and a liner allow the denture to engage the soft-tissue undercut without pain or soft-tissue trauma, yet the denture is still easy to remove.

Case Report

A healthy 76-year-old woman who had been under my care for several years had an existing removable partial denture to replace the maxillary anterior teeth and some posterior teeth (Fig. 1). The anterior abutment teeth (teeth 13, 14, 23 and 25) had lost more than three-quarters of their alveolar bone support and were mobile. There was a large apical area of radiolucency around tooth 25, so I decided to extract these 4 teeth. The 3 remaining molar teeth (teeth 17, 26 and 27) had lost about half of their alveolar bone coverage but were not mobile. The existing maxillary partial denture had no buccal flange and had settled into the anterior tissues (Fig. 2). The anterior teeth were subject to heavy function. There was a large tissue undercut, at least 4 mm in depth, in the maxillary anterior area that could serve as an aid in retention (Figs. 3 and 4). I was concerned about extraction of the remaining anterior teeth and retention of the prosthesis during healing. Therefore, I decided to extract the remaining maxillary teeth except the molars upon placement of the prosthesis.

Study casts allowed me to survey the maxillary teeth and the anterior undercut. Cast circumferential clasps with occlusal rests were placed on teeth 17, 26 and 27 (Fig. 5) for additional retention of the denture. A cast mesh encased in denture acrylic resin was used so that I could easily reline the palatal areas to allow addition of one or more molars to the prosthesis if required.

Final impression in a custom tray captured the extent of the maxillary undercut. A base plate with a shallow buccal flange was used to record the jaw relationship. Ivoclar 10-degree posterior teeth (Ivoclar Vivadent Inc., St. Catharines, Ontario) were used to create a balanced occlusion and freedom in centric. I was thus able to spread

Figure 1: *Occlusal view of maxillary model showing remaining teeth in the maxillary arch.*

Figure 2: *Old maxillary partial denture in place.*

Figure 3: *Left side view of the models showing the extent of the soft-tissue undercut.*

Figure 4: *Occlusal view of the soft-tissue undercut.*

Figure 5: *Tissue surface of the maxillary denture showing the labial flange and cast mesh.*

Figure 6: *Buccal view of the maxillary denture showing the buccal flange.*

the occlusal forces over a wide area. The anterior teeth were set with a 1.5-mm overjet to allow freedom in protrusive movements.

The denture base was constructed with the following components:

1. Ivocap injection-moulded acrylic reins (Ivoclar-Vivadent Inc., St. Catharines, Ontario) to fabricate the base and buccal flange.
2. A thermoplastic material, BITEM (Thermoplastic Technologies, Newmarket, Ontario) to fabricate the

Figure 7: *Maxillary anterior ridge 4 weeks after extraction of teeth and insertion of the denture. The gingival tissue is healthy.*

Figure 8: *New maxillary prosthesis in place at 7 months.*

external portion of the buccal flange (Fig. 6). At the usual temperatures of the oral cavity, this material is somewhat resilient, a feature that allowed the denture base to engage the undercut in the anterior part of the maxilla.

3. A resilient material, Molloplast B (Detax GmbH, Ettlingen, Germany), to line the entire denture, including the buccal flange. This lining allowed the denture to closely adapt to the maxillary ridge.

The prosthesis was inserted immediately after extraction of the maxillary anterior teeth. The soft liner allowed the tissues to heal and within 4 weeks still provided adequate retention (Fig. 7). Immediate placement of the prosthesis provided an esthetic solution to a difficult problem. At the time of writing, the prosthesis had been in place for over 16 months without need for relining or adjustment (Fig. 8).

Discussion

The Kennedy Class IV situation in the patient described here is not ideal for retention and stabilization of a prosthesis. Tooth support is preferable to mucosal support because the compressibility of the mucosa allows movement of a denture.[2] For the prosthesis constructed for this patient, the clasp axis acted as the fulcrum point, and it was necessary to engage as much of the anterior soft-tissue undercut as possible to prevent rotation and ensure retention of the prosthesis. The anterior flange of the prosthesis covered as wide an area as possible to spread the load, avoid tissue injury and engage a large area of the undercut. To engage the depth of the undercut and yet create a stable base, a series of materials were laminated to provide strength and flexibility.

The thermoplastic material BITEM is composed of methyl methacrylate, which bonds chemically to the denture base and the inner soft liner. In this case, it created a semi-rigid exterior flange that slid easily into the maxillary anterior soft-tissue undercut. This additional step added minimal laboratory cost (approximately $120.00) to the total fee for the prosthesis.

Resilient liners, such as Molloplast, are widely used as a cushion on the fitting surface of dentures in the management of traumatized oral mucosa, bony undercuts, bruxism, and ridge atrophy, as well as for congenital oral defects requiring obturation.[3] Soft lining materials provide even distribution of the functional load and avoid local concentrations of stress.[4-7] There are 2 main types: plasticized acrylics and silicone elastomers differing in the percentage of cross-linking agents, catalysts and fillers and available in autopolymerizing and heat-curing forms.[8] Silicone-based polymers remain soft or rubbery at and below mouth temperatures. The resilient liner is placed in the interior of the flange to allow the denture to engage a greater depth of the undercut.

In this case, this triple lamination of materials allowed the denture to fit into the entire extent of the anterior undercut. The semi-rigid exterior of the flange provided support and flexibility as the denture engaged the undercut. The soft liner acted as a shock absorber and distributed the occlusal load across the edentulous ridge. The undercut was thus able to function as an active component of the retentive mechanism for this denture. It also allowed the tissues to heal with very little trauma and few sore spots. The path of insertion involved rotating the anterior flange into the undercut once the posterior clasps had engaged.

Conclusions

Triple lamination of denture materials, first described for the management of mandibular tori, has other applications, especially for deep soft-tissue undercuts. With this combination of materials the prosthesis engaged the soft-tissue undercut, the undercut was actively involved in retaining the prosthesis, and the tissues healed with only very minor sore spots. Triple lamination should be considered when a

deep soft-tissue undercut must be engaged for retention of a prosthesis. ◆

Acknowledgment: I would like to acknowledge the help and advice of Mr. Ron Klausz of Klausz Dental Laboratories, Toronto, Ontario. Mr. Klausz has always provided interesting and innovative advice. He has introduced me to a number of interesting materials including BITEM. My partner, Dr. Warren Hellen, has always provided a willing ear in treatment planning and case management.

Dr. Abrams maintains a private practice in Toronto, Ontario.

Correspondence to: Dr. Stephen Abrams, 2995 Kingston Rd, Scarborough, ON M1M 1P1. E-mail: dr.abrams4cell@sympatico.ca.

The author has no declared financial interest in any company manufacturing the types of products mentioned in this article.

References

1. Abrams SH. Complete denture covering mandibular tori using three base materials: a case report. *J Can Dent Assoc* 2000; 66(9):494-6.

2. Davenport JC, Basker RM, Heath JR, Ralph JP, Glantz PO, Hammond P. Indirect retention. *Br Dent J* 2001; 90(3):128-32.

3. Baysan A, Parker S, Wright PS. Adhesion and tear energy of a long-term soft lining material activated by microwave energy. *J Prosthet Dent* 1998; 79(2):182-7.

4. Wright PS. The success and failure of denture soft-lining materials in clinical use. *J Dent* 1984; 12(4):319-27.

5. Bell DH Jr. Clinical evaluation of a resilient denture liner. *J Prosthet Dent* 1970; 23(4):394-406.

6. Kawano F, Koran A 3rd, Asaoka K, Matsumoto N. Effect of soft denture liner on stress distribution in supporting structures under a denture. *Int J Prosthodont* 1993; 6(1):43-9.

7. Kawano F, Kon M, Koran A, Matsumoto N. Shock-absorbing behaviour of four processed soft denture liners. *J Prosthet Dent* 1994; 72(6):599-605.

8. Jagger DC, Harrison A. Complete dentures — the soft option. An update for general dental practice. *Br Dent J* 1997; 182(8):313-7.