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## Restorative planning for hemisection surgery: a technique report



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Hemisection surgery involves the premeditated amputation of one or more roots and its overlying coronal structure to facilitate partial tooth retention. This can be carried out in cases where a multi-rooted tooth may have its furcation area, or one or more of its roots severely affected by periodontal disease, caries or a periodontal-endodontic lesion. With appropriate case selection and pre-operative planning it is possible to attain good aesthetics, a friendly environment for the periodontium and a good long-term prognosis. This report outlines a technique whereby a hemisected tooth may be restored without compromising its positional relationship to its abutments and by minimising occlusal loading.

### ■ Introduction

The ultimate aim of hemisection surgery is to salvage a viable part of the tooth to be used as a prosthetic abutment or for occlusal support. Favourable predictors for carrying out hemisection surgery of a multi-rooted tooth include adequate bone support to maintain the sectioned 'healthy' root, a high furcation level to reduce the amount of tooth tissue to be cut and achieving a supra-gingival restoration margin (preventing encroachment upon the biological width)<sup>1</sup>. A predictable endodontic treatment is also

of paramount importance and it is necessary to have adequate residual coronal tooth tissue after crown sectioning, caries removal, and preparation to provide adequate resistance and retention for the definitive restoration. As the hemisection procedure for a tooth requires careful planning and execution of treatment, a highly motivated patient with good oral hygiene is a prerequisite. If all these criteria are met, hemisection surgery is an alternative to extraction of the tooth and its replacement with either a dental implant or a conventional fixed/removable prosthesis.



**Fig 1** Pre-operative clinical picture (a) and cast model (b), showing loss of attachment of tooth 46 and its high furcation involvement.



**Fig 2** Periapical of tooth 46, showing severely compromised distal root (tooth 44 was extracted prior to the clinical photograph).



**Fig 3** Periapical of tooth 46 post endodontic therapy with amalgam restoration within the chamber and the coronal portion of the root canals (Nayyar core).

**Case report**

The present report documents in an illustrative manner the pre-surgical planning and the laboratory stages involved in the interim and definitive phases of restoring the remaining root after hemisection surgery of a molar tooth.

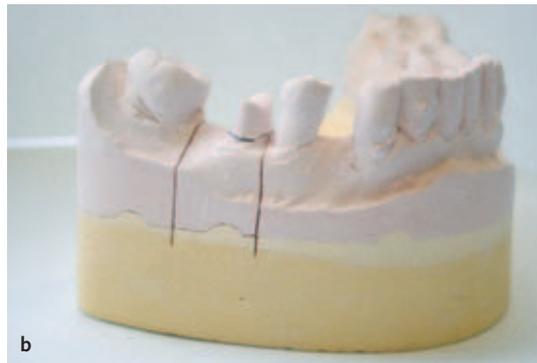
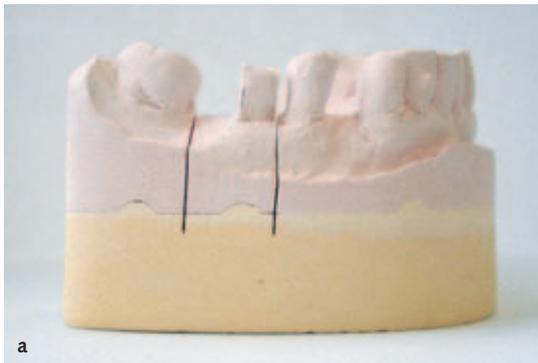
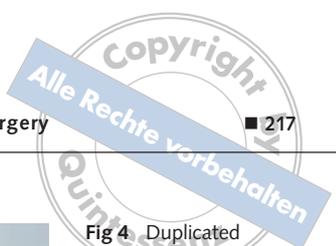
**Diagnosis and case selection**

The case presented is of a patient in whom the tooth 46 had a distal root that was severely periodontally compromised despite repeated attempts at non-surgical management. As it had a favourable anatomy it was chosen for hemisection, and endodontic therapy of the tooth was carried out to a high standard. Following root canal obturation a coronal seal is required to facilitate subsequent hemisection and can be provided by placing the coronal restoration within the pulp chamber as well as the coronal portion of

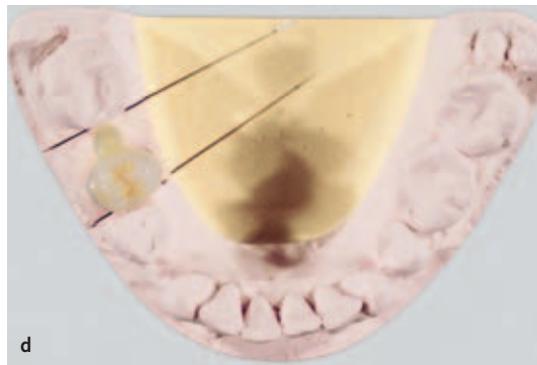
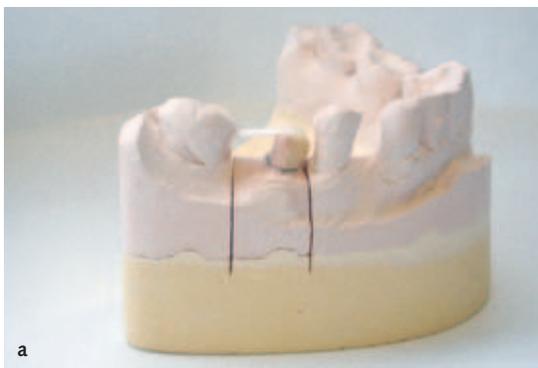
the canals (Nayyar core). Therefore if different clinicians are providing the endodontic therapy and hemisection surgery, good communication is needed to prepare the tooth endodontically for the hemisection procedure.

**Pre-surgical planning**

An alginate impression was taken and stone models (Plastex, peach die stone based with Kaffer D) were poured. The primary model was duplicated using Dubliplast thermo-reversible duplication gel (Dentaurum, Ispringen, Germany). A mock surgical procedure was performed on the duplicated cast imitating the removal of the coronal distal portion of the tooth (Fig 4a). The laboratory technician performed an idealised crown preparation of the remaining coronal part, which represented the anticipated hemisection outcome (Fig 4b). A temporary crown, either from indirect composite (3M ESPE Sinfony



**Fig 4** Duplicated models, showing (a) laboratory sectioned distal portion 46, and (b) crown prepared mesial coronal portion.



**Fig 5** Laboratory stages in the fabrication of the temporary composite crown. Reinforcement ribbon (3 mm Ribbon, THM, USA) and indirect composite were used to construct the temporary crown, with distal extension, and 'tear drop' contacting the adjacent tooth to prevent drift/tilting. The placement of the reinforcement ribbon is shown in 5a and 5b, and its incorporation within the temporary composite build up in 5c and 5d.

shade A3), as with this case, or in acrylic (Pattern resin, e.g. Duralay Dental MFG, USA) is then constructed based upon this idealised preparation (Fig 5). It is essential that the mock crown preparation is 'under'-prepared such that a small space remains at the time of fitting the crown. This takes place at the time of surgery, and over-preparation of the model would result in a temporary crown that did not fit the prepared tooth at the hemisection appointment and would require considerable chair-side adjustment, which is undesirable at the surgical appointment.



**Fig 6** Definitive clinical crown preparation.



**Fig 7** Definitive restorative phase: the final restoration was fabricated from gold (Cookson 620, type 4 alloy) with a 'distal extension' making contact with adjacent tooth.

The clinical hemisection procedure was subsequently carried out. This resulted in the division of coronal aspect and furcation of the 46 and extraction of the compromised root. Crown preparation of the remaining mesial crown was also undertaken at the chair-side at the same visit, and prior to completion of the hemisection. Final modifications to the preparation post-hemisection were performed whilst covering the extraction socket with sterile gauze.

The laboratory-made temporary, shown in Fig 5c, was checked, relined and adjusted as necessary and cemented with a temporary cement, e.g. TempBond (Kerr Corporation, Orange, CA, USA). It is important to provide a satisfactory temporary restoration, with acceptable margins, occlusion and in this case with a distal point contact with the adjacent tooth. It may be necessary for the laboratory made temporary crowns to be relined with acrylic at chair-side to provide better marginal fit and retention. The interim restoration is then cemented with temporary cement for 3 months to allow soft tissue and bony healing to occur. Once the definitive soft tissue contour has been established, the final crown preparation (Fig 6) may be performed and the final restoration placed (Fig 7).



**Fig 8** Radiograph of the definitive restorative at 3-year review appointment.

**Discussion**

The present report provides a step-by-step illustrated guide using, to our knowledge, a previously unreported technique for the interim and definitive restoration of a tooth post-hemisection. The process requires good liaison between clinicians and laboratory. It is important to plan the procedure and carry



out mock surgery on duplicated study models to ensure adequate tooth substance is available post-hemisection for restoration and to plan for successful restorative treatment.

The restorative planning described in the present case offers several advantages. The premolar crown with a distal 'tear drop' extension provides a reduced occlusal table, appropriate to the single remaining root. By providing a point contact with the adjacent tooth it also prevents drifting/tilting of the adjacent tooth, which otherwise may result in occlusal disharmony. It is important to bear in mind that post-surgery it may be necessary to wait up to 6 months for the majority of the tissue remodelling to take place<sup>2</sup>, prior to definitive indirect restoration. This is a lengthy period, thus a well-planned interim restoration is essential to offer an adequate coronal seal as well as acting as a space maintainer and providing occlusal harmony. The 'tear drop' design also provides adequate access for interdental brushing to maintain periodontal health.

## ■ Summary

The present case demonstrates a novel restorative technique and highlights the importance of meticulous treatment planning when preparing for hemisection surgery. It demonstrates an uncomplicated method of planning for the restoration of the hemisected molar tooth. The technique provides a coronal seal post-root canal therapy and hemisection, as well as adjacent tooth contact in both the interim and definitive phase in order to maintain occlusal harmony. The occlusal design enhances the long-term prognosis of the salvaged tooth.

## ■ References

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