



# Top tips for removable partial dentures: Part 3 – distal extension saddle dentures

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## Introduction

The Distal Extension Saddle (DES) denture presents a technically demanding challenge for dentists to construct and a challenge for patients to wear! Problems arise due to the differing response of teeth and mucosa to occlusal load and lack of tooth support and direct retention at the distal end of the saddle. This creates instability, with the potential movement leading to unfavourable stress on abutment teeth and supporting tissues. Movement of the denture will make the denture uncomfortable to wear. Not surprisingly DES dentures have a higher failure rate than bounded saddle dentures, and this failure rate is significantly higher for lower dentures.<sup>1</sup>

Where a less than complete dentition can satisfy a patient's functional needs, many DES dentures are not worn.<sup>2</sup>

Of relevance today are the risks of using DES removable partial dentures (RPDs) within the ageing population. This can cause a fourfold increase in new root caries in elderly patients compared with restoration with bridges.<sup>3</sup> A better option for older patients may be maintaining or improving an SDA (shortened dental arch) with simple fixed prostheses, including resin bonded bridgework.<sup>4</sup>

DES RPDs may be helpful in managing an extreme SDA and can provide improved stability for an upper complete denture.<sup>5</sup> The evidence does not support that DES can contribute to occlusal stability, or improve masticatory efficiency.<sup>6,7</sup>

## Clinical tips

A decision to make a denture should be patient led with the patient understanding the time and effort required to learn to adapt to the challenges of this denture design.

If the denture is to be accepted, not be uncomfortable or the cause of damage to the remaining teeth and oral tissues, the design needs careful planning by the clinician. Do not leave design decisions to the laboratory. Considered design and tooth preparation can greatly improve the fit and stability of the denture. Unfortunately, over 70% of dentures are made without this benefit.<sup>8</sup> Following the fundamentals as described in part one of this series is crucial, in addition to the following tips which will help optimising the chances for success.

## Design for hygiene

- Do not cover or cross gingival margins wherever possible
- Join connectors directly to the saddle and leave at least 3 mm clearance between connector and gingival margin<sup>9</sup>
- To achieve the required hygienic 3 mm clearance, and avoiding wrapping the components around the abutments, the cast will need careful blocking out.
- In the lower arch, the best options for hygiene are lingual bar, dental bar and sub-lingual bar
- Dental bars are preferable where there is lower lingual gingival recession, and the sulcus is reduced. A dental bar avoids covering vulnerable root surfaces
- Lower lingual plate design are not hygienic and pose the highest biologic risk to the remaining teeth.

'If the denture is to be accepted, the design needs careful planning by the clinician.'

## Design for comfort and stability

Good biomechanics aim to manage the high loads on the saddle and control the lateral and rotational loads in function.

All DES RPDs require greater tissue support than bounded saddle RPDs and should cover as wide an area as possible.

With all distal extension saddles, consider using the two abutments adjacent to the saddle to increase tooth support.<sup>9</sup>

Direct retention will be more effective if the clasps are placed close to the saddle.

Unilateral distal extension RPDs will be significantly more stable if there is cross-arch support and ideally four widely distributed areas of support.

There should be simultaneous contact on closure with natural and denture teeth. Avoid heavy contacts on the saddle that cause movement by driving the DES into the tissues and lifting the chrome framework off the teeth.

Where possible maintain lateral guidance on the natural teeth. Design the occlusion so there are light contacts in intercuspal position (ICP), but in lateral movement the denture teeth are separated to ►►

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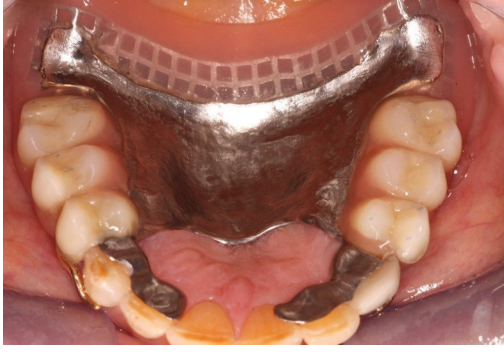


Fig. 1 Upper bilateral DES denture, showing extension to acrylic post-dam, anterior palate uncovered and optimum tooth support with hygienic horizontally approaching minor connectors to join rests to the saddle. The chrome occlusal surface was to accommodate lower tilted molars (Photograph Linda Blakely)

« avoid lateral force on the denture saddle. This may not be possible if the pattern of tooth loss is such that there are no natural tooth antagonists.

### Upper

- Extend DES saddles to hamular notch and around the tuberosity for support, stability and bracing<sup>10</sup>
- A bilateral DES RPD should have greater tissue coverage, utilising the posterior palate, to provide sufficient support (Fig. 1). Extend the denture to the vibrating line. An acrylic post-dam will enhance physical retention (as per complete denture) and facilitates a reline when required. This will also resist rotational movement around the clasp axis
- Aim to avoid covering the anterior part of the palate if possible. This avoids interference with speech and is less irritating for the patient<sup>10</sup>
- With unilateral DES RPDs, a modified mid palatal strap major connector in the vault of the palate is a good choice, it is a simple shape and can be made rigid.

### Lower

- Optimum extension of the saddle base is essential! This should include coverage of the buccal shelves, and extension onto the retromolar pad, to gain stable support from non-alveolar bone. Full extension into the functional sulci will assist with bracing against lateral forces in function. The shape of the saddle base should be the same as the posterior part of a complete denture.
- Saddles should be adapted to the neutral zone and flanges contoured to assist muscular control
- Reduce the width and length of the occlusal table. This reduces load on the ridge. Omitting the last molar creates space and allows the tongue and cheek to assist retention
- Ensure good tooth support (see above). Rest seat preparation will give axial loading to the abutments and improve the stability of the denture
- Guide planes also assist retention and stability of the denture; this small contribution can be helpful in the lower arch
- Clasps on premolars and canines can be cast chrome I-bars or wrought clasps which can be gingival or occlusally approaching. Careful clasp tip positioning will in addition to retention, help avoid the saddle moving distally away from the abutments
- Avoid using a plate design/extension of saddle for clasp reciprocation; this is not hygienic



Fig. 2 Dental bar supported by composite rests at ten-year review. Bar is clear of gingival margins and with ongoing hygiene care the periodontal health has not deteriorated (Photograph Linda Blakely)

- The mandibular major connector should be rigid.<sup>10</sup> Ensure there is sufficient thickness of chrome to achieve this
- Dental bars combined with additive composite rests provide excellent overall support<sup>9</sup> for DES (Fig. 2). The fit of the dental bar over the composite rests will resist distal movement of the denture away from the teeth. The rests need to be shaped to share the same path of insertion
- With longer spans of major connector, combine a dental bar and lingual bar to maintain rigidity with a hygienic design.<sup>9</sup>

Due to the lack of a distal abutment there will be more denture movement. This will be movement towards the ridge with displacement and compression of the tissue under occlusal loading, and movement away for the tissue when chewing sticky food.

Movement of the DES away from the tissues will occur around an axis between the clasp tips and it is usual to provide indirect retention to resist this.

The indirect retainer comprises a rest seat anterior to the rotation axis and as far away from it as practicable.

- Dental bars can provide ample indirect retention
- Lingual bars and sublingual bars require an additional component to provide indirect retention. A hygienic option is to connect the indirect retention rest directly to the saddle with a horizontal approach. This avoids crossing the gingival margin and simplifies the design
- The traditional Cummer arm indirect retainer covers the gingiva, and if placed on the tooth adjacent to the primary abutment, may not give the required 5 mm clearance between minor connectors, creating a food trap and tongue irritant<sup>10</sup>
- If the indirect retainer is placed on an anterior tooth a rest seat should be prepared or added to avoid force on the inclined tooth surface resulting in unwanted tooth movement.<sup>10</sup>

These rotational movements of the saddle in function can potentially impart undue stress on the abutment teeth. A design suggestion for minimising stress on the abutment is the RPI system (mesial occlusal rest, distal guide plane and I-bar) However this cannot be used to mitigate shortcomings in the stability of the overall design, such as under extended saddle bases and inadequate tooth support. More recent research indicates that if plaque control is good with no periodontal inflammation, and hygienic design principles applied with overall good support for the denture, then the forces on the abutments will not cause attachment loss.<sup>11</sup> This supports the need to ensure good plaque control at the outset and arrange appropriate ongoing hygiene care. »

« Traditionally the altered cast technique, a two-stage technique, has been advocated as a method to record the differential support provided by teeth and the support that can be obtained from the more displaceable edentulous ridge. The aim was to improve load distribution and increase stability of the denture.

However, it has been found that a one-piece impression can offer base support equal to that of an altered cast impression technique. Achieving this depends on the quality of the definitive impression, fit of the framework checked under magnification, and extension of the bases onto anatomic landmarks.<sup>12</sup>

The authors find it easier to do this one-piece impression in two stages. This allows focus on recording the anatomic landmarks of the saddle separately (as per complete denture), and then subsequently recording the details of the teeth and tooth preparations.

A spaced tray with stops is fabricated on the primary cast. The extension is checked in the mouth and adjusted if necessary. The distal extension and lingual border are border moulded and then an impression made of the saddle area. Trim the set impression material to give 4 mm clearance from the teeth, this allows a suitable thickness for the wash impression material over the teeth and ease of reinsertion. A second stage wash impression will record the teeth and preparations. The tray can then be resealed to the same place and held firmly down over the saddle area whilst the border moulding is repeated and until the wash impression sets. This provides an undisplaced impression of the teeth and a displaced impression of the tissue of the distal extension. The authors prefer greenstick and medium bodied silicone for the saddle/lingual area and a lighter bodied silicone or alginate for the secondary wash.

### Conclusions

As with all dentures, regular review is important to ensure that the denture is functioning well and oral hygiene remains good. Due to the potential for greater alveolar resorption in the mandible, the denture should be regularly assessed for saddle fit, and the need for relines, which will be more frequent. This will maintain denture stability and minimise tissue damage in the longer term. ■

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### CLINICAL PUZZLE

## Last standing molar



Fig. 1 Radiograph of the patient's dentition

A 52-year-old patient presented with BPE scores of:

1	1	1
4	1	1

The dentition was otherwise stable with no active caries (Fig. 1) The 46 had distal bone loss to the apex with distal pocketing of 11 mm with a purulent discharge.

There was no mobility, no furcation involvement clinically, and a negative response to sensibility testing. The patient was very keen to keep the tooth as the last standing molar on the lower RHS.

Discuss your likely diagnosis and management options for the 46 (lower right 6).

Send your answers to [k.quinlan@nature.com](mailto:k.quinlan@nature.com) by 6 April 2023.

The answer will be revealed in an upcoming issue.

If you would like to send a clinical puzzle, view the details here:

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## Perspectives on practice-based research networks

This month the BDJ Perspectives section focuses on practice-based research networks.

Associate Editor Professor Avijit Banerjee explains:

'Much of the clinical research carried out in specialist hospital settings, although important and useful, is not always immediately translatable and implementable in the primary care setting. Thus, there is a need for more oral and dental primary care research to be carried out on real patients by all members of the oral healthcare team, in real-life situations. This month's BDJ Perspectives theme focuses on this primary care, practice-based research, with commentaries to help the team appreciate its critical relevance in oral healthcare delivery, the support available to carry it out in primary care and examples of ongoing national clinical trials to get involved with. Remember, involvement in oral healthcare research is a team duty, just as important as delivering optimal healthcare to our patients!'

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