2 Clinical assessment

J. F. McCord,[1] and A. A. Grant,[2]

In this article, helpful guidelines are given to the assessment of patients and their dentures. A simple assessment sheet is suggested to serve as a record of the initial assessment visit.

In this part, we will discuss:
- General assessment of the patient
- Assessment of (oral and facial) soft tissues
- Assessment of (oral) hard tissues
- Assessment of current dentures
- Possible treatment options.

[1*]*Head of the Unit of Prosthodontics,*
[2]*Emeritus Professor of Restorative Dentistry, University Dental Hospital of Manchester, Higher Cambridge Street, Manchester M15 6FH*
**Correspondence to: Prof. J. F. McCord*
email: Learj@fs1.den.man.ac.uk
REFEREED PAPER

2000; **188:** 375–380

The clinician is responsible for the diagnosis and treatment of a variety of basic parameters in respect of the provision of a complete denture service. These include the recognition of a broad spectrum of the relevant and applied anatomical, physiological and psychological conditions of each patient, with an understanding of the significance of each patient's medical status. The development of a treatment plan that leads to the prescription of appropriate prostheses follows and, finally, the clinician must ensure that the technical requirements for each prosthesis are clearly communicated to the technician. Existing complete dentures which, ideally, have been considered to be satisfactory by the patient, should also be carefully assessed as an essential aid to diagnosis and treatment planning.

This chapter will deal with the assessment of the edentulous patient and of his or her denture as a means of determining why the patient is seeking treatment and what special problems might be considered. Two distinct but nevertheless related assessments will be described, namely that of the patient and also of the patient's dentures.

Patient assessment

The importance of establishing a rapport with the patient cannot be overemphasised. The projection of an image as a caring and thoughtful clinician is the first step to achieving good rapport. There are a number of simple methods of developing good dentist–patient relations at the outset of treatment.

The first of these is practised by many experienced clinicians who take the opportunity to escort their patients from the waiting area to the surgery. In addition to the value of the exercise gained, this philosophy affords the clinician the opportunity to assess the mien, gait and physical appearance of each patient. Figure 1 indicates a 60-year-old edentulous woman wearing complete upper and lower dentures that have been worn for more than 20 years. In addition to obvious oro-facial ageing changes, there are telltale signs of 'support' problems on the bridge of the nose caused by spectacles. This, plus generalised loss of muscle bulk in the muscles of mastication, suggests that the patient's biological age equals, or possibly exceeds, her chronological age. Early warning signs of support and vertical dimension problems concerning complete dentures are thus clear (*see* Part 10).

The next, and arguably the most important, stage in both developing a rapport and effective assessment of the patient is to elicit the appropriate complaints/symptoms (ie pain, looseness, eating, speech problems, appearance etc.) and particularly the patient's expectations. Care should be taken to ensure that the patient's views are listened to and not misinterpreted by the clinician, as this may lead to subsequent problems. The importance of paying attention to what the patient says is critical and the clinician must establish that they are in no doubt what the patient means. Anecdotally, many experienced clinicians report that patients confide to them that 'you are the first dentist who has really listened to me'. It must be stated that it is during this phase of treatment that essential background information is gleaned.

The patient's psychological needs may be met by effective communication, including the influence of body image on acceptance of treatment. Similarly, the dentist must guard against the development of frustrations which may arise from communicating with an apparently 'difficult' and demanding patient.

The medical background of the patient is also easier to obtain from a patient who has had an opportunity to relax during a preliminary conversation designed to reduce patient apprehension. Dental patients may harbour fears over problems encompassing appearance, speech or serious illness and expression of these fears often requires careful questioning. Many conditions do not present overt signs but may cause extreme discomfort to the denture patient. For example, a replacement denture provided before the detection of low-grade deficiency states may call into question the value of the clinical service provided.[1] Practitioners may find it useful to use a simple questionnaire to assess the medical background, and a variety of such questionnaires are available.

For simplicity, the assessment of the patient will be sub-divided into soft tissue and hard tissue assessment.

Soft tissue assessment

The tone of the lips and cheeks may be assessed by asking fundamental questions (eg address, family details etc.) which tend to promote unguarded replies and provide an opportunity for useful observations. This form of questioning will also tend to indicate the functional rela-

Fig. 1 Lateral view of 60-year-old edentulous patient with lack of lip support and 'support' problems on the bridge of her nose from spectacle-wearing

tionship of the lips and tongue to the dentures in speech (Fig. 2). For example, it is generally accepted that the tips of the maxillary incisor teeth touch the vermilion border of the lower lip during fricative ('f' and 'v') sounds. This can be assessed easily as can the assessment of sibilant sounds which reflect the closest speaking space as well as the appropriate positioning of the upper incisor teeth. In addition, the presence of facial asymmetry, atrophy or hypertrophy should be noted.

The oral mucosa should be checked routinely for the presence of ulcers, stomatitis, or frank pathology. The clinician should also note the presence of adverse soft tissue attachments to the edentulous ridges or any other abnormalities.

The presence of displaceable tissue, eg fibrous tuberosities, hyperplasia and fibrous ridges, should be noted and this may merit consideration/remedial action prior to complete denture construction. Similarly, the presence of minimally-displasive tissues should be recorded as these may require appropriate relief to be incorporated into the denture. A simple clinical test is to palpate the ridges firmly with a gloved finger; signs of pain or discomfort will indicate that the mucosa overlying the ridge is unable to tolerate much pressure (Fig. 3).

Hard tissue assessment

The edentulous ridges should be assessed for form, presence of retained roots, tori and degree of inter-ridge space. The classification of ridge form by Atwood,[2] which has been modified by Cawood and Howell[3] is a useful means of describing ridge shape, although it does not necessarily describe ridge consistency. It does, however, provide a useful *aide-mémoire* for inclusion in the patient's notes. The nature of ridges eg the presence of undercuts, knife-edge ridges should also be recorded, as they require subtle modifications to the master casts (ie relief) prior to processing.

In addition to the above, the clinician should assess the quality and quantity of the patient's saliva. This may affect decisions regarding selection of the impression technique and, further, relate to denture-retention potential. Diminished salivary levels may also sound a warning regarding possible frictional effects on the peri-denture tissues and may also contribute to altered taste perception.

When these factors have been assessed, the presence of anatomical, physiological or pathological factors may indicate that pre-definitive/transitional treatment is required (*see* Part 3).

A thorough assessment of the biological environment into which a prosthesis is planned is a *sine qua non* if the expectations and perceptions of the patient are to be realistically gauged. The clinician has to determine if the patient's expectations are realistic and, further to establish whether he/she feels confident that a successful outcome is achievable. If the patient's expectations are unrealistic and if the clinician has doubts that a successful outcome is outside their potential, then there are realistically only two options to consider:

- No treatment is commenced and or
- Refer the patient to a clinician who specialises in prosthodontics.

This can only be answered fully if, following the above, an examination of the patient's dentures is made.

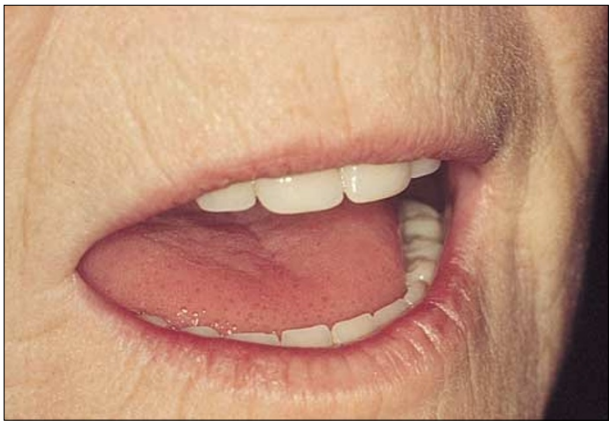


Fig. 2 Stability of lower dentures plus phonetic aspects of function depend on there being appropriate functional relationship of the dentures to the lips, cheeks and tongue

Fig. 3 Mild blanching of atrophic mucosa is evident over the mandibular ridge. Palpation with a gloved finger will indicate the ability of the soft tissue over the ridge to withstand firm, digital pressure

Denture assessment

While there is universal acceptance of a periodontal index of treatment needs[4] and an index of need for orthodontic treatment,[5] prosthodontists have been singularly unsuccessful in establishing an index of denture quality.[6,7]

For that reason, a simple yet easy-to-follow scheme for the assessment of dentures is described. Practitioners are recommended to use a denture assessment template similar to that in Table 1 to ensure that an accurate record of findings is kept.

In essence, the denture assessment and denture-wearing history is structured as follows. (These procedures may seem tedious to the inexperienced clinician, but it is remarkable how simple it is to incorporate into a replacement denture features that may be the essential cause for patients seeking replacement dentures.)

General factors:

Denture-wearing history

Record the age of the present dentures, the frequency with which previous dentures have been replaced and the patient's experiences with these dentures. Note the denture base materials used and the condition of the dentures, including signs and sites of obvious wear and usage. It is also a useful idea to record the dietary habits of the patient to determine the range and consistency of foods eaten by the patient. At this stage, there is much merit in providing the patient with a biscuit and observing if and how it is eaten, the time taken to eat the biscuit and any signs of denture instability (*see* Part 5).

The above, in addition to helping diagnose if the patient functions with the denture, must be measured with how the patient perceives the denture. If function is perceived by the patient to be acceptable, and looseness and occlusal wear are the only complaints, then the clinician should consider the provision of dentures using a copy or replica technique.

Specific factors:

Extension of the complete upper denture

- Check the peripheral extension, including presence, fit and placement of the post dam. This may be done using a ball-ended burnisher to help determine the displaceability of tissues (Fig. 4).
- Appropriate utilisation of the functional width and depth of the sulcus should be present as these relate to function (Fig. 5).

Extension of the complete lower denture

- Check the extension of the denture base in relation to the optimal available denture-bearing area, ie half-way up the retromolar pads and functional extension onto buccal shelves and lingual sulci .
- NB Appropriate extension relates to stability; instability tends to result in patients being aware of (denture) movement in function.

Assessment of retention

- Retention of the maxillary denture may be assessed by placing the thumb on the palatal aspect of the maxillary canine and the forefinger on the labial aspect and via a rotation of the wrist, pulling the thumb labially. This is an assessment of the adequacy of the peripheral seal.
- A number of factors relate to retention[8], namely peripheral seal, tissue fit and secondary factors such as support (displaceable tissue) and stability (muscle/occlusal imbalance). Neuromuscular control, particularly in the case of dentures worn regularly over many years, is an important secondary factor.
- Testing the retentive quality of the lower dentures is problematic as it tends to be intimately associated with stability (muscle control).
- A rough guide to retentive qualities of a complete lower denture may be gauged by assessing the resistance to vertical displacement. This may be evaluated by asking the patient to relax with his/her tongue at rest. Place a probe between the lower incisor teeth and assess the resistance to upward pressure of the probe and denture. Although a component of stability should be present, the presence of a peripheral seal should resist upward movement of the denture (Fig. 6).

Assessment of stability

- Stability of a denture may, generally speaking, be assessed via alternate pressing on the right and left occlusal surfaces of the premolar teeth to detect the presence of rocking or rotational movements. This may suggest the presence of fitting inaccuracies, underutili-

Table 1 Complete denture assessment

Denture details: time worn	Maxillary	Mandible
Patient's perceptions: Acceptable (A), not acceptable (N)		
Dentist's perceptions: Condition of dentures: A/N		
Retention: Tissue adaptation: A/N		
Peripheral seal: A/N		
Border/peripheral extension: Labial to ridge: A/N Buccal to ridge: A/N Lingual to ridge: A/N Posterior extension: A/N		
C/C relationships: RCP: A/N OVD: A/N Articulation: A/N		
Teeth: Plastic? Porcelain?		
Appearance: Lip support Incisal level Incisal plane Posterior planes Appearance		
Ridges - Atwood order: I, II, III, IV, V, VI		
Denture bearing tissues: Healthy Acutely inflamed Chronically inflamed Hyperplastic Flabby Hard tissue undercut Other		

Fig. 4 The tissues involved in the post dam area are not uniformly displaceable. Prior to defining the form of the post dam on the master cast, the clinician should determine, using a ball-ended burnisher, the relative displaceability from the midline through the pterygo-hamular notch bilaterally

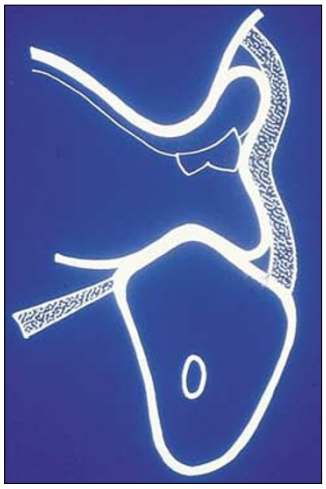


Fig. 5 As the attachment of buccinator remains essentially in the pre-extraction position and as the maxilla resorbs in a palatal direction, the clinician should use the functional width and depth of the sulcus to create a more ideal peripheral seal

sation of denture-bearing areas or support problems (ie flabby ridges) — this applies to both dentures.

- Assessment of the upper denture is generally performed with the operator standing behind the patient.
- The presence of inappropriate and adverse occlusal planes may result in stability problems as may some occlusal errors. For example, if the upper posterior planes dip posteriorly (Fig. 7) then the effect on closure of the dentures will be for the lower denture to slide anteriorly, often resulting in an ulcer lingual to the lower ridge.

Assessment of dentures as functional units

Upper tooth position

- This is usually directly related to the registration visit. A variety of subtly interconnected factors require to be established when dentures are assessed.
- Contribution to lip support: has the denture provided appropriate lip support? Upper anterior teeth placed on the ridge may affect speech, resulting in problems of instability with the lower denture and do not restore the vermilion border of the upper lip.
- Position of the mid-incisal point. This is a function of appropriate lip support and if the correct position is not achieved or if the maxillary denture teeth are set on the ridge, the mid-incisal point may be placed inappropriately (Fig. 8). The exception is a patient who has been recently rendered edentulous or has a large, undercut anterior ridge; in these cases, a full labial flange may not be appropriate.
- Angulation of the incisal plane. A useful guideline is that this should be parallel to the interpupillary line.
- Angulation of the posterior occlusal planes. Conventional wisdom suggests that these be made parallel to the ipsilateral alar-tragus lines. Reference has already been made to inappropriate occlusal planes and their effect on lower dentures.

Lower tooth position

- It is generally accepted that, in the interests of (lower) denture stability, the central fossae of the lower posterior teeth and the necks of the lower anterior teeth should lie over the residual mandibular crest.
- Relation of lingual cusps to resting tongue height. By convention, the tongue, at rest, should lie at the level of the lingual cusps of the lower denture.
- The presence of lingual undercuts should be avoided as these may lead to denture instability (Fig. 9). This factor may be extended in the case of patients with an atrophic mandible. In these cases, it is considered prudent to position the mandibular teeth in a position of minimal muscular conflict (neutral zone — *see* Part 4).[8]
- The presence of molar teeth over the ascending portion of the mandibular ramus tends to encourage displacing movements of the lower denture and this practice should be avoided (Fig. 9).

Occlusal relations in retruded contact position (RCP)

The minimal requirements for any complete dentures should be that they exhibit balanced occlusion in retruded contact position.[9,10] In

Fig. 6 The patient in this photograph has developed excellent denture control via a muscular balance of tongue, cheeks and lips

Fig. 7 The inappropriate form of the posterior occlusal planes of this upper denture will, in addition to producing a poor aesthetic result, result in unstable lower dentures

essence, this means that there should be simultaneous and even bilateral contacts in RCP. This should be established with the operator's forefinger placed on the buccal periphery of lower dentures to assist stability. The operator should detect any slide, be it protrusive or lateral, as these will tend to de-stabilise the lower denture. N.B. For protrusive and lateral movements to take place, appropriate anterior and buccal overjets must be present and the presence of incisal and/or cuspal locking detected and eliminated where required.

Assessment of appropriate freeway space

This is measured indirectly by subtracting the occlusal vertical dimension from the resting facial height (RFH-OVD). Clinicians should determine the biological capacity of the patient to withstand occlusal loading and prescribe the OVD appropriately.

Is balanced occlusion or balanced articulation required?

As has been mentioned earlier, the clinician is advised to determine the masticatory needs of the patient at an early stage in the diagnosis/treatment planning stage. Examination of the occlusal surfaces of the dentures may assist in the determination of whether balanced occlusion or balanced articulation is prescribed. Alternatively, the biscuit test or other such functional test may be used. If balanced articulation is selected, then continuous and dynamic occlusal contacts should be present in border movements of the mandible, in addition to RCP — this is demanding of the skills of the prosthodontist and of the technician! The importance of assessing this occlusal requirement should not be overlooked at this stage. Technicians as a rule do not see patients and thus are not able to advise on the occlusal scheme appropriate for the patient. We advocate that this assessment be made at the time of the initial visit as it is part of the diagnostic process — most registration techniques only record RCP and do not consider occlusal requirements of a patient.

Does the patient experience pain when dentures occlude?

If this is the case, the clinician must determine whether the cause is systemically-related, occlusally-related or related to a support problem (*see* Part 10).

Do speech problems occur when dentures are worn?

Although this will also be dealt with in Part 10, the clinician should ensure that these speech problems are not present when no dentures are worn or with other, unassociated dentures.

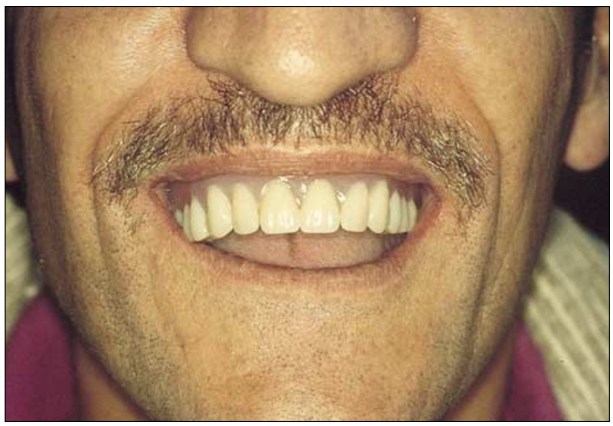


Fig. 8 In addition to not being in the midline of the face, the mid-incisal point is poorly sited antero-posteriorly and vertically with subsequent functional problems

Fig. 9 The lower molars pose two problems:
1. Their excessive bucco-lingual width presents lingual undercuts to the tongue, thereby inducing denture instability.
2. The second molars are sited on the ascending portion of the mandible, encouraging an incline-plane effect on the lower denture

Does retching occur and if so, when?

This not uncommon and functional condition is best recognised and treated prior to definitive treatment and usually involves a period of desensitising and/or provision of a training plate.[11,12]

Assessment of appearance

Although strictly speaking not a functional component, this important aspect of denture assessment does relate to the functions of mastication and speech. Important factors to assess here are:

1. **Appearance of anterior teeth — is there appropriate:**
- Upper lip support*
- Restoration of philtrum*
- Tooth shade, mould and arrangement*
- Buccal corridors*
- Harmony of gingival matrices of anterior and posterior teeth*
- Lower lip support*

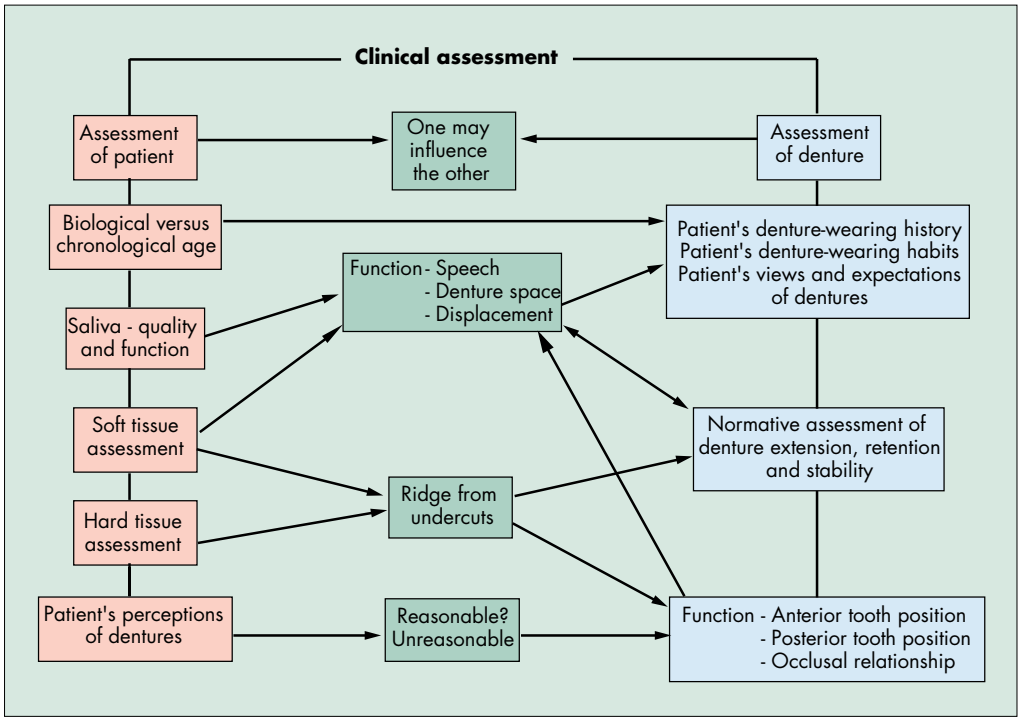
*see Part 5

2. **Posterior aesthetics — are these appropriate:**
- Occlusal planes
- Anatomical and natural flow from anteriors to posteriors
- Gingival contours.

Other aspects of denture assessment

Remove both dentures and assess the following:

Fig. 10 Algorithm of clinical assessment for replacement complete dentures



1 Grant A A, Heath J R, McCord J F. *Complete prosthodontics: problems diagnosis and management*. P25, London: Wolfe, 1994.
2 Atwood D A. The reduction of residual ridges: a major oral disease entity. *J Prosthet Dent* 1971; **26:** 266-270.
3 Cawood J I, Howell R A. A classification of the edentulous jaws. *Int J Oral Maxillfac Surg* 1988; **17:** 232-236.
4 Ainamo J, Barnes D, Beagrie G. Cutress T, Martin J, Sardo-Infirri J. Development of the World Health Organisation (WHO) Community Periodontal Index of Treatment Need (CPITN). *Int Dent J* 1982; **32:** 281-291.
5 Shaw W C, Richmond S, O'Brien K D, Brook P, Stephens C D. Quality control in orthodontics: Indices of treatment need and treatment standards. *Br Dent J* 1991; **170:** 107-112.
6 Pinsent R H, Laird W R E. The development of criteria for the assessment of complete dentures. *Comm Dent Health* 1989; **6:** 329-336.
7 Vervoorn J M, Duinkerke A S H, Luteijn F, Bouman T K, van de Poul, A C M. Reproducibility of an assessment scale of denture quality. *Comm Dent Oral Epidemiol* 1987; **15:** 209-210.
8 Jacobson T E, Krol A J A contemporary review of the factors involved in complete denture retention, stability and support. *J Prosthet Dent* 1983; **49:** 5-15; 165-172; 306-313.
9 Basker R M, Davenport J, Tomlin H R. *Prosthetic treatment of the edentulous patient*. 3rd ed. P92-110, London: Macmillan, 1992.
10 Watt D M, MacGregor A R. *Designing complete dentures* 2nd ed. pp89-92 Bristol: Wright, 1986.
11 Barsby M J. The use of hypnosis in the management of 'gagging' and intolerance to dentures. *Br Dent J* 1994; **176:** 97-102.
12 Barsby M J. The control of hyperventilation in the management of 'gagging'. *Br Dent J* 1997; **182:** 109-111.

- Impression surface of each denture. Ensure no surface irregularities are present — these may well induce support problems.
- Polished surfaces of each denture. These should be free of undercuts and should conform to the structures surrounding the denture space.
- Occlusal and incisal surfaces of each denture. Ensure that the relationship of teeth to the indentation of the ridge on the impression surface is as described above. In the case of the upper anteriors, a device such as the Alma gauge may help relate these teeth to the incisal papilla (*see* Part 5). In the case of the lower posterior teeth, a wax knife may be used to relate the lower posteriors to the ridge (*see* Part 8).

When the assessment of the patient and the patient's dentures have been made, a realistic diagnosis of any real or potential problems, may be made. Figure 10 is an algorithm of how patient and denture assessments may relate.

Reference has been made previously to the importance of taking into account the views of the patient. If the patient does not co-operate, then a successful outcome cannot be predicted.

As with all other branches of medicine/dentistry, the maxim 'no diagnosis, no treatment' is worth bearing in mind. Only when an accurate diagnosis is made may a realistic treatment plan be formed.

Decision-making factors will be discussed in Part 3.

Helpful Hints

1 Assess the denture environment.
2 Assess the patient's expectations.
3 If 1 is perceived to be generally satisfactory and 2 is supportive, consider a replica denture technique.
4 If 1 is perceived to be less than desirable by dentist and patient and 2 is supportive of dentures in general, a replacement denture should be considered.
5 If 1 is (normatively) perceived to be acceptable and 2 is unfavourable then either the assessment of the denture is not thorough enough or the patient's expectations are perhaps unattainable. It would be sensible to enlist the opinion of a specialist — or do not treat!

Correction

Because of a font problem on page 263 of issue 5 of the *BDJ* on 11 March 2000 in the article by P. Hollows *et al.* on "Delays in the referral and treatment of oral squamous cell carcinoma", some of the symbols were incorrectly indicated: all c^2's on this page should read χ^2. We apologise for any inconvenience caused