



J Fraser McCord

VE Hannah, D Cameron, D Watson and AC Donaldson

# An Update on the Replica Denture Technique

**Abstract:** This paper reviews the principles of the replica denture technique, including some of the techniques previously described. The failing of any previous technique to cater for specific support problems is brought to light and the remainder of the article is devoted to describing how the replica denture technique may be modified to treat patients more appropriately and, hopefully, result in better treatment outcomes.

**Clinical Relevance:** This article offers general dental practitioners a practical guide on how to adapt a useful denture replication technique to suit patients with denture-support problems.

**Dent Update 2010; 37: 230–235**

The provision of replacement complete dentures has often been considered a 'black' art. Others may liken it to giving a person a bicycle; the bicycle may be state of the art, but if the recipient does not know how to ride a bicycle and if the cycle has no stabilizers, then the recipient may not be able to use the cycle. Although tenuous, this comparison is not dissimilar to the problems facing a dentist when patients, especially older patients, seek to replace their complete dentures.

There is general agreement on the basic science aspects (ie the anatomical, physiological and psychological factors) related to complete denture prescription. It is generally agreed that, to be successful, complete dentures must satisfy the demands of support, retention and stability. Support is obtained from underlying bone and covering soft

tissues. Retention is achieved, essentially, via a peripheral seal, while stability is a paradigm of muscle balance and occlusal balance.<sup>1</sup> (Complete) denture stability is achieved in an integrated manner, via the definitive impressions, registration technique (posterior), tooth selection and patient neuromuscular control. In the main, retention and support are influenced by the definitive impression and this is of paramount importance where the conventional mandibular complete denture is concerned.

Fish, in 1948, pragmatically suggested that dentures had three surfaces:<sup>2</sup>

- Impression surface (often erroneously labelled the fitting surface);
- Occlusal surface;
- Polished surface (from the flanges to the occlusal surfaces labially and buccally, plus the palatal surfaces in the maxillary denture and from the flanges to the occlusal surfaces labially, buccally and lingually in the mandibular denture).

It could be argued that this order may well have been the perceived order of importance used by dentists when (replacement) dentures were being prescribed.

The advantage of replicating the

shape and contour of existing dentures has been recognized since the 1950s.<sup>3</sup> In 1964, Liddelow stated that retention and tolerance of complete dentures can be challenging for patients of all ages; moreover, he felt that they are more readily achievable in a younger cohort as they have 'better ability for learning and adaptation'. He postulated that, as patients age, there is a reduction in their ability to learn new muscle activity patterns (similar to conditioned reflexes) that are needed to adapt to a new denture shape.

In 1967, Brill, perhaps the father of biological prosthodontics, wrote a review article on retention and stability of complete dentures and emphasized the importance of neuromuscular control in the achievement of good denture stability – often perceived to be 'retention' by patients and students alike.<sup>4</sup> He pointed out the relevance of the polished surfaces and recommended that dentists should attempt to provide their patients with replacement dentures, which accorded to the polished surfaces of their present dentures, in an attempt to facilitate the process of adaptation by the patient to the replacement dentures.

From this philosophy the template or replica (erroneously termed

**J Fraser McCord**, BDS DDS FDS DRD RCS(Ed), FDS RCS(Eng) FDS RCPS(Glas), FCDS(HK) CBiol, MIBiol, **VE Hannah**, BSc, PhD, **D Cameron**, MSc DEd, **D Watson**, BDS, MSc, DDPH RCS(Eng) and **AC Donaldson**, BDS MSc MFDS RCS(Ed), Glasgow Dental Hospital and School, Glasgow, G2 3JZ.

'Copy') dentures have evolved.

Hoad-Reddick *et al* showed that 40% of denture wearers needed replacement dentures after 5 years of service; indeed, this figure rose to 80% after 10 years.<sup>5</sup> This then suggests that dentures should be replaced every 5–10 years and that doing so may reduce problems in patient adaptation to new dentures as there is potentially less loss of conditioned muscle reflexes. Hoad-Reddick and her colleagues stated that age *per se* does not preclude successful denture provision but lengthy periods between sets of dentures may lessen the ability of the wearer to tolerate and control new dentures.

For patients who have worn the same set of dentures for many years, replicating the existing denture shape and form prevents them from having to unlearn a conditioned muscle response and then relearn muscle activity for the new shaped denture. However, if there are significant deficiencies associated with the existing dentures, then this technique is not indicated as the deficiency will only be copied to the new dentures.<sup>6</sup>

In younger subjects, the replica technique may also be entirely appropriate as it allows minor changes following alveolar resorption to be carried out without risking obvious changes in the appearance of the dentures; the latter would clearly be undesirable to patients.

The purpose of this article is to describe the present techniques and highlight the advantages and uses of the concept. At the same time, shortcomings in the techniques currently used will be highlighted and recommendations offered to render the technique more generally applicable.

### Template or replica techniques

The replica technique is advantageous as it aims to copy the general shape of the polished surfaces of existing dentures with only minor alterations to them, but allows for changes to the fit of the impression surface and 'renovation' of, often worn, occlusal surfaces. The technique is relatively simple and requires fewer clinical visits compared to standard denture construction. It is therefore ideal and often used in the domiciliary setting.

Numerous authors have

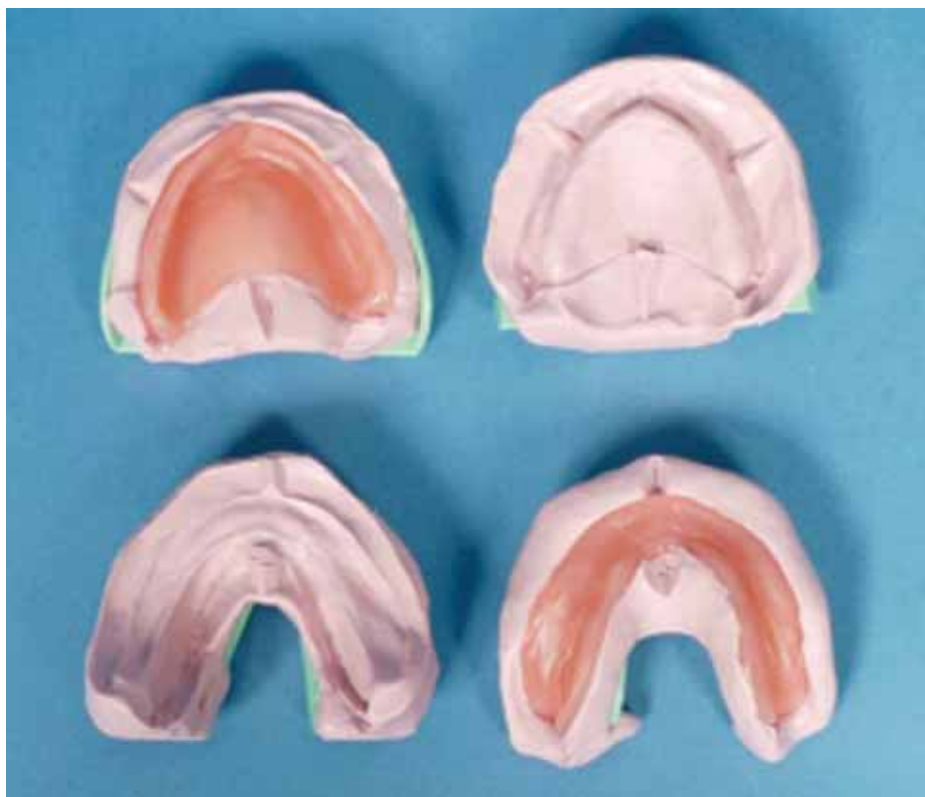


Figure 1. Dentures embedded in silicone putty.

presented their techniques in the literature.<sup>7–12</sup> These techniques follow the same principle of preparing a mould of the existing dentures either in alginate,<sup>7,9–11</sup> or a silicone rubber-poly(vinyl)siloxane impression material using stock trays,<sup>8</sup> denture processing flasks,<sup>9,11</sup> or soap boxes<sup>9</sup> as containers to support the moulds. Zoeller and Beator describe creating a plaster model from the alginate mould that is mounted on an articulator using a registration taken from the original dentures.<sup>7</sup> The teeth are then removed from the plaster model and replaced with a denture tooth and wax one by one. Others have created replicas in wax with a shellac base<sup>8</sup> or wax with a cold cure base.<sup>9</sup>

The following technique describes one approach to producing replica dentures.

### Clinical visit 1

An assessment of the existing dentures and denture bearing tissues is undertaken. If the denture base is

deemed to be under-extended, then greenstick or impression compound is added as required. Adhesive relevant to the impression material is applied to a stock tray and silicone putty is mixed and placed within the tray. The denture is then embedded within the silicone up to the denture border. The material is left to set and a separator, such as petroleum jelly, is applied to the set silicone. Adhesive is then applied to the underside of another stock tray and a silicone mix is pressed into the fitting surface of the denture to eliminate air bubbles before the stock tray is firmly seated (Figure 1). Once set, the stock trays are pulled apart and the dentures removed and cleaned prior to returning to the patient.

A laboratory prescription is then completed, requesting the technician to fabricate a template of the denture in the impressions; we recommend that wax is used to replicate the occlusal surfaces and cold-cure PMMA to replicate the polished and impression surfaces of these replica templates (Figure 2).



Figure 2. Template denture bases.



Figure 3. Registration of RCP in template rims.



Figure 4. Atrophic mandible.



Figure 5. Displaceable anterior maxillary ridge.



Figure 6. Admix impression material.

### Clinical visit 2

The replica templates are returned as prescribed above. Following appropriate infection control procedures, the replica templates are tried in and any base extension adjustments carried out. If retention is perceived to be a problem, then a 'chairside' reline may be performed using poly(vinyl)siloxane impression material; alternatively, denture adhesive may be used. Either option may be used as it is essential that some degree of retention is achieved for the next stage of this clinical visit. Following this the desired inter-maxillary relationships (horizontal and vertical) are recorded using an appropriate registration material bite registration (eg wax or a polyvinylsiloxane material, Figure 3). The appropriate tooth moulds and shade are then determined and recorded. Following disinfection, the assembly is sent to the laboratory ready to be made into trial dentures.

### Clinical visit 3

The trial stage of replica dentures is initially similar to a conventional trial denture stage. The trial dentures are checked for occlusion (vertical and horizontal aspects) and appearance. Any errors are recorded and adjusted prior to recording the definitive impressions inside the rims using an appropriate material. Following disinfection of the master impression, the trial dentures are sent to the laboratory to be processed. What is not generally recognized here is that the clinician should indicate on the master impression where the postdam is to be situated and, at a later date and prior to processing, cut out the postdam on the master cast.

### Clinical visit 4

At this visit, the template dentures are delivered and checked as per standard practice. If accuracy of clinical and technical procedures has been carried out, then retention and stability factors will have been addressed.

There is no doubt that this is a most useful technique for many patients, but it should be pointed out that there are two particular areas where it fails

to deal, adequately, with real problem areas associated with support, namely the atrophic mandible (Figure 4) and the displaceable (flabby) maxillary anterior ridge (Figure 5).

We therefore recommend the following modifications to the replica technique to cater for these problem areas, in view of the fact that this clinical management technique has not hitherto been reported.

### Clinical scenario 1

#### Atrophic mandible with atrophic mucosal cover

It is clear from Figure 4 that this is a difficult type of ridge to treat as discomfort may be felt by the patient even on digital pressure of the ridges. This clearly begets problems when any replacement denture is being considered, as the clinician should be confident that any discomfort experienced by the patient wearing replacement dentures is minimal. McCord and Tyson described a technique for recording impressions of atrophic ridges using an admix of three parts by weight of (red) impression compound and seven parts by weight of greenstick tracing compound (Figure 6) and they recommended its use in such cases, although no evidence base was cited.<sup>13</sup>

In 2005, McCord and colleagues reported the first complete denture Randomised-Controlled Trial and demonstrated that the admix material fared well when patient-perceived perceptions of outcome were measured.<sup>14</sup>

The admix material is thermoplastic and, when softened and added to a PMMA base of a replica trial denture, may be used as a definitive impression (Figure 7). The principal advantage here is that, on chilling, the ability of the atrophic mucosa to withstand occlusal loading may be tested by pressing on the occlusal surface of the mandibular premolars. Any localized spots of discomfort may be much reduced or eliminated by relieving the master cast or, alternatively, on the definitive impression.

No other technique enables this functional loading and the technique can only be utilized if the denture base is made of a self-cured PMMA.





Figure 7. Admix master impression.



Figure 8. Establishment of peripheral seal.

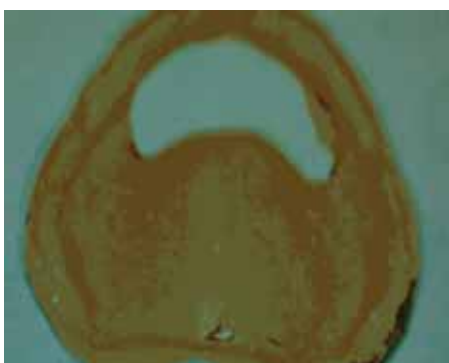


Figure 9. Window cut in PVS impression and tray.

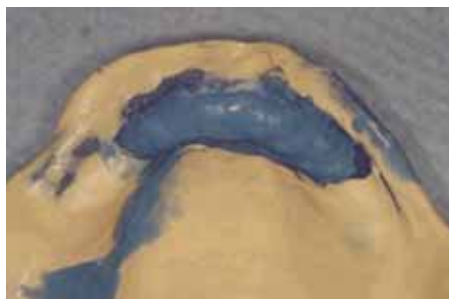


Figure 10. Wash impression.

## Clinical scenario 2

### The displaceable (flabby) anterior maxillary ridge

The principal problem here is that of support, arising from the greater

displacement of the anterior maxilla. Any attempt to overcome this should not overlook two important factors, namely retention and stability of the maxillary denture.

The retentive quotient is dealt with by making a replica template with a base of cold-cure or light-cured PMMA. The peripheral seal is made by adding tracing compound (Figure 8) and thereafter an initial definitive impression is recorded using a medium-bodied impression material. This procedure, so far, should result in a retentive maxillary complete denture in which, if border moulding is carried out, muscle balance is achievable. To cater for the displaceable anterior maxilla, the region of the impression corresponding to the flabby area of the maxilla may be removed by creating a window by cutting away the tray and impression material (Figure 9).

By asking the patient, or a dental nurse, to hold the maxillary denture in place, a light-bodied impression material may be syringed in, thereby creating a final definitive impression with minimal displacement of the flabby tissues yet re-creating a sound peripheral seal (Figure 10). This modification is again only possible if a more solid base is provided; shellac or thermoplastic bases will be liable to fracture while wax bases will be prone to distortion.

## Summary

This article has outlined the philosophical and clinical basis of the replica denture technique. While recommending this technique to colleagues, we would wish to advise colleagues that this method of prescribing replacement complete dentures should be done with the patient in mind, in particular for the provision of replacement dentures to patients with atrophic mandibles or 'flabby' or displaceable maxillary anterior ridges. These two clinical techniques are offered to help interested clinicians increase their armamentarium when dealing with edentulous patients, especially those with support problems and, hopefully, improve their chances of success.

## References

1. Jacobson TE, Krol AJ. A contemporary

review of the factors involved in complete denture retention and stability. *J Prosthet Dent* 1983; **49**: 5–15; 165–172; 306–313.

2. Fish EW. *Principles of Full Denture Prosthesis* 4th edn. London: Staples, 1948.
3. Liddelov KP. The prosthetic treatment of the elderly. *Br Dent J* 1964; **117**: 307–315.
4. Brill N. Factors in the mechanism of full denture retention – a discussion of selected papers. *Dent Pract Dent Rec* 1967; **18**: 9–19.
5. Hoad-Reddick G, Grant AA, Griffiths CS. The search for an indicator of need for denture replacement in an edentulous elderly population. *Gerodontology* 1987; **3**: 223–226.
6. McCord JF, Smith PW, Grey NJA. *Treatment of the Edentulous Patient*. London: Churchill Livingstone, 2004.
7. Zoeller GN, Beator RF. Duplicating dentures. *J Prosthet Dent* 1970; **23**: 346–354.
8. Duthie N, Lyon FF, Sturrock KC, Yemm R. A copying technique for replacement of complete dentures. *Br Dent J* 1978; **144**(8): 248–252.
9. Heath JR, Davenport JC. A modification to the copy denture technique. *Br Dent J* 1982; **153**(8): 300–302.
10. Davenport JC, Heath JR. The copy denture technique. Variables relevant to general dental practice. *Br Dent J* 1983; **155**(5): 162–163.
11. Murray J, Wolland, A. Duplicating maxillary complete dentures. *Dent Tech* 1986; **39**: 4–8.
12. Duthie N, Yemm R. An alternative method for recording the occlusion of the edentulous patient during the construction of replacement dentures. *J Oral Rehab* 1985; **12**: 161–171.
13. McCord JF, Tyson KW. A conservative prosthodontic option for the treatment of edentulous patients with atrophic (flat) mandibular ridges. *Br Dent J* 1997; **182**: 469–472.
14. McCord JF, McNally LM, Smith PW, Grey NJA. Does the nature of the definitive impression material influence the outcome of (mandibular) complete dentures. *Eur J Prosthodont Rest Dent* 2005; **13**: 105–108.