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# Sectional Dentures Revisited

**Abstract:** Sectional dentures are constructed in separate parts which join together intra-orally to create a single prosthesis. They are used to exploit undercuts around teeth, hard and soft tissues which require more than one path of insertion, and are usually of split pin or locking bolts design. By using two case studies, we aim to illustrate the provision of sectional dentures and to which situations their uses are best suited.

A 30-year-old male was referred to the Department of Prosthetics at the Birmingham Dental Hospital for a replacement upper partial cobalt chrome denture of a Kennedy Class IV bounded saddle. The patient had a history of failed upper cobalt chrome removable partial dentures owing to loss of retention and poor stability over the previous 12 months. A 40-year-old female patient was referred by her GDP for restoration of a bounded saddle in the lower right quadrant with a history of intolerance to previous dentures.

These two cases demonstrate the successful use of sectional dentures in the aesthetic zone. Although more technically demanding, they lie well within the scope of general practice and offer patients alternative solutions from dental implants and bridgework. These cases highlight the importance of the use of alternative prosthetic techniques which can be simple and achievable for all practitioners.

**Clinical Relevance:** Sectional dentures are a treatment modality for the edentulous space where the presence of one or more undercuts prevents restoration by more conventional techniques. This paper highlights some of the situations in which sectional dentures can be employed and emphasizes their use in general practice.

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Restoration of the edentulous area is one of the commonest problems faced by dentists, especially due to the increasing proportion of partial edentulism. The treatment of choice has largely been implant-supported/retained prosthesis and adhesive bridgework to restore limited bounded saddles, especially in the aesthetic zone. Removable partial dentures still

remain a cost-effective way of managing the edentulous saddle, especially if the saddle area is particularly large. A common problem in the bounded saddle is where there are two or more opposing undercuts. Achieving a good aesthetic result is difficult

where there are undercuts around the abutment teeth predisposing to food packing areas and black triangles.<sup>1</sup> An alternative approach would be a sectional denture. A sectional denture is defined as a prosthesis which is composed of two or

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Advantages	Disadvantages
Improved aesthetics (elimination of black triangles and removal of clasps in some situations)	Highly skilled technician and dentist is mandatory and communication is crucial
Improved retention in severe undercut areas	Patient requires high level of manual dexterity
Elimination of food traps interproximally in tilted teeth	Pins/bolts need regular maintenance (re-activation)
Increased stability	Mechanical deterioration or biological adaptation may allow the denture to be removed as a whole unit

**Table 1.** Advantages and disadvantages of providing sectional dentures.



**Figure 1. (a-d)** Pre-op views showing Kennedy Class IV saddle.

more parts, each utilizing differing (and often conflicting) paths of insertion.

This was first reported in the literature by Lee and Simmons in 1963.<sup>2,3</sup> The two parts of the sectional denture, when inserted together, can provide enhanced retention by utilizing two separate paths of insertion of the individual components. There are two common designs of sectional dentures, the lock and bolt design and the split pin design.<sup>2,4</sup> The denture usually consists of two separate sections which are locked together in the patient's mouth and requires separation

into the component parts in order to remove them. Three-part sectional dentures have been reported in the literature.<sup>5</sup> Advantages and disadvantages of sectional dentures versus conventional design dentures is highlighted in Table 1. Although there are some disadvantages of sectional dentures, they remain a vital treatment option in certain situations.

### Design principles

Sectional dentures can be constructed using different designs, most commonly split-pin and swing-lock designs. It is imperative that, when constructed, they must be rigid and be free from any movement once the separate components are united. When considering the design of any removable prosthesis, one must pay particular attention to the hard tissue and soft tissue undercuts. The presence of significant opposing undercuts has always been a problem in conventional denture designs and it is the presence of undesirable undercuts (one that would prevent the insertion or removal of a conventional prosthesis) which cannot be eliminated by any other means, eg tilting a cast, where a sectional denture should be strongly considered as a possible solution. The length and height of the edentulous span will dictate the design of the denture with respect to the paths of insertion utilized. In general, if the length of the edentulous span is greater than the height, then mesio-distal paths of insertion may be used (usually posteriorly), and if the height is greater than the length, then bucco-lingual paths of insertion should be utilized. The two cases below highlight two situations in which bucco-lingual paths of insertion are utilized.

The aim of this paper is to highlight situations in which sectional dentures can be used as a treatment of choice in crucial aesthetic areas using two case studies.

### Case 1

A 30-year-old male patient was referred by his GDP regarding problems with his upper partial denture. The patient had lost his upper central teeth during an accident 20 years previously and had been provided with three upper partial

dentures, two acrylic dentures and one cobalt-chrome denture. The acrylic dentures had fractured and the cobalt-chrome denture was unretentive and had poor aesthetics. The patient was under the care of a cardiologist as a result of a hypertrophic obstructive cardiomyopathy, for which he was taking a calcium-channel blocker and warfarin. The patient was keen to have a successful long-term prosthesis which was not destructive of his dentition and which met his aesthetic needs. Clinical examination revealed an intact and well cared for dentition with the UR1 and UL1 missing. The UR2 had a large composite restoration which had discoloured (shortly after the initial visit the UR2 fractured subgingivally which resulted in the eventual extraction of this tooth). The gingivae were healthy (Figure 1a, b) and there was a deep overbite with group function on lateral excursions (Figure 1c, d). The treatment options for this case were implant-retained crowns, conventional bridgework, adhesive bridgework and a removable partial denture. These options were discussed with the patient using articulated study casts and, owing to financial constraints, implant-retained crowns were not a viable option. There is limited success with bridgework replacing central incisors when using one or more lateral incisors, especially when heavily restored.<sup>6</sup> A further option would be the extraction of the lateral incisor and recruiting the maxillary canine teeth as abutments, however, when considering the deep over-bite, lack of space and the occlusal pressures, any bridge would be subjected to a conventional preparation. This would involve destructive preparation of unrestored teeth and the patient expressed firm views against this. A removable partial denture was thus planned to restore the bounded saddle area.

### Treatment

Following examination of the patient and analysis of articulated study casts, a cobalt-chrome design was planned because of the history of fracture of past acrylic dentures, and it was decided to utilize the natural undercuts between the abutment teeth (UR3 and



**Figure 2.** Chrome framework with split pins incorporated.



**Figure 3.** Acrylic section with housings for pins incorporated.



**Figure 4.** Acrylic and chrome sections together.

UL2) and the bony undercuts anteriorly to address the issue of retention. Bearing this in mind, the following design was utilized (Figures 2 and 3):

- A sectional cobalt-chrome denture was designed with retentive clasps on the UR6 and UL6;
- Rest seats were used on UR3 and UR6, UL2 and UL6;
- Split-pins were used retaining an acrylic section with housings incorporated into it replacing UR2, UR1 and UL1.

The chrome framework is



**Figure 5. (a–d)** Post-op views showing a good aesthetic result.

designed to engage the palatal surfaces of the anterior teeth and the path of insertion of the acrylic section is governed by the angle of the labial surfaces of these teeth. The paths of insertion are bucco-palatal (chrome framework and acrylic section) which are typically used in the anterior region. In this respect, the hard and soft tissues of the saddle area are restored in full without compromise as a result of opposing undesirable undercuts. The denture is fabricated in a conventional manner until the wax try-in on the chrome framework. At

this stage, the two sections are separable and the split-pins (composed of ½ round orthodontic wire soldered to the chrome framework) are present on the framework, with housings in the tooth wax-up which are fitted inside the patient's mouth (Figure 4). After a successful try-in stage the final denture *in situ* is shown in Figure 5.

#### Discussion

The patient was very happy with the aesthetics and feel of the new denture. The hygienic metal framework is compatible with the patient's good oral hygiene habits with good clearance (at least 3 mm) from the gingival margins of the teeth. A certain degree of manual dexterity is required by patients with this type of restoration in order to assemble and disassemble it in the oral cavity. The denture is tooth-supported and has rest seats as far distal as possible to reduce rocking movements. The retention is considerably improved from the previous dentures owing to the utilization of the tooth and soft tissue undercuts. The patient has successfully worn the denture for 12 months and is currently under yearly review at the Department of Prosthetics at the Birmingham Dental Hospital and has regular six-monthly check-ups with his general dental practitioner.

#### Case 2

A 40-year-old female patient was referred by her general dental practitioner for restoration of the missing LR2 and LR3. The patient had the teeth extracted a year previously and could not tolerate the immediate denture provided by her GDP owing to discomfort. A cobalt-chrome denture was also attempted by her GDP but this failed as the patient could not tolerate any lingual coverage. The patient had an unremarkable medical history and was a non-smoker. The patient was keen to explore other methods of replacement of the edentulous region without bulky lingual coverage and thus attended our clinic. Clinical examination revealed an intact upper arch which was moderately restored and a crowded lower arch with two heavily restored 6s. The patient's oral hygiene was good (Figure 6). The lower posterior teeth were lingually tilted and the lower premolars were of short clinical



**Figure 6. (a, b)** Pre-op views showing missing lower right lateral incisor and canine. Note the angulation of the abutment teeth.



**Figure 7.** The chrome framework with split pins incorporated, shown on working cast.



**Figure 8.** The acrylic section shown in position on the chrome framework.

height, which was emphasized as a result of the angulation. The options for restoration of the edentulous area included implant-retained crowns, conventional bridgework,



**Figure 9. (a–c)** Post-op views showing a good aesthetic and functional result without the need for tooth preparation.

adhesive bridgework and a removable partial denture. Owing to the aesthetic considerations and the visibility of the saddle area, the option to monitor was not acceptable to the patient. Once again, implant-retained crowns could be a feasible option for the patient in this case; however, the lack of crestal width bucco-labially would require augmentation by means of a bone graft. Conventional bridgework in this case would require heavy preparation of the unrestored premolar and central incisor. This, coupled with the position of the bridge in the arch, make this treatment option unfavourable. Adhesive bridgework could be considered in this instance if crown lengthening was carried out on the premolar to increase the bond surface area. Special consideration would need to be made with regards to the occlusion

because of the increased over-bite, thus lateral guidance would need to be shared with the posterior teeth (conformative). A conventional removable partial denture would be contra-indicated in this instance as a result of the patient's lack of tolerance of lingual coverage; however, a sectional denture could be constructed with minimal lingual coverage. Following analysis of the options with articulated study models, the patient preferred the option of a sectional denture because of economical considerations and her reluctance to undergo any surgical procedures.

#### Treatment

A metal framework was designed which extended from the LR6 to the LL1 with:

- An occlusal-approaching clasp on the LR6;
- Rest seats on the LR4 and LR6.

The extension of the framework on the lingual surfaces of the lower incisors aids the stability of the prosthesis, whilst remaining thin in cross-section to satisfy patient tolerance (Figures 7 and 8). The metal framework has two split pins incorporated into the saddle area to which an acrylic section, with a path of insertion (angled more buccally) allowing utilization of the two opposing undercuts associated with the LR4 and LR1, is retained. Figure 9(a) shows the sectional denture *in situ* and highlights the minimalism of the design. Although the framework is extended around the arch to the LL2, it is conducive to being worn without impinging on soft tissues and function. The relatively small size of the removable prosthesis minimizes plaque retention around the gingivae of the lower teeth, and is therefore compatible with maintenance of good oral hygiene. Figures 9(b, c) show the final denture *in situ* and also display how the utilization of two paths of insertion can also help reduce the effects of black triangles around the tilted teeth, which would be unavoidable in a conventional prosthesis.

#### Discussion

This patient was satisfied with the reduction in bulk of the denture lingually, which she was able to tolerate well. She was happy with the aesthetics of the prosthesis and especially with the



**Figure 10.** A close-up of split pins incorporated into a chrome framework.

disguise of the black triangles anteriorly. The patient has been successfully wearing the prosthesis for 7 years. After 2 years the patient returned on a review appointment complaining of looseness of the acrylic section. This was readily treated by re-activation of the split pins by placing an instrument into the gap in the centre of the pin and gently rotating slightly for

re-activation (Figure 10). She is currently under regular review at the Birmingham Dental Hospital and has returned on one other occasion for re-activation of the pins.

### Conclusion

These cases highlight another treatment option open to the restorative dentist. There will always be the conventional routes of implants and bridgework which will be more frequently used, however, some circumstances may mean that neither is used. A sectional denture in these cases was the treatment of choice and the patients were happy with the aesthetics and the conservative nature of the treatment.

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