Correlation between peridontology and orthodontics

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PERIO-ORTHO ASPECTS

REASON OR EFFECT? CAN OCCLUSAL TRAUMA CAUSE PERIODONTITIS?

REASON OR EFFECT? CAN PERIODONTITIS CAUSE TOOTH MOVEMENT?

Tooth movement

a. Tipping movement

b. Bodily movement


Occlusal trauma - jiggling

1. Occlusal trauma - jiggling

Healthy periodontium
No bone loss

Occlusal trauma - jiggling

Healthy periodontium
Reduced bone height


Occlusal trauma - jiggling

Healthy periodontium
Reduced bone height


Occlusal trauma - jiggling

Untreated, active periodontitis


...the offset of chewing forces or splinting are not sufficient...
cause related periodontal therapy is inevitable...

Occlusal trauma - jiggling

Periodontitis Vertical bone loss


The effect of orthodontic forces on healthy periodontium

2

Tooth movement

a. Tipping movement

b. Bodily movement

Causes: Agenesia, Extraction during:
- the alveolar cortical bone is moving with the tooth e.g. mesialization
- Teeth with periodontitis (reduced bone height): using small forces, slowly (as it is possible), risk of invagination!


Uprighting of tilted molars
- Bodily movements premolars/molars towards the missing tooth
- Bodily movements of canines
- in distal direction causing wider new bone formation in place of aplastic lateral incisors to following implantation
- Requirement: no dehiscence, recession by the site of the planned implantation (Spear et al 1997)


Space provision in order to place an implant
Fogtechnika: Balogh Zsolt


Orthodontic appliances, designed to tip the maxillary second and third incisors in facial direction, were inserted in 3 dogs. During a 5 month period, the incisors on the left side of the jaw were tipped to a facial displaced position. During a further 5 month period these teeth were moved back to their original position while the two incisors on the right side of the jaw were moved to a position corresponding to that previously reached by the incisors of the left side. The orthodontic appliances were then used to retain the teeth in these positions for 5 months. Teeth in three non-treated dogs served as controls. During the study, the animals were subjected to meticulous plaque control. The animals were sacrificed 15 months after the start of the study. The jaws were removed and buccolingually oriented histological sections of the experimental and control teeth were produced.

The study has shown (1) that dehiscences can be produced in the alveolar bone by tipping teeth in facial direction and that bone will reform in such defects when the teeth are moved back to their original position and (2) that such tooth movements are not necessarily accompanied by loss of connective tissue attachment.

The question remains: the reports are not congruent in literature regarding limiting values of the occlusion and maximal forces using by tooth movements.

Mucogingival relations

Frenectomy, Frenuloplasty: the frenulum is attached at a higher level than normal

Gingival augmentation/change of biotype: Mucogingival surgery, periodontal plastic surgery
The width of the keratinized tissue (the biotype) is more determining than the apico-coronal dimension. (Wennström et al. 1987)

Moving the incisors orally thickens the buccal gingiva

• Contrary, by widening the dental arch, especially when the biotype is thin, gingival recession occurs frequently

• Therefore, the examination of gingival biotype (and if needed widening the keratinized tissue) is suggested before the orthodontic treatment
After the successful and harmonic result of orthodontic treatment
- Gingival recession that bothers the patient

Vertical movements
2/b

1. Continuously preparing the crown to keep it in an infraocclusal position
   • Continuously preparing the crown to keep it in an infraocclusal position
     - Gingival recession that bothers the patient

2. In case of hopeless teeth for gaining bone volume in the vertical dimension
   (the horizontal remains the same) before implantation

The keratinized gingiva also follows the moving tooth and the alveolar bone
(Kajiya et al. 1993, Salama & Salama 1993)

• The level of the mucogingival junction remains the same! – the amount of keratinized tissue is growing
• Type III collagen converts into type I. – this takes place within ~ 6 months (Chayanupatkul et al. 2003)

The periodontal tissue doesn’t follow the tooth:
• Clinical crown lengthening
• Cutting gradually the periodontal ligaments
• Animal experiment results

Berglundh et al. (1991)

Gingival fibrotomy
(Pontoriero et al. 1987; Kołosweski et al. 1988)
The attachment level of periodontal tissues migrates apically. May cause pocket formation.

If gingivitis presents at the same time, we can provoke bone loss (Ericsson et al. 1977, 1978).

Histology: By healthy periodontium without inflammation (Melsen 1986, 1988)

Insufficient clinical data (Melsen et al. 1989)

Insufficient literature data, contradictory data

Questionable/pending in periodontal aspect

Simultaneous regenerative surgery (EMD) may be beneficial.


In case of chronic periodontitis moving the teeth in an inflammation-free state doesn’t cause further bone loss. But until the periodontium doesn’t reach a totally inflammation-free state, the risk of reactive tissue loss still remains (Polson 1984, Wennstrom 1993).

There is no consensus about the treatment of aggressive periodontitis patients (extremely high risk). Most of the specialists say it is a contraindication for treatment.

No general consensus about treatment guidelines; extremely few cases were published (Harpenau & Boyd 2000).

Uprighting tilted molars:
- The stabilized attachment can remain constant for decades despite of moving forces (Lundgren 1992)
- The uprightness of tilted periodontally compromised stabilized teeth can cause reduction of pocket depth and attachment level gain (Lang 1977)

There is no sufficient evidence of successful outcome of intrusion by periodontally compromised patients.
Orthodontic treatment of periodontally compromised patients

Moving furcation-involved teeth:
- Moving untreated furcation-involved molars can lead to further destruction
- Solution: di-/tri-section (premolarisation) of molars, but the orthodontic consideration needs to be very careful

Periodontal regeneration and orthodontic treatment:
In the treatment of periodontally compromised patients with great attachment loss the complementary orthodontic treatment could open new dimensions. There are only a few human cases published.
- With GTR technique significant new attachment can be achieved (Diedrich 1996), which is proved by clinical results, but the procedure is very sensitive to the technique and to reinfection (Nemcovsky et al. 1996; Stabila & Flores-de-Jacoby 1998; Rabie et al. 2001)
- Enamel matrix derivative (Emdogain) seems more successful (Attia et al. 2012)
- With wider oro-vestibular bone dimensions the invagination of the gingiva’s epithelium is less likely (Basdra et al. 1995).

Orthodontic treatment of migrated teeth as a consequence of periodontitis

After initial phase of periodontal therapy, but before/right after regenerative surgery (Experimental phase)

After initial phase
Cochran et al. 2003, Trombelli et al. 2006, Yilmaz et al. 2010

EMD + autogenous bone chips

Ortho tx: Nemes Bálint

10 m

1 y

kezdő

1 y
The importance of oral hygiene

- Active periodontal inflammation + orthodontic treatment = bone resorption
- Perfect oral hygiene, teaching, motivation, clensable orthodontic appliances, avoiding too complicated (plaque retentive) appliance surfaces, regular OH control (Zachrisson 1996)
- O-ring / elastic tie is more plaque retentive than the metal steel tie (Forsberg 1991)
- Brackets are less plaque retentive than the metal band (Zachrisson 2000)
- During the orthodontic treatment control of dental hygienist or periodontologist is recommended every 3 months (Boyd 1989)
- At the absence of perfect/good oral hygiene the orthodontic treatment should be suspended (Machen 1990)

Maintaining excellent oral hygiene
Maintaining excellent oral hygiene

Conclusions I.
Orthodontic treatment of patient with active periodontitis and/or traumatic occlusion:
- can enhance periodontal tissue breakdown, as a co-factor, therefore:
  First periodontal therapy and then the orthodontic treatment maintaining excellent individual oral hygiene during orthodontic treatment

Periodontal treatment + occlusial correction:
- periodontal pocket reduction, formation of new attachment, remineralisation

Moving teeth:
- slowly with light forces and only by stable periodontium
- neither orthodontic treatment nor traumatic occlusion detoriates periodontal attachment loss
- Periodontally compromised patients should use their retainer for longer time
- mesio-distal movement can be performed only to a certain extent. Consequence: bone apposition, invagination
- new attachment and new bone formation may be obtained in combination with regenerative periodontal surgery

Moving to labial direction:
- root must be kept within the arch (bony envelope) to prevent bone loss, alv. dehiscence, recession
- But early diagnosis and buccal reposition is possible and favorable
- Changing the biotype is recommended prior to orthodontic treatment in case of thin biotype

Forced eruption:
- in case of hopeless teeth, prior to implantation vertical bone volume gain is possible, but horizontal gain does not occur

Intrusion
- carefully, epithelial attachment apically, risk of periodontal pocket formation.

Conclusions II.

Conclusions III.
- Team work (dentist-orthodontist - periodontist - dental hygienist)
- Carefully made diagnosis is essential
- Proper treatment plan
- Realistic expectations, informing the patient
- Documentation
- Regular maintenance

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