

Hemisection as a treatment option: A case report and review

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ABSTRACT

The treatment, management and long-term retention of mandibular molar teeth exhibiting furcation invasions, or FIs, always have been a challenge to the discerning general dentist or dental specialist. This is especially true when the FI has progressed to a Class III furcation. Hemi-section of the effected tooth allows the preservation of tooth structure, alveolar bone and cost savings (time and money) over other treatment options. The term hemi-section refers to the sectioning of a molar tooth with the removal of an unrestorable root which may be affected by periodontal, endodontic, structural (cracked roots), or caries. This article describes a simple procedure for hemisection in mandibular molar and its subsequent restoration with review.

Introduction

Treatment of multirrooted teeth with lesions of varying degrees within the interradicular space has been one of the most challenging problems in periodontal therapy. The destruction of this area can be related to different causes; thus, proper diagnosis plays a fundamental role to select the correct therapy. It has been proposed that the reduced success rate of conservative nonsurgical and surgical therapy of furcation lesions is most likely related to the anatomical characteristics of the furcation area interfering with adequate instrumentation. Thus tooth resection procedures are used to preserve as much tooth structure as possible rather than sacrificing the whole tooth. The aim of this article is to present a review and a case of hemisection as a treatment option for Grade III furcation involvement.

Review

A less irreversible treatment for a Class III mandibular FI is that of root amputation. This is the removal of one root of the affected molar, with the clinical crown left intact. Although this approach usually is reserved for molar bridge abutments, the clinical crown remains in situ for occlusal function. Another approach to the problem is hemisection, the total removal of the crown portion along with the selected root. Bühler stated that hemisection should be considered before every molar extraction, because this procedure can provide a good absolute biological cost savings with good long term success. The terms "root amputation" and "hemi- section" are known collectively as "root resection." According to Newell⁹, the advantage of the amputation, hemisection or bisection is the

retention of some or all of the tooth. However, the disadvantage is that the remaining root or roots must undergo endodontic therapy and the crown must undergo restorative management. However, failure to perform endodontic care first is not a contraindication for root resectioning, if it can be determined that a successful root canal filling is practical and possible. It has been shown that vital root resections are possible, especially in the maxilla, with symptoms not being manifested until several weeks after the placement of a sedative dressing of choice. Provisions also must be made to stabilize the remaining portion of the molar, unless it already serves as a bridge abutment. On the other hand, if a hemisection is performed, the remaining root may be used as an abutment for a small bridge; alternatively, it may remain as a single crown or be used as a telescopic crown. When a bisection is performed, each segment of the molar created by the bicuspidization should stand on its own, unaided by splinting.

Erpenstein¹¹ reported the results of root resection of 34 molars examined clinically and radiographically over 4-7 years. During the followup period, 3 treated molars were extracted: two of them due to symptomatic apical periodontitis and one due to periodontal pocketing and excessive mobility. The treated teeth were successfully used as abutments for small bridges. There was no statistically significant difference in probing depth between root-resected and other surfaces at final examination, and a significant reduction in probing depth was observed and maintained as a result of treatment.

Bühler¹² presented a 10-year follow-up of 28 root-resected cases mainly used as bridge abutments. Nine teeth (32%) were lost during the study. The analysis of the causes of failure revealed that endodontic, not periodontal, complications were predominant.



Figure 1. Preoperative radiograph

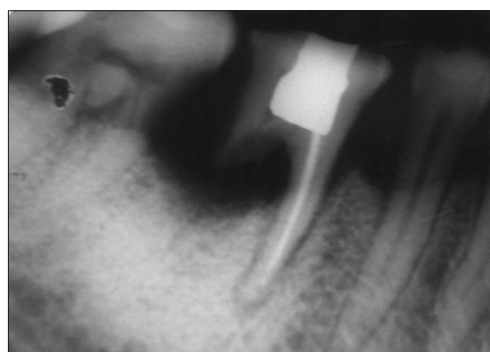


Figure 2. Radiograph after endodontic treatment

Carnevale¹³ reported a group of 72 patients with 175 furcated molars, treated with root resection and prosthetic restoration and followed longitudinally for 10 years. The healing results obtained after therapy were maintained with minimal modifications until completion of the study. At the 10- year examination the tooth survival rate was: 93% and the prosthetic survival rate was: 96%. The causes of failure were: periapical granuloma (4 teeth), secondary decay (3 teeth), recurrence of periodontitis (3 teeth) and root fracture (2 teeth).

A critical analysis of the long-term studies on root resection therapy shows, in most of the cases, a low percentage of extractions (from 0% to 9%) during the experimental period with the exception of Buhler¹², who reported failure rates of 32%. This variation among authors raises the problem of the possibility that root resection therapy might be technique-sensitive. Considering also that most of the failures reported in the different studies are caused by reasons other than periodontal breakdown, the selection of a therapeutic protocol and the care given to each phase of therapy might play a key role in order to minimize the posttreatment problem:

Weine² has listed the following indications for tooth resection

Periodontal Indications

1. Severe vertical bone loss involving only one root of multi-rooted teeth.
2. Through and through furcation destruction.
3. Unfavourable proximity of roots of adjacent teeth, preventing adequate hygiene maintenance in proximal areas.
4. Severe root exposure due to dehiscence.

Endodontic and Restorative Indications

1. Prosthetic failure of abutments within a splint: If a single or multirooted tooth is periodontally involved within a fixed bridge, instead of removing the entire bridge, if the remaining abutment support is sufficient, the root of the involved tooth is extracted.

2. Endodontic failure: Hemisection is useful in cases in which there is perforation through the floor of the pulp chamber, or pulp canal of one of the roots of an endodontically involved tooth which cannot be instrumented.
3. Vertical fracture of one root: The prognosis of vertical fracture is hopeless. If vertical fracture traverses one root while the other roots are unaffected, the offending root may be amputated.
4. Severe destructive process: This may occur as a result of furcation or sub. gingival caries, traumatic injury, and large root perforation during endodontic therapy.

Contraindications

1. Poorly shaped roots or fused roots.
2. Poor endodontic candidates or inoperable endodontic roots.
3. Patient unwilling to undergo surgical and endodontic treatments and undertake the care or the resulting restoration

Therapeutic Protocol for Root Resection

A complete medical and dental history, thorough clinical and radiographic evaluations including periapical radiographs, diagnostic casts and consultation with the restorative dentist should be carried out. Treatment options should be presented to the patient, and the potential problems should be discussed. The decision concerning the final treatment to be performed should be made after the effects of the cause-related therapy have been evaluated. Carnevale¹⁰ (1995) suggested the following sequence of therapy:

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| Phase 1 | Endodontic treatment |
| Phase 2 | Crown build-up |
| Phase 3a | Root resection or root separation during preliminary prosthetic preparation |
| Phase 3b | Relining and insertion of a prefabricated shell provisional restoration |
| Phase 3c | Impression for a metal reinforced provisional restoration |
| Phase 4 | Insertion of the reinforced provisional restoration |
| Phase 5a | Periodontal surgery |
| Phase 5b | Root resection or root separation if not previously executed |



Figure 3. After debridement and bone graft is placed



Figure 4. Radiograph after 3 months

- Phase 5c Tooth preparation during surgery
- Phase 5d Relining of the reinforced provisional restoration
- Phase 6 Clinical and radiographic re-evaluation
- Phase 7 Final prosthetic tooth preparation and impressions
- Phase 8 Insertion of the definitive prosthetic reconstruction

Case Report

A 30 years old female reported with the complaint of pain and mobility of right mandibular first molar. On examination, the tooth was sensitive to percussion and revealed grade 2 mobility. On probing the area, there was a 13 mm deep periodontal pocket around the distal root of the tooth. On radiographic examination, severe vertical bone loss was evident surrounding the distal root with resorption of root and involving the furcation area (Figure 1). The probing pocket depth around the mesial root was 4 mm (Figure 1). It was decided that the distal root should be hemisected after completion of endodontic therapy of the tooth. The canals were obturated with lateral condensation method and the chamber was filled with composite (Figure 2) to maintain a good seal and allow interproximal area to be properly contoured during surgical separation. Under local anesthesia, full thickness flap was reflected after giving a crevicular incision from first premolar to second molar. Upon reflection of the flap, the crater like bony defect along the distal root became quite evident. All granulation tissue was removed with Gracey curettes to expose the bone. The vertical cut method was used to resect the crown with distal root. A long shank tapered fissure carbide bur was used to make vertical cut toward the bifurcation area. A fine probe was passed through the cut to ensure separation. The distal half was extracted and the socket was irrigated adequately with sterile saline. Scaling and root planning of the root surfaces, which became accessible on removal of distal root was done. The extraction site was irrigated and debrided. The crater like bony defect was grafted with hydroxyapatite bone graft (osteogen) (Figure 3). Then the flap was repositioned and sutured with 3/0 black silk sutures. The occlusal table was minimized to redirect the forces along the long axis of the mesial root. After 3 months healing of the tissues (Figure 4), fixed bridge involving retained mesial half and mandibular second molar with sanitary pontic was given (Figure 5).



Figure 5. After prosthesis

Discussion

The clinician's decision to choose one treatment plan over another when confronted with a Class III FI of a mandibular molar is influenced by many factors. These may be enumerated in three areas:

- a) Local factors-tooth anatomy, tooth mobility, crown:root ratio, severity of attachment loss, interarch and intra-arch occlusal relationship, strategic dental value for retention or removal;
- b) Patient factors-systemic health/host resistance, emotional value of the tooth to the patient, involvement and commitment in time and money;
- c) Clinician factors-diagnostic and treatment planning skills, awareness of therapeutic options and clinical acumen or skill in providing service..

Hemisection has been used successfully to retain teeth with furcation involvement. However, there are few disadvantages associated with it. As with any surgical procedure, it can cause pain and anxiety. Root surfaces that are reshaped by grinding in the furcation or at the site of hemisection are more susceptible to caries. Often a favorable result may be negated by decay after treatment. Failure of endodontic therapy due to any reason will cause failure of the procedure. In addition, when the tooth has lost part of its root support, it will require a restoration to permit it to function independently or to serve as an abutment for a splint or bridge. Unfortunately, a restoration can contribute to periodontal destruction, if the margins are defective or if non-occlusal surfaces do not have physiologic form. Also, an improperly shaped occlusal

contact area may convert acceptable forces into destructive forces and predispose the tooth to trauma from occlusion and ultimate failure of hemisection. In the case reported, various aspects of occlusal function such as location and size of contacts and the steepness of cuspal inclines may have played a significant role in causing mobility before treatment. During treatment, occlusal contacts were reduced in size and repositioned more favorably. Lateral forces were reduced by making cuspal inclines less steep and eliminating balancing incline contacts.

Conclusion

The use of hemi-section to retain a compromised tooth, in the restoration arsenal of the restorative dentist offers a predictable treatment option with a prognosis comparable to any tooth with an endodontic treatment. The key, with any restorative treatment, is to balance the factors that indicate the procedure is a suitable one to be undertaken vs. the contra indications. With recent refinements in endodontics, periodontics and restorative dentistry, hemisection has received acceptance as a conservative and dependable dental treatment and teeth so treated have endured the demands of function. This article presents a technique for the dentist to offer patients to maintain tooth structure where that structure is compromised.

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