Tooth Hemisection and Restoration an Alternative To Extraction For A Grossly Decayed Multirooted Tooth - A Case Report

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ABSTRACT
Advances in dentistry, as well as the increased desire of patients to maintain their dentition, have lead to treatment of teeth that once would have been removed. In order to carry out this present day mandate, extensive tooth structure loss of lingual and mesial surface(46) associated with involvement of furcation area of the tooth may well be retained by removal of one root. This case report describes a simple procedure for hemisection in mandibular molar and its subsequent restoration.

KEYWORDS: Furcation involvement, MTA, Hemisection, Fixed partial denture

INTRODUCTION
Modern advances in dentistry have provided the opportunity for patients to maintain a functional artificial dentition for lifetime. Therapeutic measures performed to ensure retention of teeth vary in complexity. The inter disciplinary treatment may involve combining restorative dentistry, endodontics, orthodontics, and periodontics so that the teeth are retained in whole or in part [1].

The furcation is an area of complex anatomic morphology that may be difficult or impossible to debride by routine periodontal instrumentation. Furcation involvement can be defined as the loss of attachment and radiographic evidence of bone loss in the bifurcation and trifurcation areas of multi-rooted teeth. The furcation defects vary from a subtle loss of attachment in the buccal furcation area, forming a shallow pocket, to advanced pathology with deep pockets > 10 mm, advanced bone loss and clinical exposure of the furcation [2].

Furcal perforations defined as mechanical or pathologic communications between the root canal system and the external tooth surface. They allow microorganisms to invade the supporting structures, triggering inflammation and a loss of attachment, which may ultimately compromise the prognosis of the tooth. In grade IV furcations, the interdental bone is destroyed and the soft tissues have receded apically so that the furcation opening is clinically visible. A tunnel therefore exists between the roots of such an affected tooth. Thus the periodontal probe passes readily from one aspect of the tooth to another [3].

Perforations occur primarily through three possible mechanisms: procedural errors occurring during root canal treatment or post-space preparation, resorptive processes and caries. Several materials have been used to repair perforations like amalgam, zinc oxide eugenol cements (IRM and Super-EBA), glass ionomer cement, composite resins, MTA, BIODENTINE [4].

The term tooth Resection denotes the excision and removal of any segment of the tooth or a root with or without its accompanying crown portion. Various resection procedures described are: root amputation, hemisection, radisection and bisection. The treatment goal is preservation of remaining tooth structure and restoration of the function.

Periodontal Indications for tooth resection:
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.
Hemisection represents a form of conservative dentistry, aiming to retain as much of the original tooth structure as possible. Hemisection (removal of one root) involves removing significantly compromised root structure and the associated coronal structure through deliberate excision.

**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 multirooted 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.

**Contra indications for Hemisection 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. [5]

**Guideline for determining which root should be removed-**

1. The root that will eliminate the furcation and allow the production of a maintainable architecture on the remaining roots.
2. Root with greatest amount of bone and attachment loss.
3. The root that best contributes to the elimination of periodontal problems on adjacent teeth.
4. The root with the greatest number of anatomic problems such as severe curvature, developmental grooves, root flutings, or accessory and multiple root canals.

The treatment goal is preservation of remaining tooth structure and restoration of the function. This case report describes hemisection procedure which was chosen to retain the endodontically treated distal root of and extraction of grossly carious mesial root of mandibular right first molar(46).

**CASE REPORT**

A 24-year-old female reported to the Department of Conservative dentistry and Endodontics, Guru Nanak Institute of Dental Science and Research, Kolkata- 700114, with the chief complaint of food lodgement in right lower back teeth region of mouth. The medical and dental histories were noncontributory. No abnormalities in general growth and development were noted. Clinical examination revealed-

- i) extensive tooth structure loss of lingual and mesial surface of the tooth(46) associated with involvement of furcation area of the tooth. ii) The tooth was vital according to the vitality test. iii) The tooth was sensitive to percussion and the gingival overgrowth was revealed in the mesio-lingual area of the tooth (46). iv) Class I occlusion present. v) Mobility was not present in that particular tooth.

On radiographic examination, extensive tooth structure loss of lingual and mesial surface of the tooth(46) associated with involvement of furcation area of the tooth. The bony support of mesial and distal root was completely intact. It was decided that the mesial root should be hemisected after completion of endodontic therapy of the tooth.

Caries was completely removed with spoon excavator and round bur and pieces of abgel were placed in furcation area of the tooth (46). Mineral Trioxide Aggregate (MTA) was placed on the absorbable gelatin base foam (AbGel) and temporary restoration was given. Patient was recalled after weeks. Access cavity was prepared with round bur and no. 15 K files were inserted into disto-buccal and disto-lingual canals in the distal root of the tooth (46).

Working length (22mm) was established radiographically and Biomechanical preparation was performed using crown-down technique with rotary Protaper Universal files and the canal was enlarged upto # F1. Sodium hypochlorite (2.5%) and normal saline were alternatively used as irrigants at every change of instruments. Obturation of the root canal was undertaken with laterally condensed gutta-percha using lateral compaction technique and the access cavity was sealed with intermediate restorative material (IRM).

The patient was recalled after one week for hemisection of the tooth (46). After reflecting a conservative flap hemisection of mandibular left first molar was performed using diamond cylindrical point. Mesial root was managed by Intra-alveolar extraction under local anesthesia (Lignocaine Hydrochloride 2% with Adrenaline Bitartrate 1:80,000) and socket was packed with absorbable gelatin base foam (AbGel).

The patient returned after six weeks of post surgical healing. The soft tissue had healed at the mesial socket, and the distal root remained asymptomatic. Post obturation restoration was done with light cure composite resin. Crown cutting was done for fixed partial denture involving retained distal half of the right mandibular molar (46) and right mandibular second premolar (45) with sanitary pontic was given. The fixed partial denture was finally cemented with tooth using GIC luting.
Fig 1: Extensive loss of tooth structure (lingual and mesial surface) with involvement of furcation area of the tooth (46). Abgel and MTA placed in the furcation area.

Fig 2: BMP and obturation done in distal canals of the tooth and mesial root was managed by Intra-alveolar extraction under local anesthesia and socket was packed with absorbable gelatin base foam (AbGel).

Fig 3: Crown cutting was done for fixed partial denture involving retained distal half of the right mandibular molar (46) and right mandibular second premolar (45)

Fig 4: The fixed partial denture was finally cemented with using GIC luting.

DISCUSSION

As practitioners of the art and science of dentistry we owe our patients to be able to provide a wide range of treatment options based on the clinical situation, age, economical considerations of the patient and the best available clinical evidence of successful treatment modalities. The loss of posterior teeth can result in several undesirable sequelae, hence a guiding principle should be followed to try and maintain what is present. This case study presents a treatment available in cases of extensive carious lesion involving the furcation area of the right lower first molar.

Root Amputation- Root amputation refers to the removal of one root in a multi-rooted tooth. These procedures may become options for treatment when there is a persistent endodontic failure in ONLY one root of a “key tooth” which must be kept, or if there is significant bone loss around an individual root due to periodontal disease. Hemisection- This procedure involves removal of one-half of a tooth. The remaining half will be restored as a one-rooted tooth, and is usually attached or anchored to an adjacent tooth, for additional support and stability.

It is important to consider the following factors before deciding to undertake any of the resection procedures.

a. Advanced bone loss around one root with acceptable level of bone around the remaining roots.

b. Angulation and position of the tooth in the arch. A molar that is buccally, lingually, mesially or distally tilted, cannot be resected.
c. Divergence of the roots - teeth with divergent roots is easier to resect. Closely approximated or fused roots are poor candidates.

d. Length and curvature of roots - long and straight roots are more favourable for resection than short, conical roots [6]

**For this patient, hemisection was selected for the treatment due to:**

a. Extensive tooth structure loss of lingual and mesial surface associated with involvement of furcation area of the tooth.

b. The mesial root was resected because the mesial surface of the tooth was grossly carious along with the mesial root.

c. After removal of caries from furcation area and mesial surface of the tooth the periodontal probe passes readily from one aspect of the tooth to another (bucco-lingually). Grade IV furcation involvement was present and mesial root was completely separated from the furcation area.

d. Implant therapy is a predictable option with good functionality. However, in this case the patient chose an alternative treatment because of financial consideration and her desire to retain the teeth.

Hemisection allows for physiologic tooth movement of the remaining root, which is thus a more suitable abutment for fixed partial dentures. The smaller size of the occlusal tables, under-contouring of the embrasure spaces and ensuring that the crown margin encompasses the furcation are all factors in the high success rates observed with hemisection therapy [7]. Absorbable Gelatin Sponge (AbGel) that is a surgical, absorbable haemostatic sponge [10] In this case abgel is used as a base of MTA in furcation area and as a haemostatic agent in mesial socket after extraction of mesial root of that particular tooth (46). The ideal material for treating radicular perforations should be non-toxic, non-absorbable, radiopaque, and bacteriostatic or bactericidal; it should also provide a seal against microleakage from the perforation. Mineral trioxide aggregate (MTA) has all of these characteristics [8]

The term hygienic is used to describe pontics that have no contact with the edentulous ridge. This pontic design is frequently called a “sanitary pontic,” used for mandibular molar pontics. The occluso-gingival thickness of the pontic should be no less than 3.0 mm, and there should be adequate space under it to facilitate cleaning. The hygienic pontic is frequently made in an all-convex configuration, facio-lingually and mesio-distally. In three common designs (bar sanitary pontic, Conventional sanitary or fish belly pontic and modified sanitary or perel pontic or arc-fixed partial denture), the modified sanitary pontic is preferred due to its hyperparaboloid design. The gingival surface of the pontic is concave mesiodistally and convex buccolingually. The arch shape increases the size of the connectors and is easier to maintain [9].

**CONCLUSION**

The prognosis for hemisection is the same as for routine endodontic procedures provided that case selection has been correct, the endodontics has been performed adequately, and the restoration is of an acceptable design relative to the occlusal and periodontal needs of the patient. Root amputation and hemisection should be considered as another weapon in the arsenal of the dental surgeon, determined to retain and not remove the natural teeth. 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. In conclusion, hemisection can be considered a suitable alternative to extraction and should be discussed with patients, during consideration of treatment options. The results of hemisection are predictable, and success rates are high if certain basic considerations are taken into account.

**REFERENCES**


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