

Correlation between peridontology and orthodontics

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PERIO-ORTHO ASPECTS



REASON OR EFFECT?
CAN OCCLUSAL TRAUMA CAUSE PERIODONTITIS?

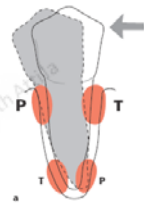


REASON OR EFFECT?
CAN PERIODONTITIS CAUSE TOOTH MIGRATION?

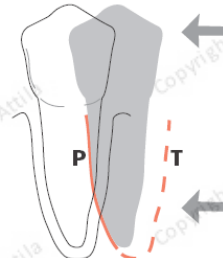


Tooth movement


a. Tipping movement




b. Bodily movement



Reitan, K. (1951). The initial tissue reaction incident to orthodontic tooth movement as related to the influence of function. *Acta Odontologica Scandinavica* 10, Suppl 6.





1 Occlusal trauma - jiggling




Occlusal trauma - jiggling

Healthy periodontium
No bone loss

Wentz, F.M., Jarabak, J. & Orban, B. (1958). Experimental occlusal trauma imitating cuspal interferences. *Journal of Periodontology* 29, 117-127.

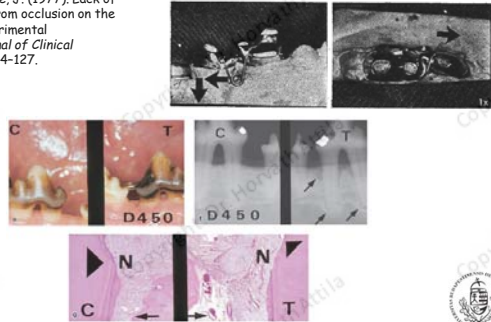


Occlusal trauma - jiggling

Healthy periodontium
Reduced bone height

ORTHODONTIC TIPPING FORCES AND GINGIVITIS

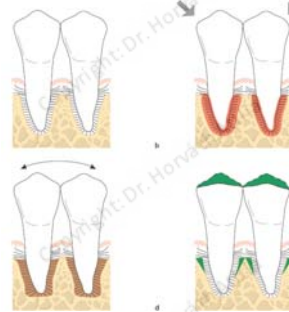
Ericsson, I. & Lindhe, J. (1977). Lack of effect of trauma from occlusion on the recurrence of experimental periodontitis. *Journal of Clinical Periodontology* 4, 114-127.



Occlusal trauma - jiggling

Healthy periodontium
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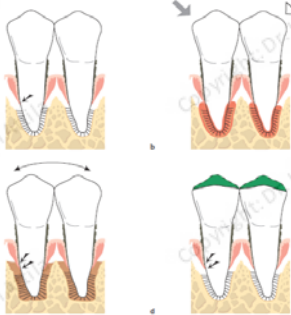


Occlusal trauma - jiggling

Untreated, active periodontitis

Ericsson, I. & Lindhe, J. (1982). The effect of longstanding jiggling on experimental marginal periodontitis in the beagle dog. *Journal of Clinical Periodontology* 9, 497-503.

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



Occlusal trauma - jiggling

Periodontitis
Vertical bone loss

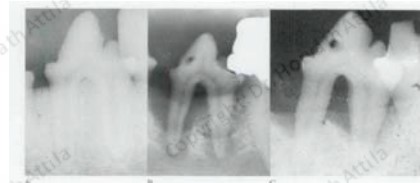
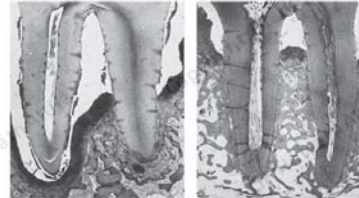


Fig. 4. Radiographs of two teeth obtained on Day 0 (A) and on Day 200 (B, C). Note the variation in depth of the alveolar bone defect on Day 200 in Fig. B (Day 2) and in Fig. C (Day 6).

Ericsson, I. & Lindhe, J. (1982). The effect of longstanding jiggling on experimental marginal periodontitis in the beagle dog. *Journal of Clinical Periodontology* 9, 497-503.



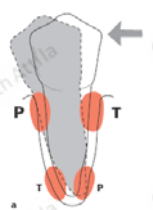
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The effect of orthodontic forces on healthy periodontium

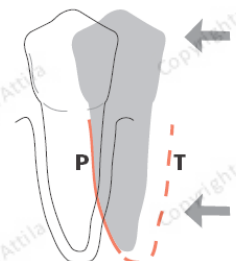


Tooth movement

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2/a

Horizontal displacement



2/a/1

Horizontal displacement Mesiodistal



2/a/1

Horizontal displacement Mesiodistal

Causes:

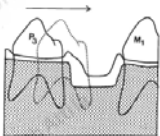
Agnesia, Extraction

during:

the alveolar cortical bone is moving with the tooth eg.:mesialization

Teeth with periodontitis (reduced bone height):

using **small forces, slowly** (as it is possible), risk of invagination!



Lindskog-Stokland, B., Wennström, J.L., Nyman, S. & Thilander, B. (1993). Orthodontic tooth movement into edentulous areas with reduced bone height. An experimental study in the dog. *European Journal of Orthodontics* 15, 89-96.



Horizontal displacement Mesiodist e.g.: diastema closure (instead of implant placement)



Lindskog-Stokland, B., Wennström, J.L., Nyman, S. & Thilander, B. (1993). Orthodontic tooth movement into edentulous areas with reduced bone height. An experimental study in the dog. *European Journal of Orthodontics* 15, 89-96.



Horizontal displacement Mesiodist e.g.: prior to implant placement

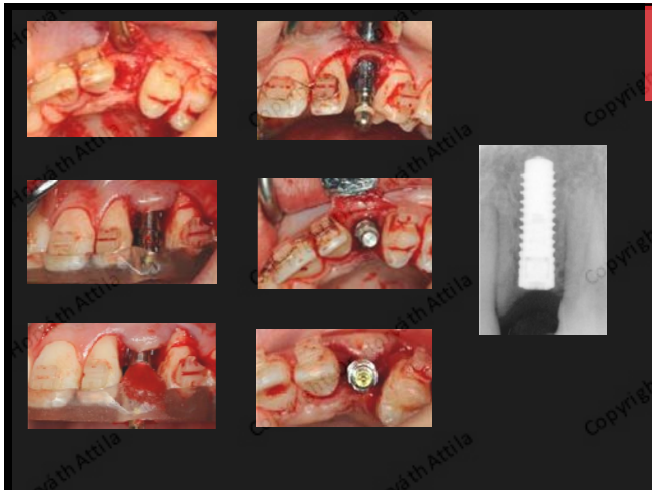
- Uprighting of tilted molars
- Bodily movements premolars/molars towards the missing tooth
- Bodily movements of canines
- In distal direction causing wider new bone formation in place of aplastic lateral incisors to following implantation
- Requirement: no dehiscence, recession by the site of the planned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

Zachrisson, B.U., Stenvik, A. & Haanes, H.R. (2004). Management of missing maxillary anterior teeth with emphasis on autotransplantation. *American Journal of Orthodontics and Dentofacial Orthopedics* 126, 284-288.



Space provision in order to place an implant





2/a/2

Horizontal displacement
orovestibular

Horizontal displacement
orovestibular

Fig. 1. Outline of the study. The maxillary second and third incisors in both sides of the jaw (I², I³) served as experimental teeth. PII = Plaque Index, GI = Gingival Index, PD = Pocket depth, AL = Attachment level.

Nyman, S., Karring, T. & Bergenholz, G. (1982). Bone regeneration in alveolar bone dehiscences produced by jiggling forces. *Journal of Periodontal Research* 17, 316-322.

Horizontal displacement
orovestibular

Engelking, G. & Zachrisson, B.U. (1982). Effects of incisor repositioning on monkey periodontium after expansion through the cortical plate. *American Journal of Orthodontics* 83, 23-32.

Horizontal displacement orovestibular

Orthodontic appliances, designed to tip the maxillary second and third incisors in facial direction, were inserted in 3 d/7s. During a 5 month period, the incisors on the left side of the jaw were tipped to a facially 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.

Nyman, S., Karring, T. & Bergenholz, G. (1982). Bone regeneration in alveolar bone dehiscences produced by jiggling forces. *Journal of Periodontal Research* 17, 316-322.



Horizontal displacement orovestibular

teeth have to stay in jaw arch (bony envelope) in any case!

If in the course of tooth movement (intentionally, accidentally)

- moving in vestibular direction (out of the jaw)
- bone does not move simultaneously with tooth
- consequently: alveolar dehiscence/fenestration eg.:
 - mandib front (Wehrbein 1994)
 - maxilla buccal #bite (Greenbaum&Zachrisson 1982)
 - Maxilla front overjet (Ten Hove&Mulie 1976)

• clinical picture: often gingiva recession

eg.: mandib.- fronts, maxilla - molars, in case of expressed palatal overjet

If tooth gets out the arch, it could be moved back successfully (ossification at buccal site)



Dislocation out of the arch



Horizontal displacement orovestibular

Therapy:

- firstly GBR (guided bone regeneration) suggested (Diedrich 1996)
- if there is no soft tissue defect: moving back teeth to the alveolus (Engelkind& Zachrisson 1982)
- **Plastic surgery, biotype modification** (Steiner 1981, Karring 1982) before? – after?
- Moving by controlled forces, to controlled limit (prevention)

The question remains:

the reports are not congruent in literature regarding limiting values of the occlusion and maximal forces using by tooth movements



Mucogingival surgery

- before or after orthodontic treatment?-



Mucogingival relations

Frenulectomy, Frenuloplasty:

Correction of the frenulum – the frenulum is attached at a higher level than normal



Gingival augmentation/change of biotype:

Mucogingival surgery, periodontal plastic surgery

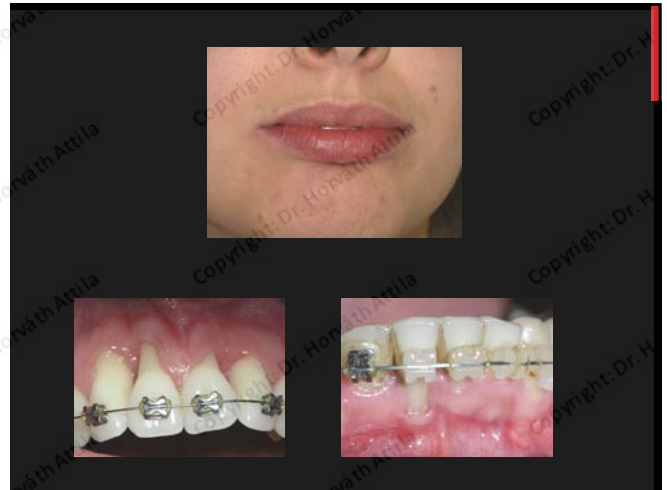


Mucongival relations

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 -



2/b

Vertical movements



2/b/1

Vertical movements
 Coronally

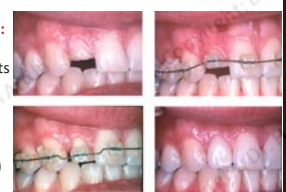


Vertical movement- Forced eruption

- Continuously preparing the crown to keep it in an infraocclusal position
- 1. the periodontal tissue follows the tooth:
 - 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 (Kajiyama et al. 1993, Salama&Salama 1993)
 - The level of the mucogingival junction remains the same! – the amount of keratinized tissue is growing
 - the type III. collagen converts into type I. - this takes place within ~ 6 months (Chayanupatkul et al. 2003;)

- 2. The periodontal tissue doesn't follow the tooth:
 - Clinical crown lengthening
 - Cutting gradually the periodontal ligaments
 - Animal experiment results Berglundh et al. (1991)

Gingival fiberotomy
 (Pontoriero et al. 1987; Kozlowsky et al. 1988)



2/b/2

Vertical movement- Apically



2/b/2

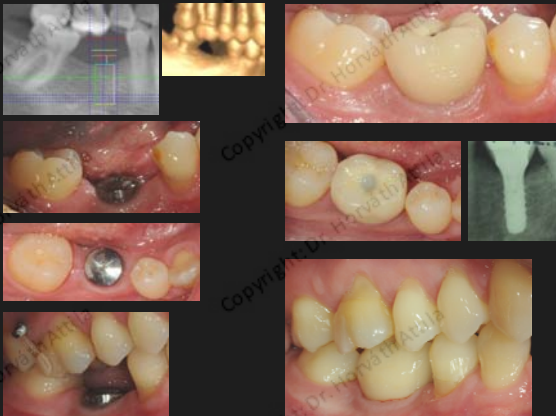
Vertical movement- Intrusion



- 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

Diedrich, P. (1996). Guided tissue regeneration associated with orthodontic therapy. *Seminars in Orthodontics* 2, 39-45.

Vertical movement- Intrusion



3

Orthodontic treatment of periodontally compromised patients



Orthodontic treatment of periodontally compromised patients

- 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 uprighting 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

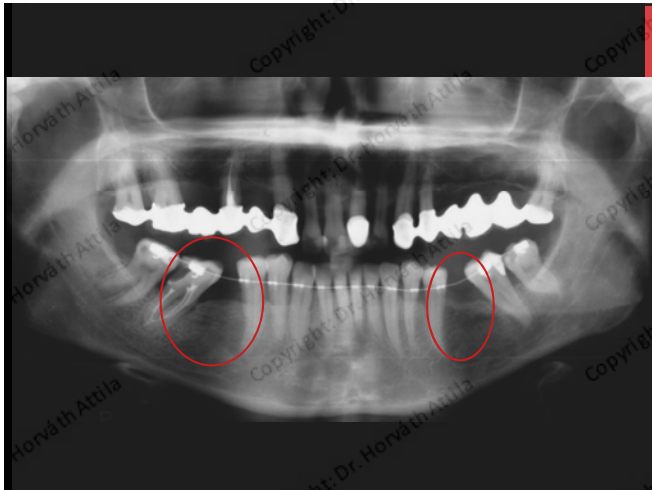
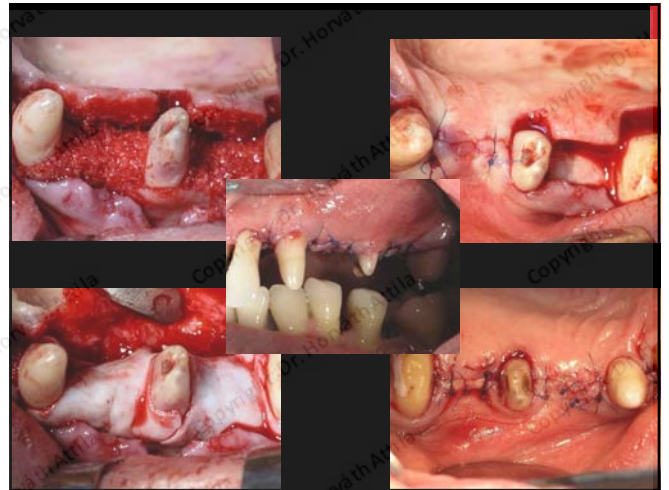


3/a

Orthodontic treatment of migrated teeth as a consequence of periodontitis

After reaching stable periodontium.
Uninflamed tissues





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.

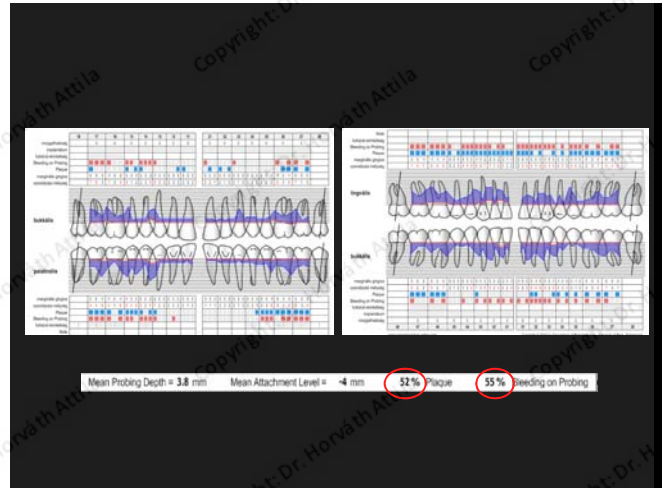
- With GTR technique significant new attachment can be achieved (Diedrich 1996), which is proved by clinical results, but the procedure is very sensitive to the technique and to reinfection (Nemcovsky et al. 1996; Stelzel & Flores-de-Jacoby 1998; Rabie et al. 2001)
- Enamel-matrix derivative (Emdogain) 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.)

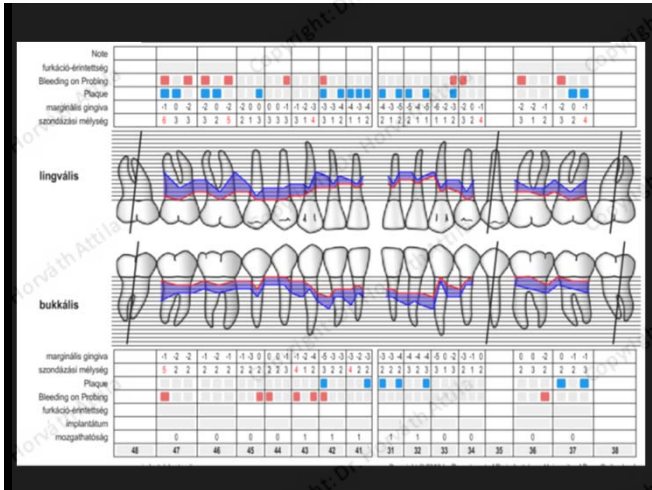
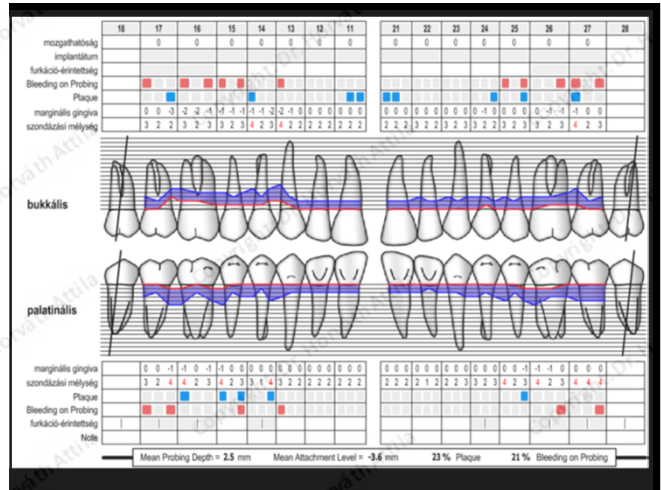


3/b

Orthodontic treatment of migrated teeth as a consequence of periodontitis

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





The importance of oral hygiene

- **Active periodontal inflammation + orthodontic treatment = bone resorption**
Ericsson, I. & Lindhe, J. (1982).
- 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

TePe Select™
A TePe Select™ fogkefék két méretben kaphatók. A kis fej kialakítása megkönnyíti a nehezen elérhető helyek tisztítását.

TePe Interspace™
Hajlított kefe csúcsos hegyvel. Ideális a kritikus területek tisztítására a bracketek körül és az ívek alatt. A kefehegy csőrölhető.

TePe Supreme™
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TePe Compact Tuft™
A hajlított nyakú, kicsi, rugalmas kefe csúcsos alkalmas a bracketek környékének és az ívesztel tisztítására.

TePe Orthodontai fogkefe
A csak két sörtésorral álló és különösen kényelmes fogkefe rendelkezik a fogkefe hatékony tisztítást és könnyebb hozzáférést biztosít.

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A fogkefékkel kiegészítő hasznosak a bracketek és az ívek alatti területek tisztítására, és alkalmasak a fogkefék tisztítására is. A TePe fogkefék tisztító kefék többféle méretben kaphatók.



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 + occlusal 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 deteriorates 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

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Conclusions II.

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.


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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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