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Furcation invasion (FI)  
  
FI can be seen radiographically if it’s advanced enough “grade 1 is not”, i.e. there is enough bone loss. FI can be on molars and maxillary premolars “mostly the first”. Maxillary molars have three furcations “mesial, distal, and buccal”.  
  
Etiology:  
  
It is dental plaque, FI is a part of the periodontal problem bit it affects a tooth that has furcation.   
There are factors that make furcations more susceptible to have bone loss:  
1-anatomic factors  
2-developmental anomalies   
3-age “gradual attachment loss is a part of the aging process”  
4-local factors “like: overhangs”  
  
Most commonly affected furcation is the distal of maxillary first molar .. logically speaking, the most commonly affected furcation should be the closest furcation to the cementoenamel junction (CEJ), but this is not the case in the distal of maxillary first molar “it’s actually the furthest furcation for the molar from the CEJ “4.8 mm from the furcation to CEJ””, the cause why it’s the most commonly affected is because it’s located directly under the contact point “where most of the bone loss begins to happen”.  
The premolar’s furcation is about 7-8mm away from the CEJ so for FI to happen there severe attachment loss must happen.  
“This of course differs between individuals”.  
  
In diagnosing FI there are aspects that need to be found which are:  
1- There is actual FI  
2- Level of attachment  
3- The shape of the bone defect  
  
To detect FI Naber’s probe is used “it’s graded for every 3mm, because the level of classification that’s used changes every 3mm”  
  
once FI is identified anatomical factors should be evaluated to know their effect of the treatment plan.  
  
During probing using Naber’s probe clinically, we usually feel a slight concavity “which is not FI” it’s only a part of the normal anatomy of the tooth, FI means that the probe must go horizontally under the roof of the furcation. “to make sure of that you should pull upward while the probe is under the furcation, if it comes out then this is not FI, it’s just normal anatomy of the tooth, but if the probe is stuck then there is FI.  
The degree of FI should be measured from the entrance of the furcation “not from the gingival margin” so clinically you should know how much of the probe can enter in the gingival before it enters the furcation area to account for that distance when calculating the amount “level” of FI.  
  
For mandibular molars buccal furcations are probe buccally and lingual furcations are probed lingually. For maxillary teeth probing is more difficult than the lowers “and the premolars are harder to probe than molars”, the molar’s buccal furcation is probed buccally, and its mesial furcation is probed palatally “due to the width of the mesial root”, the distal furcation is probed either from the buccal or the palatal sides.  
  
Another way to examine FI, is radiographical, but the FI should be verified clinically, because there are conditions when radiolucency is present in the furcation area there will be no FI; the cause for this is either, perforations “especially in heavily restored teeth”, or occlusal trauma “in occlusal trauma there is bone loss but no attachment loss (only widening in the PDL)” so there is no FI.  
  
“”out of our lecture  
There is periodontitis if all of the following are present  
1-proximal attachment loss  
2-local factors  
3-bleeding on probing””  
  
In FI there is attachment loss “attachment is either fibers from PDL embedded into the cementum, or dentogingival fibers “from the gingival” embedded into the cementum”.  
  
Anatomic factors that affect the susceptibility of a tooth to get FI: “in periodontitis patients”  
1- root trunk length “shorter means more susceptible”  
2- root length  
3- root morphology “in slide 11 picA is more susceptible than picB”  
root proximity is a risk factor because when the roots are so close to each other there is actually no bone present between them in the normal status, only PDL attachment is present, so they are more susceptible to FI.  
There are percentages in the photos in slide 12 they resemble the probability of finding furcation concavity on each root “You should memorize them”.  
4-entrance of furcation: about 80% of furcation entrances is smaller than 1mm which makes it smaller than the instruments tip, and this makes cleaning it more difficult, so modified instruments or ultra sonic tips should be used.  
5-radicular grooves on the root surface from the furcation site “especially on mandibular molar” which makes is therapeutic challenge because these areas must be cleaned also.  
6-cervical enamel projection: extension of enamel covering the root surface and extending on the root trunk and in most of cases it reaches the entrance of the furcation and in some of them it actually go inside the furcation area.  
“Refer to slide 15 for Masters/Hoskins classification of cervical enamel projections”  
When enamel is extending to the furcation area that means there is no PDL attachment in that area, because fibers don’t attach to enamel, and that’s what makes it a risk factor.  
  
Hamp classification “see slide 17”; is the classification that’s used for FI and it measures the horizontal bone loss, so it gives us an idea about the shape of the bone defect. On the other hand, Tarnow and Fletcher classification doesn’t only measure the horizontal bone loss it also measures vertical bone loss.  
  
  
Notes: Hamp classification   
3mm invasion is considered from class 1  
“Through and through” means that the probe enters from one side of the furcation and exists from the other side.  
  
Treatment:  
1- root instrumentation: in order to remove the causative factor “surgical debridement , or scaling and root planning”  
2-facilitate maintenance: maintenance in the area of the furcation is difficult for both the patient and the operator, so one of the treatment options is to facilitate the maintenance of the furaction.  
Maintenance is facilitated by removing overhangs “slides23+24”, or odontoplasty.  
3-prevent attachment loss and stabilize the disease  
4-obliteration of furcation defect, by bone regeneration.   
  
 Non surgical therapy:  
1-Oral hygiene: OH in the area of FI is challenging, there are several aids that makes it easier like; Perio aid “slide26”, proxa brush “slide27” , rubber tips.  
2-scaling and root planning: effective in class1 and accessible class 2, “accessible means that the furcation is not in the proximal area”.  
Ultrasonic instrumentation is more effective in FI treatment than hand instruments.   
  
Surgical therapy:  
1-Osseous resection.  
2-Regenerative surgery  
3-Root resection  
4-Extraction  
5-Dental implants  
  
In slide 30 there is a photo where bone in furcation of the teeth is very thick and is preventing access for cleaning, so osteoplasty is done to facilitate cleaning and allowing soft tissues to grow again as in slide 31.  
This results in recession but it makes it easier to clean the furcation area   
  
In class 1 and accessible class 2 regenerative therapy is effective “regenerative therapy for proximal class 2 is not predictable”  
For class 2 you should start thinking about hemisection and root resection and tunnel technique “which is inducing recession in order to provide access for cleaning, but there is risk for root caries” as a therapeutic measure.  
root resection is in slide 57.  
  
Hemisection “slides 43+44+45” is done for mandibular molars “the molars are separated into two (two premolars)”, the prognosis of this is not predictable, and these teeth are lost most of the time due to restorative, endodontic or carious causes “not due to periodontal causes”.  
  
Clinical studies show that teeth with FI “any class” usually survive for a long time (from prognosis lecture teeth with FI have questionable prognosis, but this doesn’t mean that the tooth needs extraction).