FURCATION: INVOLVEMENT AND TREATMENT

413 PCS
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• The progress of periodontal disease results in attachment loss sufficient enough to affect the bifurcation or trifurcation of multirooted teeth

• The furcation is an area of complex anatomic morphology that may be difficult or impossible to debride by routine periodontal instrumentation

• The presence of furcation involvement can potentially lead to a less favorable prognosis for the affected tooth or teeth.
ETIOLOGICAL FACTORS
• The primary factor is **bacterial plaque**

• Extent of attachment loss depends on **local anatomic factors** (root trunk, length, root morphology)

• Prevalence and severity of furcation **increases with age**

• **Dental caries and pulpal death** may also affect a tooth with furcation involvement
LOCAL ANATOMIC FACTORS
ROOT COMPLEX

• The portion of a tooth that is located apical to the cementoenamel junction
• The portion that is usually covered by cementum
• It is divided into two parts: the root trunk and the root cone
THE ROOT TRUNK

- Represents the undivided region of the root.
- The height of the root trunk is the distance between the CEJ and the separation line between two root cones.
ROOT LENGTH

• Directly related to **the quantity of attachment** supporting the tooth

• Teeth with long root trunks and short roots may have lost a majority of their support by the time the furcation becomes affected.

• Teeth with long roots and short to moderate root trunks are more easily treated because sufficient attachment remains to meet functional demands.
INTERRADICULAR DIMENSION

- **Degree of separation**: The angle of separation between two roots

- **Divergence**: Is the distance between two roots; this distance normally increases in apical direction
ANATOMY OF INDIVIDUAL TEETH
MAXILLARY MOLARS

- First molar is larger than the second molar
- First and second molars have three roots
- The first molar has a shorter root trunk than the second molar
- The mesiobuccal root is vertically positioned
- Palatal root is wider in mesiodistal than in buccopalatal direction
- Distal surface of the mesiobuccal root has a concavity
MAXILLARY PREMOLARS

- First premolars have two root cones (40%)
- One buccal and one palatal root
- **Mesiodistal furcation exists**
- The furcation is located in the **apical third of the root complex**
- The mean distance between the CEJ and the furcation entrance is about **8 mm**.
MANDIBULAR MOLARS

- First molar is **larger** than the second molar
- First and second molars have two roots
- The mesial root is larger than the distal
- The mesial root is wider in the buccolingual direction
- The root trunk of the first molar is **shorter** than the trunk of the second molar
- **The lingual entrance is found more apical to CEJ than the buccal entrance**
DIAGNOSIS
• **A thorough clinical examination** is the key to diagnosis and treatment planning.

• Careful probing is required using the *Nabors probe*.

• **Transgingival sounding** may further define the anatomy of the furcation defect.

• Buccal furcation of both maxillary and mandibular molars and the lingual furcation of the mandibular molars are accessible for examination.

• Examination of approximal furcations is more difficult.

• In maxillary molars, the *mesial* furcation entrance is located closer to *palatal* than buccal tooth surface.

• The *distal* furcation is located *midway between buccal and palatal* surfaces.
HAMP CLASSIFICATION OF FURCATIONS 1975
Degree I - horizontal penetration into furcation < 3 mm

Degree II - horizontal penetration into furcation > 3 mm

Degree III - Through-and-through furcation
RADIOGRAPHIC EXAMINATION

• Should include both *periapical and bitewing* views

• Location of the interdental bone and bone level within the root complex should be examined
MANAGEMENT
OBJECTIVES OF TREATMENT

- The elimination of the microbial plaque from the exposed surfaces of the root complex

- The establishment of an anatomy of the affected surfaces that facilitates proper self-performed plaque control
FURCATION INVOLVEMENT DEGREE I

- Non-surgical Treatment
  (Oral Hygiene measurements and Scaling and Root planning)

- Furcation Plasty
SCALING AND ROOT PLANNING

• In most situations it results in the resolution of the inflammatory lesion in the gingiva

• Healing will reestablish a normal gingival anatomy with the soft tissue properly adapted to the hard tissue walls of the furcation entrance
FURCATION PLASTY

• It is a resective surgical treatment associated with odontoplasty and osteoplasty.
• It is used mainly at the buccal and lingual furcations

• Procedure:
  - Reflection of a full thickness flap
  - Removal of inflammatory soft tissue
  - Odontoplasty to eliminate or reduce the horizontal component of the defect and to widen the furcation entrance
  - Recontouring of the alveolar bone crest to reduce the buccal-lingual dimension of bone in the furcation area
  - Positioning and suturing of the flap
FURCATION INVOLVEMENT DEGREE II

- Furcation plasticity
- Tunnel preparation
- Root resection
- Tooth extraction
- Guided tissue regeneration
FURCATION INVOLVEMENT DEGREE III

- Tunnel preparation
- Root resection
- Tooth extraction
TUNNEL PREPARATION

• It is a technique used to treat **deep degree II and III furcation defects** in mandibular molars and with short root trunks.

• The procedure includes the surgical exposure and management of the entire furcation area of the affected molar.

• During maintenance **topical application of CHX and fluoride** should be done.

• At mandibular molars with:
  • **Short root trunk**
  • **Wide separation angle**
  • **long divergence between the mesial and distal roots**
**ROOT SEPARATION AND RESECTION (RSR)**

- **Root separation** involves the sectioning of the root complex and the maintenance of all roots.

- **Root resection** involves the sectioning and the removal of one or two roots of a multi-rooted tooth.

- RSR is frequently used in cases of *deep degree II and degree III furcation involved molars*.

- Can be done on vital or endodontically treated teeth.
FACTORS TO BE CONSIDERED

- The length of the root trunk
- The divergence between the root cones
- The length and the shape of the root cones
- Fusion between root cones
- Amount of remaining support around individual roots
- Stability of individual roots
- Access for oral hygiene devices
INDICATIONS OF RSR

• Teeth that are critically important to the overall dental treatment plan

• Teeth that have sufficient attachment remaining for function.

• Teeth for which a more predictable or cost-effective method of therapy is not available. Examples are teeth with furcation defects that have been treated successfully with endodontics but now present with a vertical root fracture, advanced bone loss, or caries on the root.

• Teeth in patients with good oral hygiene and low activity for caries

• Root-resected teeth require endodontic treatment and usually cast restorations
SEQUENCE OF TREATMENT WITH RSR

- Endodontic treatment
- Provisional restoration
- RSR
- Periodontal surgery
- Final prosthetic restoration
WHICH ROOT TO REMOVE?
GENERAL GUIDELINES

• Remove the root(s) that will eliminate the furcation and allow the production of a maintainable architecture on the remaining roots.

• Remove the root with the greatest amount of bone and attachment loss. Sufficient periodontal attachment must remain after surgery for the tooth to withstand the functional demands.

• Remove the root with the greatest number of anatomic problems such as severe curvature, developmental grooves, root flutings, or accessory and multiple root canals.

• Remove the root that complicates future periodontal maintenance.
MAXILLARY MOLARS

• **Distobuccal root**
  1. The shortest of the three roots
  2. The root trunk is comparatively long
  3. Thus it has a small quantity of bone support
  4. Therefore, it is often removed as part of RSR
MAXILLARY MOLARS

- **Mesiobuccal root**
  1. Has a wide buccopalatal dimension
  2. an hour-glass cross section
  3. Thus it has a large root surface area
  4. It is located centrally in the alveolar process
  5. Is properly aligned with the maxillary premolars
  6. It is in an ideal position to function as a separate unit
  7. However, the root canals of the mesiobuccal root are narrow and more difficult to treat
MAXILLARY MOLARS

- **Palatal root**
  - If there is degree II or degree III involvement of palatine root while the bone between the mesiobuccal and distobuccal roots is preserved, the palatine root is separated and resected.
MANDIBULAR MOLARS

• Three treatment modalities exist:
  1. Separate the two roots, but maintain both (premolarization)
  2. Separate and extract the mesial root
  3. Separate and extract the distal root
MANDIBULAR MOLARS

- **Mesial root**
  1. Greater surface area than the distal root
  2. Hour-glass shaped cross section which is difficult to be managed in self plaque control and restorative procedures
  3. Has two narrow root canals
  4. Root canals are close to the external root surface
MANDIBULAR MOLARS

• Distal root
  1. Has an oval cross section and one wide root canal
  2. Large root providing greater mass of dentin to resist root fracture
  3. Good for pin or post treatment
HEMISECTION

• Hemisection is **the splitting of a two-rooted tooth into two separate portions**. This process has been called bicuspidization or separation because it changes the molar into two separate roots. Hemisection is most likely to be performed on mandibular molars with buccal and lingual Class II or III furcation involvements.

• After sectioning of the teeth, **one or both roots can be retained**. This decision is based on the extent and pattern of bony loss, root trunk and root length, ability to eliminate the osseous defect, and endodontic and restorative considerations.
EXTRACTION

• The extraction of teeth with through-and-through furcation defects and advanced attachment loss may be the most appropriate therapy for some patients.

• In patients who cannot or will not perform adequate plaque control, who have a high level of caries activity, who will not commit to a suitable maintenance program, or who have socioeconomic factors that may preclude more complex therapies.

• The high level of predictability of osseointegration may motivate the therapist and patient to consider removal of teeth with a guarded or poor prognosis and to seek an implant-supported prosthetic treatment plan.
REGENERATION

- Predictable outcome of Guided Tissue Regeneration therapy was demonstrated only in degree II furcation involved mandibular molars.
- Less favorable results have been reported in other types of furcation defects.
- GTR could be considered in areas with isolated degree II furcation defects.
PROGNOSIS
Recurrent periodontal disease is not a major cause of the failure of root resected teeth. Long-term investigations of root-resected or hemisected teeth have shown that such teeth can function successfully for long periods.

The keys to long-term success appear to be (1) thorough diagnosis, (2) selection of patients with good oral hygiene, (3) excellence in nonsurgical therapy, and (4) careful surgical and restorative management.