

## HEMISECTION: A CONSERVATIVE APPROACH FOR FURCATION-INVOLVED MANDIBULAR MOLAR

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### ABSTRACT:

Hemisection is a treatment procedure involving removal of the involved tooth root and its associated crown portion, which is done with the purpose of preserving as much tooth structure as possible rather than sacrificing the whole tooth. This treatment can produce predictable results as long as proper diagnostic, endodontic, surgical, prosthetic and maintenance procedures are performed.

**Key words:** Hemisection; root resection; furcation involvement; mandibular molar



### INTRODUCTION:

In 1867, Magitot reported on the complete removal (root resection or amputation) of molar roots. However, Farrar, in 1884 is often cited as the first author and clinician to detail the resective techniques for the radical removal by amputation of any portions of the roots of the teeth that can be of no further use.<sup>[1]</sup>

Through root resection therapy furcation involved molars can be converted to non-furcated single root teeth and provide a favorable environment for oral hygiene for patients and clinicians. In a recent article, Minsk and Polson suggested that root resection can be a valuable procedure when the tooth in question has a very high strategic value or when there are specific problems that cannot be solved by other therapeutic procedures.<sup>[1,2,3]</sup>

Hemisection (removal of one root) involves removing significantly compromised root structure and the associated coronal structure through deliberate excision <sup>[4]</sup>. Appropriate endodontic therapy must be performed before these tooth modifications to avoid intrapulpal dystrophic calcification and postoperative tooth sensitivity. The furcation region is carefully smoothed, to allow proper cleansing and thus to prevent accumulation of plaque. <sup>[5]</sup>Root fracture is the main cause of failure after hemisection, so occlusal modifications are required to balance the occlusal forces on the remaining root.<sup>[1,4,5]</sup> (Fig. 1).

**Weine F** <sup>[5]</sup> 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 multi-rooted 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.

Hemisection represents a form of conservative dentistry, aiming to retain as much of the original tooth structure as possible.<sup>[2]</sup> Hemisection (removal of one root) involves removing significantly compromised root structure and the associated coronal structure through deliberate excision<sup>[3]</sup>

#### **Indications for Hemisection include :**

1. The tooth is affected by caries, vertical root fracture, periodontal disease or iatrogenic root perforation where only one root of a multirouted tooth is affected.
2. The surviving root is accessible and treatable endodontically.
3. The surviving root is structurally capable of supporting a dowel and core restoration.
4. The surviving root is aligned so as to provide proper draw for the resulting fixed prosthetic restoration.

The root morphology allows for surgical access and proper periodontal maintenance of the final restoration.<sup>[4-9]</sup>

#### **Contra indications of using a tooth root as an abutment can include:**

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.<sup>[6-8]</sup>

This article describes a procedure of hemisection in mandibular molar and its subsequent restoration. The key to long term success appear to be thorough diagnosis, selection of patients with good oral hygiene and careful surgical and restorative management.

### **CASE DETAIL:**

A 26 years old male patient reported to my private dental clinic with the complaint of pain in left mandibular first molar. On examination, the tooth was tender to percussion and was grossly carious. On probing the area, there was a deep periodontal pocket around the mesial root of the tooth. On radiographic examination, furcation involvement was evident. The bony support of distal root was completely intact (Fig. 2). It was decided that the mesial root should be hemisected after completion of endodontic therapy of the tooth. The working length was determined and the canals were biomechanically prepared using crown-down technique using protaper rotary instruments as per manufacturer instructions. Mesiobuccal and mesiolingual canals were prepared upto F3. The canals were obturated with lateral condensation method and the chamber was filled with amalgam to maintain a good seal and allow interproximal area to be properly contoured during surgical separation.

Hemisection of the mesial root and crown was done with a vertical cut method. After vertical incision and sulcular incision, a mucoperiosteal flap was reflected. The crown was cut with a long shank, tapered

fissure carbide bur till the furcation is reached(Figure 3,4). Once the separation was complete, the mesial half was extracted. The empty socket was thoroughly irrigated and the flap was sutured back into its position. All chronic inflammatory tissue was removed with currettes to expose the bone. The vertical cut method was used to respect the crown. A long shank tapered fissure carbide bur was used to make vertical cut toward the bifurcation area. The flap was then repositioned and sutured with 3/0 black silk sutures. After the complete healing of the extraction socket, the crown of the remaing thooth was restored with FPD on 45,46 so as to distribute the occlusal stresses(Figure 5). The occlusal table was minimized to redirect the forces along the long axis of the mesial root. Hemisected molar was restored with full coverage cast restoration. Patient had been followed up since with regular recall visits and oral prophylaxis. He had good masticatory efficiency with the restoration was very happy with the treatment outcome.

### **DISCUSSION:**

Implant therapy is considered to be a predictable option with good functional outcome. However, in this case, because of financial constraints and the patient's willingness to maintain the original portion of involved tooth structure, hemisection therapy was considered. Hemisection allows for physiologic tooth mobility of the remaining root, which is thus a more suitable abutment for fixed

partial dentures than an osseointegrated counterpart<sup>[10]</sup>.

Buhler compared survival rates of hemisected teeth with those of single-tooth alloplastic implants and found that the failure rates of the two treatment alternatives were not substantially different<sup>[5]</sup>. It was suggested that hemisection, being a relatively simple, inexpensive treatment option with a good chance of success (given appropriate case selection), should always be considered as an option before molar extraction<sup>[5,9]</sup>.

According to Buhler, hemisection, being a relatively simple, inexpensive treatment option with a good chance of success (given appropriate case selection), should always be considered as an option before molar extraction<sup>[5]</sup>. After accurate evaluation and taking into account all the positive considerations, the case was selected for hemisection therapy<sup>[5]</sup>.

In the present case the above mentioned indication for case selection in performing hemisection was optimum as the roots were not closely approximated or fused. The tooth had to be endodontically treated before hemisection. In situations when resection periodontal therapy is decided, initiation of conventional endodontic treatment before therapy simplifies the surgical procedure. This is because tooth preparation can invade the pulp chamber and jeopardize control of the coronal seal of the endodontic access opening complicating the completion of endodontic therapy.

Carnevale in his study on long term effects of root resective therapy suggested that it can be considered an effective measure to resolve periodontal problems of furcation defects.<sup>[11]</sup> The data indicate that recurrent periodontal disease is not a major cause of the failure of these teeth. It was shown that such teeth can function successfully for long periods. Therefore, early and correct diagnosis is imperative, as delay will result in rapid loss of supporting bone and eventually tooth loss.<sup>[11]</sup>

Baston et al reviewed records of 100 patients who had undergone root resection over a 10 years period. They reported a failure rate of 38%, of which 15.8% occurred within the first 5 years after surgery. Most failures involved mandibular teeth and occurred for reasons other than inflammatory periodontal disease.<sup>[12]</sup>

Recently, Park et al. have suggested that hemisection of molars with questionable prognosis can maintain the teeth without detectable bone loss for a long-term period, provided that the patient has optimal oral hygiene.<sup>[13,14]</sup>

Saad et al. have also concluded that hemisection of a mandibular molar may be a suitable treatment option when the decay is restricted to one root and the other root is healthy and remaining portion of tooth can very well act as an abutment. In the present case, the mesial root was extremely resorbed while the distal root could act as an abutment for the future prosthesis.<sup>[10,14,15]</sup> As there was a bone loss from the mesial surface of the

distal root of 46 and adequate bone support was present on the distal surface of the distal root, in order to provide better bone support and faster bone healing, bone graft material was placed inside the socket of the extracted mesial root as well as on the mesial surface of the distal root. [10]

Erpenstein 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 rootresected and other surfaces at final examination, and a significant reduction in probing depth was observed and maintained as a result of treatment. [16]

Successful restoration of periodontally weakened teeth is aided by creating an occlusal scheme with canine guided occlusion and flattened posterior cusps with point contact thereby directing the occlusal forces along long axis of the tooth [8]. Goals of prosthetic rehabilitation prevent fracture of the hemisectioned tooth and root, preserve the health of the periodontal tissues, preserve the proprioception, restores occlusion & functions. [17]

Consideration when choosing to perform a hemisection procedure should be given to the morphology, clinical length and

shape of the roots of a multirrooted tooth. The divergence of the roots is indeed an important indication. Those affected teeth with roots spread apart facilitate the clinician's ability to perform a root resection, whereas teeth with closely approximated or fused roots should not receive hemisection therapy. [18]

The long-term success of root resection varies from 27% to 100%. Most reported failures were non-periodontal in nature, with periodontal failures accounting for only 0-10% of the total failures. Buhler conducted a meta-analysis attempting to find the common denominators among the different studies and demonstrated that over a seven-year observation period, the failure rate for teeth treated by root resection was 11%. [19,20]

## CONCLUSION:

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. In conclusion, this treatment modality has produced predictable results in restoring occlusion and achieving expected degree of function. Proper diagnosis, perfect endodontic treatment, and proper surgical procedure are the prerequisites for successful prosthodontic rehabilitation in such cases.

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**FIGURES:**

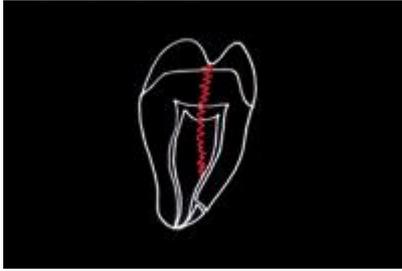


Figure 1. Schematic of class III fracture: incomplete vertical fracture involving the attachment apparatus.



Figure 2. Pretreatment radiograph of mandibular first molar demonstrating a class III fracture



Figure 3. The separation was complete, the mesial half was extracted



Figure 4. The mesial root has been amputated and the fracture is observed



Figure 5. . A 8-year recall of hemisection and restoration