Preparation of the denture-bearing area—An essential component of successful complete-denture treatment

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Success in complete-denture treatment is often directly related to the health and condition of the hard and soft tissues that make up the denture-bearing areas. Surgical alteration of the denture-bearing area is frequently necessary to ensure a morphologically correct form capable of providing adequate support for the prosthesis. A number of these anatomic hard and soft tissue obstacles are discussed, and methods for managing these hindrances to complete-denture treatment are suggested. (Quintessence Int 1995;26:689-695.)

Introduction

In this age of preventive dentistry and sophisticated methods of replacing teeth, such as with dental implants, conventional complete dentures still remain a viable method of treatment for many patients. One critical aspect of complete-denture treatment, which is often confusing and poorly understood, is the proper preparation of the denture-bearing areas.

Preparation of the denture-bearing area can at times involve surgical alteration of the anatomic structures; alternatively, depending on the needs of the patient, a nonsurgical approach can be utilized. In many instances both forms of treatment are needed to return the denture-bearing tissues to a state of optimal health and form.

The purposes of this article are to review some of the more common situations in which preparation of the denture-bearing area would be indicated and to provide some suggested methods of treatment as well as the rationale for that treatment.

Unerupted teeth and retained tooth fragments

Survey reports of edentulous patients indicate that as many as 24% to 33% had one or more retained roots. When evaluating retained teeth and portions of their roots, the clinician must consider several factors that in turn influence the type of preprosthetic surgery rendered. Use of standardized, repeatable dental radiographic techniques are essential to allow assessment of any pathologic change associated with retained teeth and roots.

Most impacted teeth should be extracted, particularly in young patients. In older individuals, if there is no evidence of pathologic change and the removal of a submerged tooth would result in a significant surgical defect, the tooth may be left but must be carefully observed at recall visits for any sign of follicular space enlargement. Regardless of the patient's age, if the impacted tooth's follicular wall is close to or has perforated the cortical plate, it should be removed.

Areas of sclerotic bone must not be mistaken for tooth fragments. In occlusal radiographic views, sclerotic bone will appear as irregular radiopaque areas attached to the internal surface of the cortex. These bodies will not have a definite lamina dura. These areas warrant documented observation, but preprosthetic surgery is usually not necessary.
Large bony maxillary tuberosities

The presence of vertically enlarged bony maxillary tuberosities can compromise proper occlusal plane orientation, affecting function and esthetics of the denture (Fig 1). The occlusal plane of a denture will slope posteriorly and inferiorly, and the resultant vertical occlusal forces will be directed obliquely to the denture-bearing area. This can lead to instability of the denture. An enlarged tuberosity can also reduce the amount of denture space to the point that strength of the denture can be compromised by fracture or perforation of the denture. This situation can dramatically decrease the retention of the denture.

Large osseous vertical tuberosities often are a result of alveolar bone accompanying supraerupted teeth. When these teeth are removed, the bone remains. Depending on the proximity of the maxillary sinus, which may expand into the tuberosity, the amount of bone that can be removed may be limited. The sinus floor may be surgically collapsed upward if the sinus limits the amount of bone that can be removed.3

Residual ridge undercuts

Bony undercuts that are associated with the vertical walls of residual ridges and obstruct the proper extension of denture borders should be considered for surgical removal. Undercuts in the tuberosity areas (Fig 2), opposed by prominent anterior ridge undercuts, usually should be surgically modified in the tuberosity area only. This will preserve the important anterior cortical bone.

Mandibular residual ridge undercuts that appear to interfere with a common path of placement of the denture should be closely analyzed. If a rotational placement is possible, then this should be considered a better option than surgery, which could eliminate vital supporting bone.

Sharp residual ridges

Bony projections that underlie residual ridge morphology are common sources of chronic pain and discomfort during denture wearing. This condition occurs more frequently in the severely resorbed anterior mandible. The situation results when the more accelerated resorptive pattern of the buccal and lingual surfaces leaves a thin sharp bony crest. Also, sharp spicules may persist after teeth are extracted. These often result from the failure to remove jagged interseptal bone at the time of surgery. This condition is less common in the anterior maxillae. The soft tissue that overlies these sharp extensions is chronically irritated and becomes redundant.4

The clinician must utilize radiographs and physical examination to evaluate this situation clinically. It is also essential to rule out any underlying systemic complications. The ridge crest can appear razorlike, sawtoothed, or as discrete, large, spiny projections on
dental roentgenograms. Palpation of the suspected areas usually elicits pain. Clinical features of a knife-edge ridge often appear as an overlying soft tissue bulge delineated inferiorly by buccal and lingual undercuts or grooves.

Treatment may consist of occlusal adjustment and judicious relief of the tissue surface of the denture. This is usually only a temporary remedy. Surgery can be attempted and is more successful in situations where the residual ridge is broad and has some clinical vertical height (Fig 3). Surgical treatment of an atrophic residual ridge may eliminate what little denture-bearing area exists. If surgery is the only treatment option to create a smooth, broad denture foundation, then some success may be obtained with denture construction techniques that redistribute stress to areas of bony support, such as the buccal shelf.

Sharp internal oblique and mylohyoid ridges

These osseous ridges (the oblique is superior to the mylohyoid) can pose obstacles to mandibular denture construction. As the posterior mandible resorbs inferiorly and laterally, these ridges become more prominent. The soft tissue overlying these structures is usually thin. This factor, coupled with the underlying sharp medial shelf of bone, may inhibit proper lingual border extension of a denture into the retromylohyoid space. The result is often loss of stability and retention of the denture because of gross relief of the denture in this area (Fig 4).

These ridges should be surgically smoothed if they are tender to finger pressure during oral examination. They should also be considered for surgical removal in a severely resorbed mandible where there often is a need to maximize the lingual extension of the denture border. Clinical studies have indicated that this procedure may substantially enhance patients' tolerance of removable prostheses in the short term.

Torus palatinus

This slow-growing bony convexity, located along the midpalatal suture, can create significant problems during maxillary complete-denture fabrication. These osseous prominences can range in size from that of a pea to a large multilobular structure that may fill and overflow the palatal vault. The soft tissue that covers these hard enlargements is usually thin. Consequently, if a denture is made over the torus, adequate internal relief must be provided to avoid irritating this very thin mucosa.

A conservative nonsurgical approach to management of a torus seems to be popular. In this case, the denture is constructed over the bony prominence, taking into consideration the requirements for internal relief. If the torus extends posteriorly to or beyond the vibrating line, it should be removed to assure an adequate posterior palatal seal. If this exostosis is so large that its undercuts trap food, causing tissue irritation, it should be surgically excised.

A very large torus may add excessive palatal contour to a denture, resulting in speech difficulties. In this situation, the denture may also develop instability because of the fulcrum potential (Fig 5).
Torus mandibularis

The mandibular torus is considered more of an obstacle to successful denture construction than is its maxillary counterpart. Therefore, surgical removal is the frequent choice of preprosthetic treatment. These tori vary in size similarly to the maxillary torus. They are usually bilateral and are located on the lingual alveolar surface in the canine-premolar area. The mucosa covering these hard convexities is thin and subject to constant irritation during denture function.

Because of their size and location, these exostoses frequently hinder proper lingual border seal of a denture (Fig 6). The practitioner should not be misled by the concept that provision of enough internal lingual relief of a denture will obviate surgical correction. These tori are often large and provide undercut contours in close proximity to the lingual sulcus and, therefore, should be surgically removed.

Small tori that do not present with the aforementioned contours and location may be retained. Adequate relief can be provided without compromising extension and seal of the denture border.

Unfavorable frenal positions

Frena are fibrous bands of tissue that may have several folds of movable mucosa. These structures attach to bone, but are superficial to muscle attachments. Common locations are labial, lingual, and buccal areas. All frenae, when too close to the alveolar ridge crests, may interfere with proper border extension leading to poor peripheral seal and fracture-prone areas in the denture (Figs 7a and 7b). If a strong force is applied by a frenum, then the extension of the denture border may be compromised. A mandibular lingual frenum may dislodge a denture with normal tongue movements. It has been shown that a large midline frenal notch in a denture complemented by a narrow diastema between the central incisors greatly increases the risk of denture base fracture through this area.

In the majority of situations, a high or strong frenal attachment should be surgically corrected prior to denture construction.

Fibrous residual ridge

The fibrous residual ridge can be a significant impediment to the successful function of complete dentures. Although often described as part of the combination syndrome that affects the anterior maxillary residual ridge, fibrous changes in the composition of the residual ridge can occur throughout the maxillary and mandibular denture-bearing areas. The maxillary tuberosity is an example of an area where fibrous tissue enlargement is often encountered.
Identifying the cause of the development of the fibrous tissue is often impossible. Frequently, trauma to the residual ridge is thought to play a significant role. This has been well described by other authors as a major factor in the genesis of the combination syndrome.10,11 Inadequate posterior occlusion combined with natural mandibular anterior teeth functioning against a complete maxillary denture is thought to cause the development of the fibrous residual ridge in the combination syndrome (Fig 8).

Treatment will vary with the extent and location of the fibrous tissue. Surgical removal is generally considered if the fibrous tissue can be removed and adequate residual ridge height will remain to support and retain the prosthesis. This treatment approach is used principally where the fibrous ridge area is well defined and limited. A common example of this situation would normally arise in the maxillary tuberosity area (Fig 9). Surgical excision of the fibrous tissue would generally be limited to the tuberosity area and would usually not significantly reduce the ability of the dentist to provide a retentive complete denture. The implantation of alloplastic materials, implanted to restore a firm consistency to the residual ridge, has

Fig 7a

Figs 7a and 7b Labial frenum too close to ridge crest. Lingual frenum that will interfere with border extension and seal.

Fig 7b

Fig 8

(A) Natural mandibular anterior teeth functioning against maxillary complete denture. (B) Maxillary anterior fibrous ridge.

Fig 9

Thick layer of fibrous tissue overlying maxillary tuberosity.
been advocated by some individuals. Changes in impression techniques aimed at recording the fibrous residual ridge tissue in a nondisplaced state has been suggested by others as an alternative to any surgical intervention.

The dentist often faces a significant treatment dilemma in this situation; creating a single solution that will fit each instance is an unobtainable goal. The fibrous nature of the residual ridge will undoubtedly affect the stability of any prosthesis because of the lack of a firm, solid base of alveolar bone making up the residual ridge. Removal of all the fibrous tissue from the residual ridge will potentially improve the stability of the prosthesis, but could create a situation in which the residual ridge height is inadequate to provide sufficient retention for the prosthesis. The dentist must carefully analyze each situation and, along with the patient, choose the treatment approach that will be most beneficial.

Papillary hyperplasia

Papillary hyperplasia is characterized by the development of numerous small papules usually located on the hard palate under an existing maxillary prosthesis (Figs 10a and 10b). Although papillary hyperplasia may occur on the mandibular denture-bearing areas, it is rare. Papillary hyperplasia is generally believed to develop as a result of chronic inflammation induced by continuous denture wearing. The typical patient who presents with papillary hyperplasia wears a maxillary prosthesis continuously, 24 hours a day. In addition to the papillary formation, the tissues usually are red and inflamed. White patches frequently associated with Candida albicans infection may also be present.

Treatment is first aimed at resolving the inflammation. Because the source of the problem is usually 24-hour-a-day wearing of the denture, this practice must be stopped. Improvement in the hygiene of the mouth and the prosthesis must commence immediately. A properly fitting denture with a stable occlusion is vital. Provisional liners can be placed in the denture to improve the adaptation of the prosthesis, and the occlusion can be adjusted to reduce interferences and to distribute the occlusal load properly. Patients should be given home care instructions that involve specific guidelines for both oral and denture hygiene. This most often means brushing and/or massaging the denture-bearing tissues and brushing and soaking the denture to ensure that it is clean.

Once the inflammatory component has been eliminated, the true extent and size of the papules can be determined. Research has shown that papillary hyperplasia is not a malignant condition and therefore may be treated in a conservative manner. If the papules do not interfere with denture construction or the development of an adequate peripheral border seal, then removal is not indicated. Removal of the papules should be considered in any instance where proper denture retention will be compromised or where the size of the remaining papules will not allow adequate hygiene. Ongoing observation by the dentist, along with continued reinforcement to the patient of the importance of removing the denture for at least 8 hours in a 24-hour period and maintaining proper hygiene practices, is essential to long-term resolution of this condition.
Prosthodontics

Summary
Successful treatment with removable prostheses is dependent on many factors. One component that can profoundly affect treatment success is the condition of the denture-bearing tissues. Every effort should be made to ensure that both the hard and soft tissues are developed in a form that will enhance the patient’s ability to wear a denture. It is the responsibility of the practitioner to carefully evaluate and identify the need for any alteration of the denture-bearing areas and to educate the patient as to the importance of accomplishing this vital procedure.

References

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