

Unilateral Bounded Saddles: A Clinical Case Report on the use of a Two Part Sectional Removable Partial Denture

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Abstract - An increasing proportion of the adult population is partially dentate. Dental implants, being fixed and conservative of tooth tissue could be the ideal treatment of choice however cost, systemic and local factors may limit their use. An alternative treatment modality is therefore required for patients who are not suitable candidates for dental implants, conventional removable partial dentures or bridges. This case report illustrates the use of a sectional removable partial denture to restore a unilateral bounded saddle using a Hader bar connector.

KEYWORDS: Unilateral bounded saddle, sectional removable partial denture(s), Hader bar

INTRODUCTION

In the last 30 years, the percentage of edentulous adults in England has dropped from 28% to 6%¹ and an increasing number of people are retaining their natural dentition as they age. This often presents prosthodontic challenges where tooth replacement options for bounded saddles are explored, be it to improve function or aesthetics. When the edentulous space is larger than a span of two-teeth, the options for replacement are usually limited to a conventional removable partial denture (RPD) or implants. The use of implants has transformed the replacement of missing teeth as shown in several studies², but this treatment modality also has its limitations as shown in Table 1. This case report illustrates the use of a sectional RPD to restore a unilateral bounded saddle.

Sectional Removable Partial Dentures

The principles behind the mechanism of sectional RPDs are two-fold: opposing undercuts are engaged using two separate units with different paths of insertion (Figure 1); these separate units must be mechanically locked together in the mouth for positive retention to be achieved and to prevent the disengagement of each counterpart whilst in function.

The fulfilment of the first principle is straight forward. Where the length of the edentulous span is greater than its height, the mesial and distal undercuts are utilised; where the height of the span is greater than its length, then the buccal and lingual aspects are engaged.

It is the second principle which clinicians and technicians have explored in different ways. A design first described in detail by Lee³ in 1963 illustrated the use of an internal locking bolt to hold the two parts of the sectional RPD together. Since then, an array of mechanisms to hold the two parts together have been described. These have included: various types of bolts⁴; hinge and bolt⁴; split-pin-and-sleeve device⁵; stud attachments⁶ (e.g. Dalla Bona and Conod); magnets⁸; captive screw⁹ and other precision attachments^{7,10} (Figure 2). All these mechanisms have shown to be successful but have the following disadvantages:

- Complex and expensive technical skills are required for their construction;
- Interarch space dependent;
- Difficult to repair or refurbish when the locking retention has worn or when parts are no longer on the market;
- Difficult to clean, insert and withdraw;

The development and success of implant supported overdentures have been well documented². Not surprisingly, the principle behind the retention of such prostheses is similar to the locking of sectional RPDs in that the first part of the attachment device (attached to the implant) is used to engage with the second part housed within the overdenture. One common system used in implant supported overdentures is the Hader bar and nylon plastic sheath mechanism. This has been shown in several studies to possess sufficient retention and resistance to fatigue^{11,12}. Hader bars and plastic sheaths have several advantages over the previously described methods. They are technically relatively simple to use, cost effective and easier to clean. The plastic sheath is easily replaceable if retention deteriorates, removing the need for replacement of the prosthesis as a whole and they may be more versatile where space is a premium. For these reasons, it was decided to adopt its use in interlocking a sectional RPD as described in the following case report.

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Table 1. Factors which preclude the provision of implants

- Lack of bone height and width – need for bone augmentation which is complicated and prolongs treatment
- Implant site close to anatomical structures such as inferior alveolar nerve, mental nerve and maxillary sinus
- Medical restrictions eg. poorly controlled diabetes, haematological disease, autoimmune disorders, metabolic bone diseases
- Risk of necrosis of bone – previous radiotherapy, use of bisphosphonates
- Smoker
- Poor oral hygiene
- Costs of implants and components

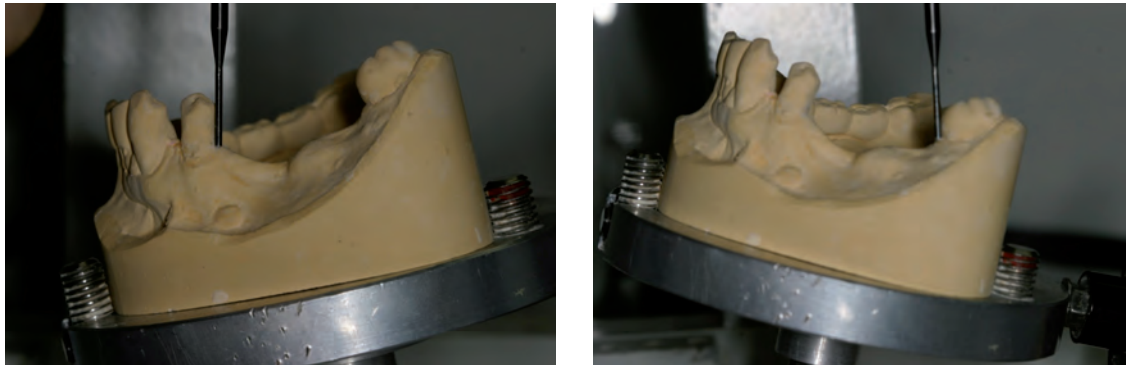


Figure 1. Different paths of insertion of mesial and distal abutment teeth

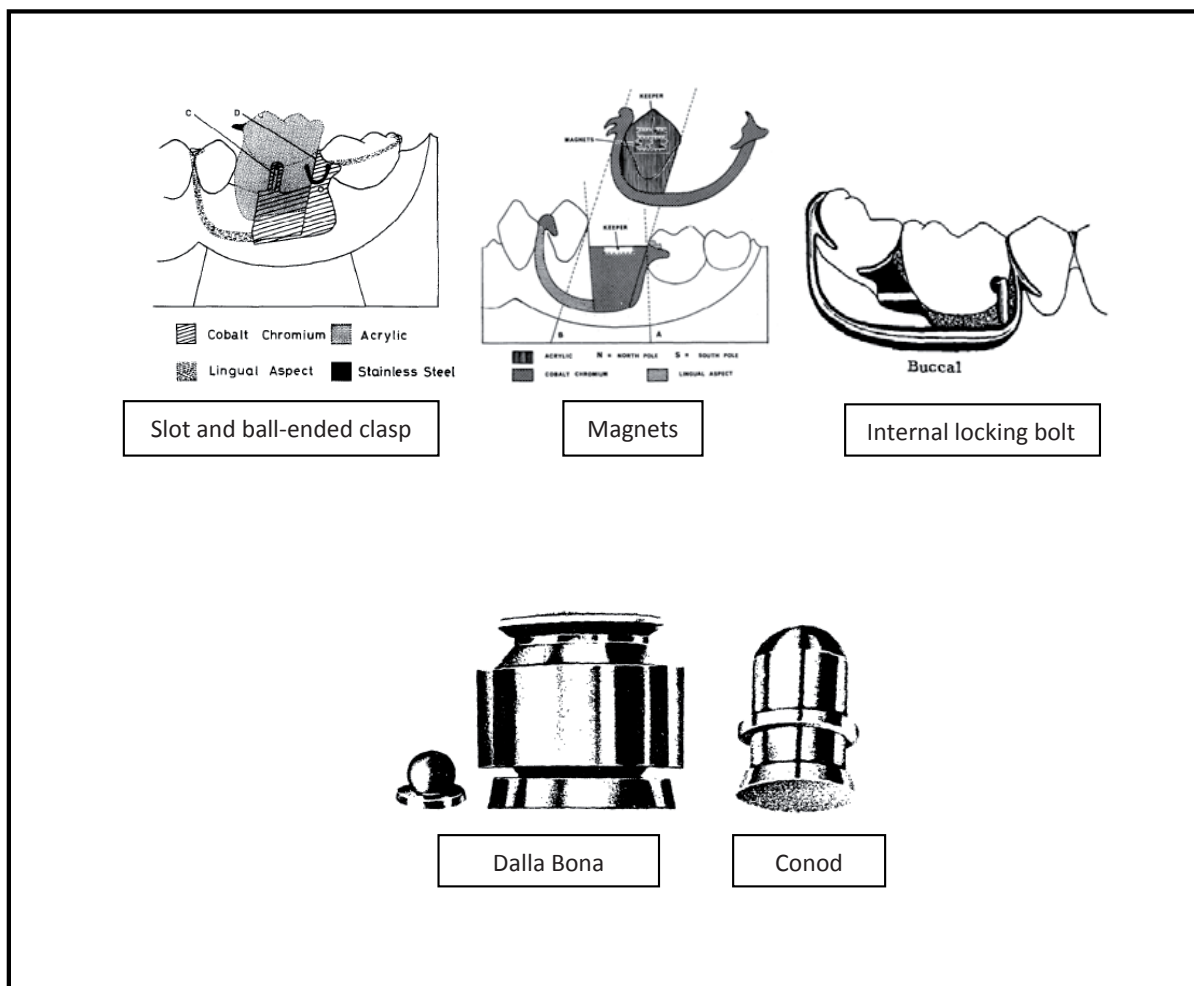


Figure 2. Examples of sectional RPD attachments³⁻⁹

Other existing details																
Caries and existing restorations	bucc. ling.															
Teeth visible (notation)	8 7 6 5 4 3 2 1 1 2 3 4 5 6 7 8 right left															
Caries and existing restorations	ling. bucc.															
Other existing details																

Figure 3. Pre-operative teeth chart

Key:
 - Tooth coloured filling
 - Amalgam filling

CASE REPORT

History and Complaint

A 73 year-old male presented complaining of loose and ill-fitting upper and lower immediate acrylic resin RPDs. There was dissatisfaction with the appearance of several crowns, one of which had de-cemented several times. Medically, he had well controlled type II diabetes and was taking metformin, gliclazide, sitagliptin and clopidogrel. The patient stopped smoking 28 years ago but had previously smoked 20 cigarettes a day for 27 years.

The patient presented with Kennedy class III maxillary and mandibular arches. The patients' teeth chart is shown in Figure 3. There was generalised gingival recession of 2-3mm. Detailed periodontal charting revealed pockets of more than 5mm on the distal aspect of 23, mesial aspect of 24 and distal aspect of 26. The crowns in 14, 23 and 24 had deficient and discoloured margins.

Investigations

Pre-operative photographs were taken as shown in Figure 4 together with appropriate long cone periapical radiographs (Figure 5). Articulated study casts were used for occlusal analysis and determination of inter arch space availability for prosthetic components. The study casts were further analysed by surveying to find appropriate paths of insertion (Figure 1), guide planes, retention undercuts and discover potential soft and hard tissue interferences.

Diagnoses

The following diagnoses were made:

1. Mild to moderate chronic periodontitis
2. Recurrent caries 23
3. Apical periodontitis 24
4. Fractured restoration 18
5. Poor crown margins 13 and 14
6. Acquired loss of teeth with a bounded saddle in upper right and lower left quadrants

Table 2. Summary of restorative treatment provided

Extraction

- Tooth 23 was extracted as caries extended along the root canal and deemed unrestorable

Direct restoration

- Class V resin composite restoration on tooth 44 to create a buccal undercut
- Class V resin composite restoration on tooth 13 to mask discrepancy in crown margin

Root canal treatment

- Repeat endodontic treatment for tooth 24 via orthograde approach

Indirect restoration

- Gold coping for overdenture on tooth 24
- Full gold crown with rest seat and guideplane on tooth 18
- Full gold crown with rest seat and guideplane on tooth 48
- Replacement metal-ceramic crown with rest seat and guideplane for tooth 14

Removable prosthesis

- Upper conventional cobalt chromium RPD
- Lower sectional RPD

Restorative Treatment

The patient's oral health and dentition were first stabilised with oral hygiene instructions and diet advice, routine supra- and sub-gingival scaling and root surface debridement where pockets of >5mm were present. A daily 0.05% fluoride mouthwash was also prescribed for prevention of caries. Following this, extensive restorative care was carried out as summarised in Table 2. Post-operative photographs following completion of restorative treatment are shown in Figure 6.

Table 3. Indication and contraindications for the provision of a sectional RPD

Indication	Contraindication
Opposing undercuts on each end of a bounded saddle	Parallel surfaces on tooth mesial and distal to bounded saddle
Healthy abutment teeth	Questionable prognosis of abutment teeth
Good oral hygiene	Poor oral hygiene
Adequate inter-arch space (min 4.5mm for Hader bar ¹³)	Inadequate inter-arch
Adequate size of bounded saddle	Inadequate size of bounded saddle
Good manual dexterity	Poor manual dexterity (eg. arthritis)

Table 4. Advantages of sectional RPDs

• They are especially useful in unilateral bounded saddles as support or retention from the contralateral side is not required. This is advantageous for patients with severe gag reflex or tori who cannot tolerate major connectors in the palate or floor of the mouth. • They may provide superior retention to conventional dentures. • They are able to engage opposing undercuts that would have to be blocked out if a conventional RPD was designed. This reduces areas of food packing and gingival inflammation around abutment teeth. • They are able to eliminate dark unaesthetic triangles by engaging the appropriate undercuts. This results in better aesthetics. • They are still able to replace soft tissues for lip and cheek support. • They are removable which may aid maintenance of gingival health around abutment teeth. • Treatment is relatively conservative. No or minimal tooth preparation is required. • Chairsides technique is the same as for the construction of conventional RPDs. Therefore there is no need for further training for dentists to provide this treatment option.

Lower Sectional RPD Design

Two separate but interlocking cobalt chromium frameworks were designed. The first section was inserted parallel to the mesial angulation of 38 engaging its mesial undercut and held the Hader bar. The second section was designed to be parallel to and engage the distal undercut of 34. This second part contained the acrylic resin teeth and flange beneath which was housed the Hader plastic sheath which in turn engaged the undercut of the Hader bar as shown in Figure 7a. The plastic sheaths are colour coded according to retentive strength – white, yellow and red from least retentive to most retentive (Figure 7b). The sheaths are removable and may be replaced if the retention declines. The completed sectional RPD is shown on the master casts in Figure 8.

DISCUSSION

The use of sectional RPDs has been discussed in several published articles³⁻¹⁰. A conventional cobalt chromium RPD was not prescribed because placing clasps and rests on the contralateral non-problematic 6-unit bridge could have potentially affected its prognosis. An alternative to the sectional RPD could have been a *single unit* RPD limited to the bounded saddle. This would have had certain

limitations due to its single path of insertion. The tilted nature of the abutment teeth would have led to food or plaque stagnation areas. Both abutment teeth could have been prepared to be parallel, but this would have been quite destructive of tooth structure. The retention of a *single unit* RPD is also inferior to a *two-part* sectional RPD which gains retention from the opposing undercuts. Other indications and contraindications for sectional RPDs are found in Table 3. The advantages and limitations of sectional RPDs are illustrated in Table 4 and 5.

CONCLUSION

This case report demonstrates an example where a sectional RPD was used to successfully restore the patient's dentition. It is an alternative treatment modality for patients where conventional treatment options are not suitable. The use of the Hader bar system to lock the two conjoining parts of the sectional RPD may be a technically simpler way of fabricating such a prosthesis. The ability to simply replace the Hader plastic sheath when refurbishment is required is also a major benefit. More importantly, with this method sectional RPDs can be clinically relatively simple, conservative and reversible, the epitome of minimally-invasive dentistry.

Table 5. *Limitations of sectional RPDs*

- They can be complex in design and not all dental technicians have the necessary skills and materials for their fabrication.
- Case selection is important. Patients must have good manual dexterity for sectional RPD's to be suitable.
- The abutment teeth must have two opposing undercuts for two conjoining parts of the sectional RPD to engage separately.
- The cost of fabricating a sectional RPD may be higher than a conventional RPD.



Figure 4. *Pre-operative photographs*

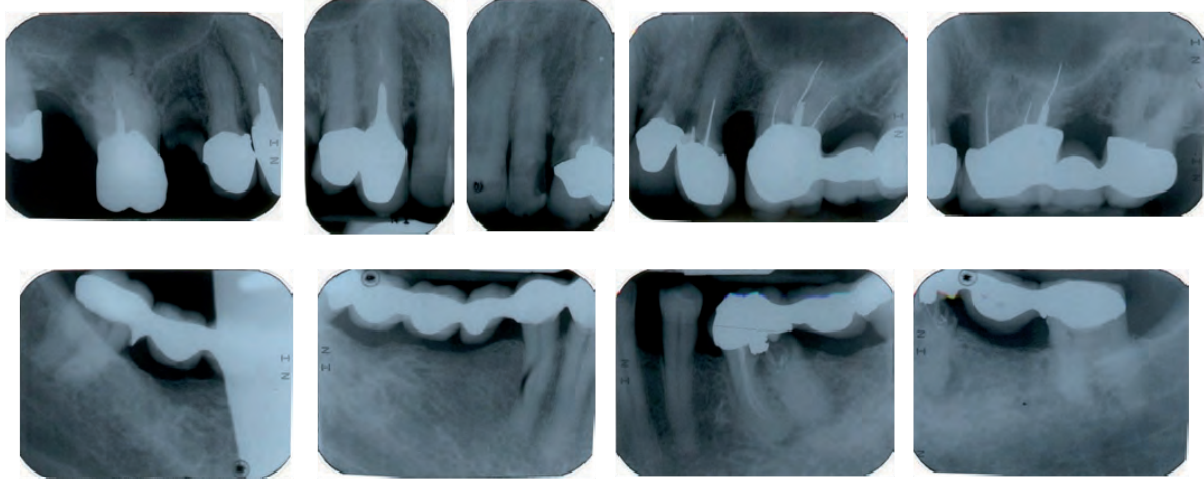
		
Periodontal bone levels	Generalised 30% horizontal bone loss	
Retained root	15	
Caries	22 (distal)	
Recurrent caries	23, 36	
Periapical pathology	16, 24, 36	
Endodontically treated teeth	16	over erupted, post retained crown, poorly condensed obturation
	13	post retained crown, poorly condensed obturation
	23	post retained crown, poorly condensed obturation, recurrent caries around post and crown margin
	24	post retained crown with dentine pinned core, poorly condensed obturation, recurrent caries at crown margin
	26	threaded post retained bridge abutment, obturation with silver points
	36	poorly condensed obturation, gross recurrent caries under bridge abutment

Figure 5. Periapical radiographs and report



Figure 6. Post-operative photographs

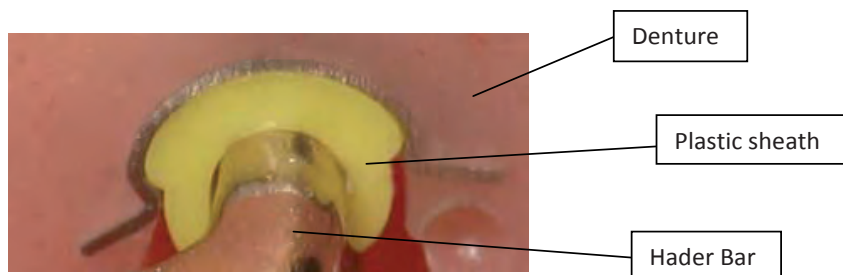


Figure 7a. Hader plastic sheath engages undercut of Hader bar



Figure 7b. Different retention strengths of Hader plastic sheaths

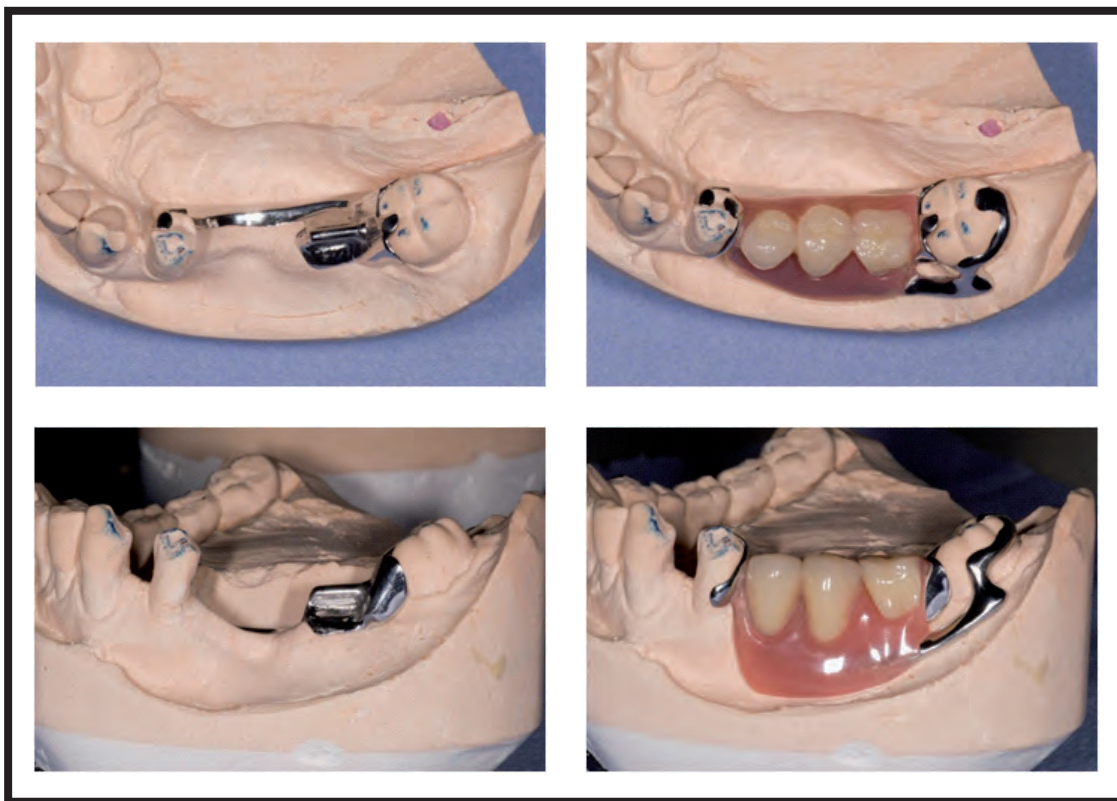


Figure 8. Completed sectional RPD on master casts

MANUFACTURER'S DETAILS

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