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Pre-definitive treatment:
rehabilitation prosthesesJ. F. McCord,¹ and A. A. Grant,²

This article deals with the treatment of common conditions affecting the denture supporting tissues. Several preliminary (non-definitive) treatment options are presented along with a brief account of their rationale.

In this part, we will discuss:

- Common soft tissue conditions
- Common hard tissue conditions
- Rehabilitation devices.

In formulating a treatment plan for the edentulous patient, early decisions must be made regarding essential oral tissue rehabilitation and other necessary pre-prosthetic measures. It is essential that the mouth is in an optimal state of health prior to commencing prosthetic treatment, and failure to achieve this may well produce an unsatisfactory treatment result. The latter is therapeutically unacceptable as well as being ethically questionable.

While some patients may present for their first denture with underlying conditions, it is more common to find that those seeking replacement appliances are in need of pre-prosthetic treatment. This may be because of the long-term consequences of denture wearing, and may also relate to the greater likelihood of systemic conditions having oral consequences in the age group concerned.

In essence, problems that may benefit from preliminary treatment might involve both soft and/or hard tissues.

It should be appreciated that the following lists are not exhaustive as only the more commonly encountered conditions will be dealt with. Rare and more complex problems should be the subject of referral for treatment by a specialist. The lists are included for the sake of simplicity, as many conditions cannot be compartmentalised and may occur simultaneously, and be complicated by oral manifestations of a general disease state.

Some treatment measures may require what might be termed 'rehabilitation devices'. These are considered separately later in this chapter together with comments on their usefulness. Depending on a variety of situations, the den-

tist may find it necessary to modify the patient's existing dentures or, occasionally, to construct a special appliance, as the old denture may be irreversibly altered.

Common soft tissue conditions are:

- Tissue distortion
- Denture-related stomatitis
- Angular cheilitis
- Fibrous degeneration of the residual ridge(s)
- Border faults
- Hyperplasia of the border tissues.

Common hard tissue conditions are:

- Unerrupted teeth and retained roots
- Sharp bony ridges
- Enlarged tuberosities
- Tori and other bony prominences
- Sharp mylohyoid ridges.

Common soft tissue conditions

Tissue distortion

A soft tissue-supported denture may become ill fitting because of continuing resorption or tooth wear. Both may result in uneven forces being directed to the underlying mucosa and these tend to cause distortion of the surface contours of the residual ridges. This results from the unbound tissue fluid being driven from its normal resting position.

An impression of the tissues in their distorted state, when poured in gypsum, will reproduce the distorted form of the residual ridges (Fig. 1). A denture made using such a cast will only fit the patient as well as the denture it replaces.

Distortion is most evident where thickened mucoperiosteum is present and while some signs of inflammation may be seen, there may be little or no obvious signs of deformation.

Fig. 1 The displacement of this fibrous tuberosity is obvious. Displacement or distortion of thinner, more displaceable fibrous mandibular ridges will pose support problems for lower dentures

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The tissues will recover their stable form if the cause of the distorting force is removed and this recovery in such cases, in theory, is a time-dependent phenomenon. At least 90 minutes after removal of the old denture should be allowed prior to obtaining working impressions. Where distortion is obvious and severe, tissue recovery will take much longer and it may be necessary for the old dentures to be removed for several hours.

Fig. 2 This slide illustrates a case where the maxillary anterior ridge is obviously readily displaceable; inappropriate impression techniques are likely to result in dentures of inappropriate surface form and tissue contact

There can be no denying that the optimal denture-related tissue option is to leave the dentures out for several hours before attending surgery. For most patients this is an unacceptable option and would lead to social embarrassment, an occurrence that should always be avoided. Moreover, it is also not a feasible option to keep a patient in a surgery chair while the tissues resolve. The clinician, however, may improve matters by relieving denture undercuts and carrying out a chairside reline using a thin resilient lining material such as Visco-gel™ (Dentsply Limited, Surrey) over a 24-hour period. Patients should be encouraged, however, to remove their dentures whenever it is socially convenient to do so (ie when they are in the house alone).

Denture-related stomatitis

Where chronic irritation of the mucosa contacted by a denture base has occurred, an inflammatory condition may be observed. It is most commonly associated with the upper denture and may be seen as a vivid inflammation of the whole area covered by the denture. In the early stages, discrete areas of pinpoint inflammation can be seen in the region of the palatal mucous glands. A further form is described as papillary hyperplasia in which a nodular hyperplasia of the central palatal area is seen.

The condition is usually symptomless and the patient may be unaware of its presence.

A large number of causative factors have been implicated, the most common of which is denture-related trauma. The trauma may arise from occlusal faults (static or dynamic), poor denture hygiene, poor fit of the denture base, or roughness of the denture base. These are all fac-

tors that may be present in dentures which have been used over a prolonged period. The condition may be associated with the presence of *Candida albicans*, invasion of which appears to be stimulated by trauma to the affected tissues, and particularly when the dentures are worn continuously.

Other factors implicated in denture-related stomatitis include endocrine disorders, deficiency states, opportunistic infection associated with antibiotic therapy and associated with xerostomia.

Denture-induced trauma is resolved most effectively when the patient is not wearing the dentures. If this is not practicable — as resolution may take up to 6 weeks to effect — alternative measures are required. Where the trauma arises from ill-fitting bases, stabilisation of the denture by means of tissue conditioners may be carried out. This may have to be repeated perhaps several times until the condition is resolved, as tissue conditioners in use over several weeks can themselves be a source of trauma.

Where occlusal or articulation faults are present, the dentures will require more radical modification to remove the effects of trauma and this is considered in the section on rehabilitation devices (see previous page).

Angular cheilitis

This painful and unsightly inflammation of the corners of the mouth results from constant wetting of the angles of the mouth by saliva. It may be caused by lack of lip support following tooth extraction, poorly designed denture flanges not providing adequate lip support or loss of occlusal vertical dimension.

Other causes include vitamin deficiency and iron deficiency. Secondary infection by staphylococcal organisms may occur, but it may be associated with an intraoral candidal infection. Where denture-related stomatitis and angular cheilitis occur together, *Candida albicans* is almost certainly implicated, in which case antifungal agents eg Miconazole will be required as part of the treatment. Bear in mind that the denture in such a case is a source of infection and it must be placed in a suitable antifungicide — such as dilute hypochlorite — overnight.

Fibrous degeneration of the residual ridge

One result of prolonged denture wearing may be the development of a hypermobile, readily displaceable ridge form. This can be disadvantageous to the production of a stable denture. Such a readily displaceable form is also subject to the greatest tissue distortion (Fig. 2). Thus a prolonged period of recovery is required before commencing the impression stage of treatment and special impression procedures are required (*vide infra*).

Surgical procedures may be considered where fibrous degeneration has occurred, but these should be approached with caution and considered as a last resort.

Border faults

Where a denture has been worn for a prolonged period of time the presence of border faults might be anticipated. The most common of these is over-extension, but where the borders were inaccurate at insertion, then there may be regions of overextension and others of under-extension.

Where over-extension is present, the resultant trauma will produce tenderness, swelling and possibly ulceration (Fig. 3).

Overextended regions must be relieved and the patient instructed to return for further examination in 1 week. If, at that stage, recovery is not complete, the procedure is repeated until complete healing has taken place. Treatment may then proceed to the impression stage.

Occasionally, a frenum or muscle attachment is so prominent that it prevents the creation of an adequate peripheral seal. In such cases, it may be necessary to consider surgical repositioning of a muscle attachment, or removal of frenal tissue. The surgical treatment must be supplemented with the production of a stent, or modified prosthesis, during the healing phase in order that the operated condition might be maintained. Stents will be considered further in the section on rehabilitation devices below.

Hyperplasia of the border tissues

A result of chronic irritation produced by an overextended border may be hyperplasia of the tissue. This can be painless and the patient is often unaware of its presence. Sometimes, however, where the mass of hyperplastic tissue is large, patients may show concern — often about the possibility that such a 'growth' is malignant.

The source of irritation must be removed. This requires reduction of the over-extended flanges, or possibly removal of the entire denture flange. Where the areas concerned are extensive, the preferred treatment is for the denture not to be worn. The patient should be encouraged to massage the hyperplastic tissue with the ball of the finger. Reduction of the denture flange and resolution of the tissue mass will have the effect of the denture feeling loose, and the patient should be warned of this.

Over a period of some 4–6 weeks much, if not all, of the tissue mass will resolve. Surgery may be indicated if resolution is incomplete, but this should be only after the conservative approach described above has been completed, and as a last resort.

Common hard tissue conditions

Unerupted teeth and retained roots

Where there is some irregularity of the shape of the bone or because of painful symptoms in an apparently normal region, a radiograph should be taken of the area. This may disclose a root or unerupted tooth or even a dental cyst.

A root or unerupted tooth that is deep, completely invested in bone and shows no evidence of pathological change need not necessarily be removed as undue loss of alveolar bone would result. Preservation of residual bone and favourable ridge contour is of far greater importance than removal of an entity simply because it has been discovered. The patient should, of course, be informed of the findings and the decision.

Fig. 3 The classic signs of erythema, swelling and ulceration are clear where over-extension has occurred in the (left) post dam area

Where a tooth or root is only partly in bone and is in contact with overlying soft tissue, then removal is advised, taking into account such factors as the age and medical status of the patient, etc.

Sharp bony ridges

This condition may occur on the crest of the lower ridge in the anterior region (Fig. 4) or may manifest as sharp mylohyoid ridges. It can be painful for the patient owing to forces generated during chewing displacing this, or even fibrous mucosa, onto the bony spicules. Surgical smoothing of such a ridge may produce temporary relief, but it must be appreciated that continuing resorption may cause the condition to recur. A conservative approach to overcom-

Fig. 4 Occlusal view of mandibular ridge. The anterior aspect of the ridge is clearly a knife-edge profile

ing the problem is recommended, at least in the first instance. This will include relief of the master cast (eg 1 mm tin foil over the relevant area of the ridge crest of the cast) and reduction of the load applied to the tissue by decreasing the size of the occlusal table or, in appropriate cases, increasing the freeway space. Where the overlying mucosa is displaceable, a special impression technique (Fig 12a-c, Part 4) should be used.

Enlarged tuberosities

Enlarged tuberosities may be bony or fibrous in nature, and it is important to discriminate between these by means of radiographs if it is necessary to provide treatment. The size of the tuberosities may be such that it is impossible to insert a fully extended denture flange either because of the size of undercut (the denture flange prevents movement of the coronoid process) or the tuberosity contacts the opposing retromolar pad (Fig. 5). In the experience of the authors, enlarged tuberosities are rarely subjected to the surgeon's knife or drill.

Fig. 5 Bulbous tuberosities present problems of planning for retention and for inter-ridge space

As a good rule of thumb, however, if the inter arch space cannot accommodate 2 mm of denture base (1 mm for the upper denture and one for the lower denture) then surgery will be required.

Where the tuberosity enlargement is bony in nature and contains an extension of the maxillary sinus, surgical reduction is not an easy option. In this case the undercuts must be blocked out during denture fabrication and/or a specific path of insertion of the denture must be selected.

Where there is adequate bone present and where mobile large fibrous tuberosities impinge into the lower ridge, surgery to produce a firm, stable base might be undertaken.

Tori and other bony prominences

Bony prominences may be present in the form of maxillary or mandibular tori, prominent maxillary midline suture or anterior nasal spine or as an exostosis in some less common site. The common problem resulting from these structures relates to the generally thin mucosal covering, relative to the overall

denture supporting tissues. This can cause discomfort and/or instability of a denture unless adequate and accurate relief is provided in the denture. The relief area must be no deeper or extensive than the case in hand requires, or loss of retention of the denture may result. If the extent of the bony prominence is ill-defined, the assistance of a disclosing paste will be required to outline the area to be relieved.

Occasionally, an exostosis or torus may be so large and/or undercut as to prevent denture insertion, or cause the baseplate to excessively encroach on the available space in the oral cavity. Particular examples are:

- *Maxillary torus*: If this extends onto the post dam area and peripheral seal is significantly reduced, surgery will be required.
- *Mandibular tori*: If these are large enough to significantly reduce the width of the tongue space anteriorly, surgery will be required.

In these circumstances, surgical modification of the bony contour will need to be considered.

Rehabilitation devices (transitional prostheses)

This is a term that is used to describe those appliances which are used either as primary devices, to prepare a patient for prosthodontic treatment, or as an adjunct to surgical pre-prosthetic procedures.

The most commonly used of these include:

- Conditioning appliances to desensitise patients who suffer from gagging
- Pivots used to assess tolerance to vertical dimension increase
- Pivots used as a diagnostic appliance for patients having a history of intolerance to a lower denture
- Stents for use following surgery to the border tissues
- Transitional prostheses for patients with exceedingly worn prostheses.

Conditioning appliances

A conditioning appliance, or training plate, may be provided for home use for a patient who suffers from nausea or gagging when wearing a denture.¹ The most common causes of gagging are looseness/rocking of the denture, excessive thickness of the posterior border of the upper denture (particularly when it is placed forward of the vibrating line), or a narrow arch form that forces the lingual cusps of the upper posterior teeth to impinge on the dorsum of the tongue. There can also be a strong behavioural/psychological aspect to this problem, and as an approach to developing the necessary confidence in the sufferer to feel motivated to overcome the problem, a training plate can be helpful. The training plate must be fully extended and properly tapered in thickness at

the posterior border that must be provided with a carefully formed post dam. A finger grip may be provided so that the patient can control insertion and removal of the device (Fig. 6).

Additionally, psychological assessment might be appropriate for some patients, in association with some adaptational/self-controlling measures such as auto-hypnosis and controlled breathing (*see Part 2*).^{11,12}

Occlusal pivot appliances

Where excessive freeway space is present with existing dentures, it is not advisable to increase the denture height beyond some 3 mm at a time unless the tolerance of the patient to a greater increase is first determined. This can be achieved by the use of occlusal pivots.²

Occlusal pivots consist of two flat-surfaced pillars of acrylic resin placed bilaterally in the second premolar and first molar region of the lower denture. These planes must contact the opposing teeth of the upper denture bilaterally and evenly. Pivots can also be used where a gross error in the retruded contact position (RCP) of occlusion is present, to increase the stability of the denture bases and thus reduce trauma to the underlying tissues.

Pivots are made using thin tin foil placed on a paste of self-polymerising polymer (methyl methacrylate) (PMMA) added to the occlusal surfaces of the second premolar/first molar region of the lower denture. The denture is seated in the mouth and the patient instructed to close gently into RCP. Closure must cease when bilateral contact is made to prevent displacement of the acrylic dough. The denture is then removed from the mouth and the PMMA cured, after which the occlusal contacts are confirmed as simultaneously bilateral and at the required occlusal vertical dimension.

The tin foil is then removed and the occlusal pivots are polished with the occlusal surfaces made flat.

Given the increased trend towards potential litigation, there is merit in considering adapting this technique by applying the pivots to a 'copy' denture, to ensure that the patient's original denture remains intact, in case the outcome of this treatment does not prove to be successful.

Other applications for pivots

If a patient has never successfully managed a complete lower denture, or is unable to provide a reproducible RCP, occlusal pivots may be helpfully prescribed initially in the replacement denture. In such cases, denture production proceeds conventionally up to the trial denture stage, after which the lower posterior teeth are removed and replaced by wax pivots. These are converted to PMMA pivots during processing (Fig. 7).

As with the pivots described earlier, care must

Fig. 6 Training plate which may be used in the treatment of a patient with a retching problem

be taken to ensure that occlusal contact on the flat planes is bilateral and even.

In review visits, occlusal adjustments can be made and pressure relief provided as necessary, until comfort and a reproducible RCP is achieved. When this occurs, an occlusal registration can then be obtained and the posterior teeth added.

Stents

Where border tissues have been subjected to surgery, such as for muscle attachment repositioning, frenal tissue excision, or a sulcus deepening procedure, a stent will be required to be used during the healing phase. The stent is made prior to surgery and is inserted immediately at the operation. If this sequence is not followed, there is likely to be a marked loss of sulcus depth rendering denture base extension and consequent compromise to retention and stability of the denture.

The stent must be of the form and required extent of a denture base. It is essential that the periphery of the device is highly polished, of rounded form having a minimum thickness of 2mm.

Fig. 7 Complete lower denture processed in the form of lower pivot prosthesis

'Stents' are also recommended, in the form of a surgical template, in dental implant surgery. When the wax try-in has confirmed the position of the teeth on the implant-supported prostheses, the try-in is duplicated in translucent PMMA and this surgical template is modified lingual to the anterior teeth to give an

Fig. 8 Example of translucent stent used prior to the placement of dental implants. Note the removal of base material, lingual to the suggested anterior tooth position, to facilitate placement of the bone drill and subsequent implants

indication to the placement of the implants (Fig. 8).

Although most general dental practitioners might not be normally expected to make such prostheses, they should be aware of the fact that they may be requested to make one by an oral surgeon, to whom they have referred a patient. These stents for either soft tissue management or implant placement, should be planned by the clinician providing the restorative care prior to surgery.

- 1 Basker R M, Davenport J C, Tomlin H R. *Prosthetic Treatment of the Edentulous Patient*. p184-185. London: Macmillan Press Limited.
- 2 Watt D M, MacGregor A R. *Designing complete dentures*. 2nd ed. p96-98. Bristol: Wright, 1982.

Helpful Hints

- 1 Attempt to restore soft tissues to appropriate level of health prior to commencing replacement dentures.
- 2 If hard tissue enlargement is such that inter-arch space will not permit placement of minimal denture bases, or if tongue space is constrained, pre-prosthetic surgery will usually be indicated.
- 3 Occlusal pivot appliance therapy is useful where patients have worn dentures over a lengthy period. Although the technique is simple, there is merit, for medico-legal reasons, in copying the existing denture and modifying the copy as a transitional denture — the existing denture is thus unaltered and can as such be returned to the patient if a successful outcome is not achieved.