

# Furcation And Its Management - Review Article

Dr.Sajid.T.Hussain<sup>1</sup> , Dr.Pavithra.P<sup>2</sup>

1. Associate Professor, Department of Periodontics and Implantology, Sree Balaji Dental College and Hospital, Bharath Institute of Higher Education and Research, Chennai.

2. Undergraduate student, Sree Balaji Dental College and Hospital, Bharath Institute of Higher Education and Research, Chennai.

Corresponding Author

Dr.SAJID.T.HUSSAIN

Associate Professor, Department of Periodontics and Implantology, Sree Balaji Dental College and Hospital, Bharath Institute of Higher Education and Research, Chennai.

Mail Id: [sajid2000@gmail.com](mailto:sajid2000@gmail.com)

Phone no: 9962550388

## **ABSTRACT:**

*Chronic bacterial infection that affects the gums and bone supporting the teeth. Periodontal disease ranges from simple inflammation to serious disease that can lead to major damage to the soft tissue and bone the teeth. Our mouth is filled with bacteria, these bacteria along with mucus and other particles, constantly form a sticky, colourless “plaque” on teeth. This plaque formation slowly leads to bone loss and furcation involvement.*

**KEY WORD:** Furcation, Bone loss, Management.

## **INTRODUCTION:**

Periodontitis, also called gum disease, is a serious gum infection that damages the soft tissue and, without treatment, can destroy the bone that supports your teeth. Periodontitis can cause teeth to loosen or lead to tooth loss. This is caused due to poor oral hygiene, improper flossing habits that allows bacteria formation. Due to this in advanced stages it can lead to swelling, bleeding gums, painful chewing even mobility of the teeth. Furcation involvement is one of the periodontal problem caused due to bone loss.

Definition: Commonly occurring condition in which the bifurcation and trifurcation of multirrooted teeth are denuded by periodontal diseases. – Glickman(1950)

Aetiology: Common cause for furcation involvement is “Plaque” and the inflammation due to its long-term presence.

Other causes: 1. Increase in age

2. Bacterial invasion

3. Trauma from occlusion

4. Dental caries

5. Enamel projection

## **Classification Of Furcation:**

### **Glickman Classification (1953):**

Grade I-furcation involvement is an early/ incipient stage of furcation involvement. The pocket is supra bony and primarily affects the soft tissues. Early bone loss may have occurred with an increase in probing depth but radiographic changes are not usually found. <sup>[1]</sup>



FIGURE – 1 [6]

Grade II- furcation involvement can affect one or more furcation of same tooth. Furcation lesion is essentially a cul-de-sac with a definite horizontal component. If multiple defects are present, they do not communicate with each other because a portion of the alveolar bone remains attached to the tooth. The extent of horizontal probing of the furcation determines whether the defect is early or advanced. Vertical bone loss may be present and represents a therapeutic complication. Radiographs may or may not depict the furcation involvement, particularly with maxillary molars, because of the radio graphic overlap of the roots. [1]

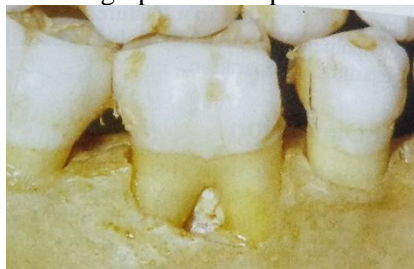


FIGURE – 2 [10]

Grade III- the bone is not attached to the dome of the furcation. In early grade III involvement, the opening may be filled with soft tissue and may not be visible. The clinician may not even be able to pass a periodontal probe completely through the furcation because of interference with the bifurcational ridges or facial/lingual bony margins. However, if the clinician adds the Buccal and lingual probing dimensions and obtains a cumulative probing measurement that is equal to or greater than the buccal /lingual dimensions of the tooth at the furcation orifice, the clinician must conclude that grade III furcation exists. Properly exposed angled radiographs of early class III furcation display the defect as a radiolucent area in the crotch of the tooth. [1]



FIGURE – 3 [10]

Grade IV- The interdental bone is destroyed, and the soft tissue have receded apically so that the furcation opening is clinically visible. A tunnel, therefore, exists between the roots of such an effective tooth. Thus, the periodontal probe passes readily from one aspect of the tooth to another. [1]



FIGURE – 4 [10]

DIAGNOSIS: -

Probing: Instruments used - Naber's probe

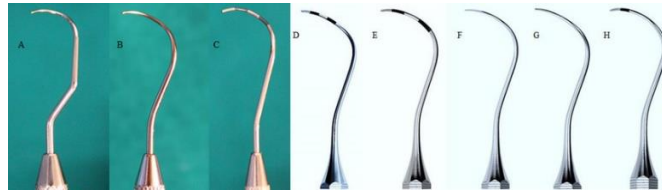


FIGURE – 5 [9]

Naber's probe is used to detect and measure the involvement of furcation. It has markings of 3mm,6mm,9mm,12mm with black band at 6mm &12mm.

Radiographical findings: Both the intraoral periapical radiographs and bitewing radiographs are used to detect the furcation lesion.

MANAGEMENT:

The various treatment modalities of furcation involvement are as following:	
<b>GRADE I</b>	Conservative periodontal therapy in the form of hygiene maintainance, scaling and root planing, odontoplasty, recontouring/ replacement of faulty restoration.
<b>GRADE II (early)</b>	Flap procedure, odontoplasty, osteoplasty, guided tissue regeneration.
<b>GRADE II (advanced), GRADE III, GRADE IV</b>	Tunneling, root resection, extraction

FIGURE – 6 [5]

The objective of furcation therapy Are

1. Facilitate maintenance
2. Prevent further attachment loss
3. Obliterate the furcation defects as a periodontal maintenance problem

Therapeutic classes of furcation defects:

Class I: Early Defects - If the pocket is supra bony and not reached the furcation, oral hygiene, scaling, and root planning is enough. If any overhanging restoration are present it should be removed by odontoplasty and recontouring. The treatment for inflammation and frequent repair of periodontal ligament and bone are usually effect.

Class II: - Once horizontal component to the furcation has developed, therapy becomes difficult. Shallow horizontal involvement without significant vertical bone loss usually repairs itself with the help of localised flap procedures with odontoplasty, osteoblasts and ostectomy. Deep Class II furcation respond to flap procedures with bone grafts and guided tissue regeneration.

Class II to IV: Advanced Defects: - The development of a significant horizontal component to one or more furcation areas (late class II, class III or class IV) or the development of deep vertical component to the furca poses additional problems. Nonsurgical treatment usually Fail in these conditions because the instrument the tooth surface adequately is compromised. Periodontal surgery, endodontic therapy, and restoration of the tooth may be required to save the tooth.

**NONSURGICAL TREATMENT:**

1. Oral hygiene procedures
2. Scaling and root planning

**ORAL HYGIENE PROCEDURES:** Maintaining oral hygiene is a effective method to prevent periodontal problems. Regular visit to the dentist may help in early diagnosis of the furcation. Nowadays periodontal brushes, Periodontal aids and rubber tips, tooth brushes, both specific and general aids have been used over time for access to the patient.

**SCALING AND ROOT PLANNING:** Nonsurgical therapy aims to eliminate both living bacteria in the microbial biofilm and calcified biofilm microorganisms from the tooth surface and adjacent soft tissue.

**Scaling-** It is a process by which plaque and calculus are removed from both supragingival and subgingival tooth surface. (Carranza). **Root planning-** Is the process by which residual embedded calculus and portion of cementum are removed from the roots to produce a smooth, hard and clean surface. (Carranza)

#### **SURGICAL THERAPY:**

1. Osseous Resection
2. Regeneration
3. Hemi section
4. Root Resection/ Hemi section procedure
5. Extraction
6. Dental implants

#### **OSSEOUS SURGERY:**

It is most effective in grade II furcation. Osseous surgery can be divided into two resective and regeneration therapy. This also applies to the furcation areas when surgical therapy is complicated. Most of the time osteoplasty and ostectomy have been used to make the furcation areas easily cleansable. This allows easy hygiene into the furcation area for the patient. These techniques have limited usefulness today, but in the compromised individual in whom teeth cannot be extract or in whom conservative therapy has failed, these surgical techniques have been used. The immediate goal with this surgical approach is to create access for the patient to maintain good oral hygiene.

#### **REGENERATION**

Periodontal regeneration is defined as a reproduction or reconstruction of a lost or injured part in such a way that the architecture and function of the lost or injured tissue are completely restored. GTR is defined as “the procedure by which a barrier is utilised to exclude epithelium from the root surface”. Principle of GTR is based on the assumption that only the periodontal ligament cells have the potential for the regeneration of the attachment apparatus of tooth. GTR is more successful in degree II furcation involvement then in degree III involvement. GTR is a process where a special material is placed to help new bone formation. Resorbable or non-resorbable artificial membrane is used to keep soft tissue from growing into these defective sites.  
Procedure:

#### **Surgery On Gums:**

Initial step is consisting of oral hygiene instruction, supragingival and subgingival scaling and root planning under LA is done. gum is opened using flap procedure, a membrane is placed over the damaged bone.<sup>[3]</sup> **Separating tissue:** Once after the membrane is placed in between the damaged bone and tissue, it gives the necessary time and space for the bone to heal. **After healing:** The stitches are removed and the membrane dissolve or it is removed.



FIGURE – 7 <sup>[8]</sup>

#### **BONE GRAFTING:**

*Osteogenesis* - Formation of new bone by the cells in the graft

*Osteoinduction* - It is a chemical process by which the molecules present in the graft convert the neighbouring cells into osteoblasts promoting new bone formation.

*Osteoconduction* - It is a physical effect by which the matrix of the graft forms a scaffold that favours outside cells to penetrate the graft and form new bone.

### **CLASSIFICATION OF BONE GRAFTING:**

#### **BONE GRAFT:**

- A. Human bone
  - 1. Autograft
  - 2. Allografts
- B. Bone substitutes
  - 1. Xenografts
  - 2. Alloplast

#### **AUTOGRAFTS:**

It is divided into intraoral and extra oral. It is the first bone replacement graft option in periodontal application. It is also known as “Gold Standard” for bone grafting procedures. Good in osteogenic potential.

**EXTRA ORAL:** The bones for extra oral grafting is taken from iliac crest, ribs, cranium, tibial metaphysis.

**INTRA ORAL:** The bones for intraoral is taken from extraction site, maxillary tuberosity, osseous coagulum.

**INTRA ORAL:** Overall mean bone fill of 3.0 to 3.5mm is done. Significant gains in probing attachment level in treating one, two or three wall defects.

#### **INSTRUMENTS USED:**

- a) Bone trap - collecting osseous coagulum.
- b) Maxillon bone retrieval device- collection of bone shavings.

**CORTICAL BONE CHIPS:** Cortical bone grafts are a good choice for repairing of segmental bone defects lesser than 5 to 6 cm. It provides more structural support. Shavings of cortical bone is removed by chisels

**OSSEOUS COAGULUM (ROBINSON 1969):** This technique is done by mixing the bone shavings and blood from surgical area. Concept is mineralised substance can induce osteogenesis. Sites-Tori ,heavy marginal ridges and adjacent sites undergoing osseous correction. It is obtained with round burs during osteoplasty, collected on a large retractor or mirror, then it is mixed with patient’s blood in a sterile dappendish.

#### **DISADVANTAGES:**

- a) Inability to aspirate during the collection process
- b) The quantity and quality of the collected bone fragments is unknown.
- c) Fluidity of the material.

#### **Tuberosity Site (Hyatt And Schallhorl 1973):**

It is a alternative source to iliac crest. It is a potential source for residual red marrow. Cancellous bone potential source of osteoblast.

#### **Extraction Site (Halliday 1969):**

Bone Trephine used to create artificial defect. Extraction required were timed to coincide with treatment of intra osseous defect.

#### **Allografts:**

Allografts are grafts transferred between genetically dissimilar members of the same species. Three types of bones are used in this Allografts for periodontics. Demineralized freeze-dried bone induces host mesenchymal cells to differentiate into osteoblasts. Frozen or Freeze-dried- Reduces immunogenicity while maintaining osteoconductive properties, reduces osteo inductive capabilities.<sup>[4]</sup>

#### **PROCESSING-**

Debridement of soft tissue, wash with ethanol (removes live cells), sterilisation. Higher doses irradiation kills bacteria and viruses but may impair biomechanical properties.

- ① Cortical bone is harvested in a sterile manner. Long bones are the source.
- ② The cortical bone is rough cut to a particle size ranging from 500µm to 5mm
- ③ Graft material immersed in 100% ethyl alcohol or a similar solvent 1 hour to remove fat that may inhibit osteogenesis.
- ④ Cortical bone is ground and sieved to a particle size range of approximately 250 to 750µm.
- ⑤ Decalcification with 0.6 or 0.5 N HCL removes calcium leaves bone matrix and exposes bone inductive properties.
- ⑥ Bone is washed in a sodium phosphate buffer to remove residual acid.
- ⑦ Cortical bone is frozen at -80°C for 1 to 2 weeks to interrupt the degradation process.
- ⑧ Results from bacterial cultures, serological tests & Ag Ab assays are analysed.

#### **ADVANTAGES:**

- a) Material is available in large quantities.
- b) Reduces antigenicity.
- c) Facilitates long term storage.

#### **DISADVANTAGES:**

- a) Process of preparing the graft materials integrity and osteogenic potential, & immunological response to it may diminish its incorporation into the recipient bone.
- b) Particularly viral transmission more particularly HIV.

#### **XENOGRAFTS:**

Bone graft from other species have long term use in periodontal therapy.

Calf bone- Treated by detergent, sterilised and freeze dried. Used in osseous defects.

Kiel bone- Calf or Ox bone is denatured with 20% H<sub>2</sub>O<sub>2</sub>, dried with acetone and sterilised with ethylene oxide.

An organic bone- Ox bone from which the organic material has been extracted by ethylene diamine. Then sterilised by autoclaving.

Bio oss- Porosity similar to human cancellous bone. Used to treat defect size up to 2 Alveoli, can also be used for more than 2 alveoli.

Peppen 15- Mimics the cellbinding domain of type 1 collagen. Used for mandibular grade II furcation.

#### **ALLOPLASTS:**

A synthetic bone graft material, a bone graft substance. These materials are available in variety of texture, sizes and shapes.

##### **TYPES**

1. Plaster of Paris
2. Bio glass
3. Coral derived materials
4. Calcium
5. Tricalcium phosphate

POP allows fluid exchange thereby prevent flap necrosis. Pop resorbs completely within 2 weeks.

**BIOGLASS-** Two forms are available currently, they are Perio glass and Biogran. Hench et al (1980) developed this glass. This glass bond to bone through the development of a surface layer of carbonated hydroxyapatite. Composed of silicon dioxide, sodium oxide, calcium oxide, and phosphorus pentoxide.

#### **CORAL DERIVED MATERIAL-**

There are two different types one is natural coral and the other is coral derived porous HA. Both are biocompatible but natural Coral is resorbed slowly, whereas Porous HA is not resorbed or takes years for resorption.

#### **ROOT RESECTION**

Root resection can only be done in multiple rooted teeth with grade II -IV furcation involvement. It is done in tooth with major bone loss and maximum anatomical problems. This procedure can be done in vital tooth or endodontically treated tooth but for better convenience the tooth can be treated endodontically. If not treated before the pulp of the specific tooth should be removed patency of the canal should be determined and the pulp chamber should be medicated.



FIGURE – 7 [8]

FIGURE – 8 [5]

#### **INDICATION AND CONTRAINDICATION:**

- a) Tooth which is more important for the overall prognosis.
- b) Teeth that have enough amount of bone support to continue its original function.
- c) Teeth in patients with good oral hygiene and less chances of caries formation. Patients with bad oral hygiene and preventive measures are not suitable for this procedure.
- d) Molar with advanced bone loss in the interproximal and interradicular zones, unless the lesions have three bony walls, are not candidates for root amputation.
- e) Fused roots cannot undergo resection.

#### **HEMISECTION**

Hemisection is the separation of two rooted tooth into two separate Portion. Removal of compromised root along with the crown portion. This process is called as bi-cuspidization or separation because it changes molar into two separate roots. Molars with advanced bone loss in interproximal and interradicular zones are not suitable for Hemisection. After sectioning of teeth retaining the original tooth structure. For Hemi section interradicular dimension between the two roots of the tooth is important.<sup>[7]</sup>

#### **ROOT RESECTION/ROOT HEMISECTION PROCEDURE**

The most common root resection is done in distobuccal root of maxillary first molar. Its prognosis depends on successful endodontic treatment as well as total plaque control. <sup>[2]</sup>

- ① Local anaesthesia is injected in the appropriate site.
- ② Full thickness mucoperiosteal flap is elevated. Root resection and hemi section requires both facial and lingual/palatal flap to be elevated. A elevated flap should provide sufficient visualisation and space for instrumentation.
- ③ After elevation and debridement the resection begins with clear exposure of furcation. A cut is made from apical to the contact point of the tooth, through the tooth, and to the facial and distal orifice of the furcation.

④ For Hemi section Vertical cut is made facio-lingually from the buccal and lingual development grooves through the pulp chamber and furcation. If the cut passes through the metal restoration, the cut should be made prior to the flap elevation, which prevents contamination of metallic particles into the flap regions.

⑤ After re-sectioning the root is elevated from its socket without damaging the remaining bone and the adjacent tooth. After removing the root we get a clear view of the furcation, with the help of this visualisation debridement begins using rotatory or ultrasonic instruments.

⑥ Occlusion of tooth is evaluated, if need occlusion changes is made. <sup>[10]</sup>

### **EXTRACTION**

SAXE and CAMEN (1969) - stated that the indication for removal of a tooth with a grade III furcation defect. The extraction of teeth with furcation defects and advanced attachment loss may be the most appropriate therapy for some patients. This is particularly suitable for individuals who cannot or will not perform adequate plaque control, who have a high level caries activity, who have socioeconomic factors that may preclude more complex therapies. <sup>[10]</sup>

### **DENTAL IMPLANTS**

The advent of osseointegrated dental implants as an alternative abutment source has had a major impact on the retention of teeth with advanced furcation problems. The high level of predictability of osseointegration may motivate the therapist also the patient to consider extraction of teeth with guarded or poor prognosis and to seek for an implant supported prosthetic treatment plan. <sup>[10]</sup>

### **CONCLUSION:**

The treatment for furcation depends upon several factors like age of the patient, general body condition and condition of the tooth is more that. Following its degree of furcation and type of the tooth is noted and tooth deformation and morphology is also taken into concern. A proper diagnosis is most important to design the treatment plan, because appropriate treatment depends on the rate of the disease. Patient concern and confidence should be earned because Though being a confident clinician, patient confidence is important for a good cooperative treatment. Furcation management is easy if detected earlier. Preserving the natural dentition is the ultimate goal. <sup>[1]</sup>

### **REFERENCES:**

1. Parihar AS, Katoch V - Furcation involvement & its treatment - Journal of Advanced Medical and Dental Science Research (January-March 2015)
2. Jens Waerhaug -The furcation problem: Etiology, pathogenesis, diagnosis, therapy and prognosis - Journal of clinical periodontology (1980)
3. Vishal Kiran Kher, Manohar L. Bhongade, and Tushar S. Shirao - A comparative evaluation of the effectiveness of guided tissue regeneration by using a collagen membrane with or without decalcified freeze-dried bone allograft in the treatment of infra bony defects - Journal of Indian Society of Periodontology (July- August 2013)
4. Zhang H, Yang L, Feng JT - Demineralised Bone Matrix Carriers and their Clinical Application- Journal of basic science (2019)
5. Anindya Priya Saha, Sananda Saha, B.K Biswas - Management of Furcation Involvement: A case series- International Journal of Oral Health and Medical Research (September to October 2018).
6. Andrea Pilloni and Mariana A. Rojas -Furcation Involvement Classification-A Comprehensive Review and a New System Proposal- Dentistry Journal
7. Arora A, Arya A, Singhal RK, Khatana R - Hemisection - Indian Journal of Dental Science 2017
8. Vineeta Vurghese, Jaideep Mahendra, N. Ambalavanan - Resection and Regeneration-A Novel Approach in Treating a Perio-endo Lesion - Journal of Clinical and Diagnostic Research (01 March 2015)



9. Karthikeyan, VasudevaluSujatha ,Munivenkatappa L V Prabhuji – Furcation Measurement: Realities and Limitation – Journal of International Academy of Periodontology 2016.0
10. Clinical Periodontology- Carranza 9/10<sup>th</sup> Edition.