

**ARTICLES FROM THE CURRENT  
ORTHODONTIC LITERATURE, SELECTED AND  
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### Ultrasound effects on root resorption

**Inubushi T, Tanaka E, Rego EB, Ohtani J, Kawazoe A, Tanne K, et al. Ultrasound stimulation attenuates resorption of tooth root induced by experimental force application. *Bone* 2013;53:497-506.**

The authors of this study evaluated the in-vivo effects of low-intensity pulsed ultrasound (LIPUS) on root resorption caused by excessive orthodontic forces and its role in the RANKL/OPG mechanism in vitro. The maxillary first molars of 24 Wistar rats were subjected to 50 g of mesial traction force for 1, 2, or 3 weeks. Each rat received LIPUS for 15 minutes per day for 1, 2, or 3 weeks on 1 molar; the contralateral side served as the control. At the end of 3 weeks, the LIPUS group showed significantly shorter root resorption lacunae and smaller root resorption areas with histomorphometric analyses. Fewer odontoclast and osteoclast numbers through TRAP staining were also observed in the LIPUS group. The amount of tooth movement was significantly greater at the end of 2 weeks with LIPUS, but not different at the end of 3 weeks. In-vitro experiments with no compressive forces and no LIPUS showed that osteoblastic cells (MC3R3-E1) continuously expressed higher levels of the osteoclastic/cementoclastic remodeling markers RANKL and RANTES mRNA compared with the cementoblastic cells (OCCM-30). The cementoblastic cells expressed much higher levels of the antiosteoclastic/cementoclastic remodeling markers OPG mRNA. LIPUS without compressive forces significantly increased RANKL mRNA expression at 4 and 12 hours in the osteoblastic cells, whereas OPG mRNA was not affected. Expressions of RANKL and OPG mRNAs were both significantly increased by LIPUS in the cementoblastic cells at 12 hours. LIPUS with compressive forces

suppressed the up-regulation of RANKL mRNA in the cementoblastic cells; no similar effect on the osteoblastic cells was observed. The authors concluded that LIPUS significantly reduces root resorption by suppression of cementoclastogenesis by altering the OPG/RANKL ratio without interrupting bone remodeling and tooth movement.

*Reviewed by Catherine Woo*

### Experimental assessment of orthodontic relapse

**Franzen TJ, Monjo M, Rubert M, Vandevska-Radunovic V. Expression of bone markers and micro-CT analysis of alveolar bone during orthodontic relapse. *Orthod Craniofac Res* 2014 Jun 15 [Epub ahead of print].**

The aim of this study was to elucidate the biologic mechanisms surrounding the relapse of orthodontic tooth movement by evaluating 3-dimensional bone morphometric parameters and related gene expression. Forty 6-week-old male Wistar rats were divided evenly into 8 groups: control with no orthodontic tooth movement (OTM), 10 days of OTM only, and 6 groups of 10 days OTM and relapse by removing the appliances and killing the animals on days 1, 3, 5, 7, 14, and 21 after removal of the appliances. Tooth movement was performed by a closed-coil spring ligated from the mesial surface of the first molar to the incisor with 0.5 N of force. A feeler gauge was used to measure the amount of tooth movement. Relapse was calculated as a percentage per group after calculating the mean relapse per group. The investigators found that relapse in the 21-day group was  $93\% \pm 15\%$ , with the most relapse (70%) occurring 1 day after appliance removal. The rate of relapse decreased gradually after day 1 and reached nearly the level of physiologic distal drift by day 21. Micro-computed tomography analysis showed that, similar to OTM, the relapsing tension side showed signs of bone formation only a few days after appliance removal. In addition, after 3 days of continued decreasing values, tooth mineral density returned to the control levels. Gene expression analysis showed that the best biologic markers to predict relapse are bone resorption markers RANKL and  $H^+$ -ATPase expression by mRNA because of their significant correlation to the percentage of relapse. Overall, orthodontic relapse appears to have similar biologic

processes as OTM occurring immediately after the orthodontic forces are removed.

*Reviewed by Lyle Schofield*

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## The surgery-first orthognathic approach may be a faster alternative to the traditional approach

**Choi JW, Lee JY, Yang SJ, Koh KS. The reliability of a surgery-first orthognathic approach without presurgical orthodontic treatment for skeletal Class III dentofacial deformity. *Ann Plast Surg* 2013 Jul 8 [Epub ahead of print].**

Orthognathic surgery traditionally requires both pre-surgical and postsurgical orthodontic treatment phases, often resulting in increased treatment time and possible worsening of facial esthetics during the presurgical phase. The authors hypothesized that a surgery-first approach (SFA) in treating skeletal Class III patients would provide results similar to conventional orthognathic surgery. This prospective study included 24 adult skeletal Class III patients treated with conventional orthognathic surgery and 32 patients treated with the SFA approach. The average age was 22.4 years for the 16 men and 40 women. Cephalometric evaluations showed that both groups were similar at baseline. In the SFA group, model surgery was performed on casts in which the teeth were reset to ideal positions to estimate the amount of skeletal movement needed. Subsequently, the casts were replaced by original casts with the teeth not reset, reflecting orthognathic surgery without presurgical orthodontics. The remaining steps of the SFA method were similar to the conventional approach. LeFort 1 osteotomy with posterior maxillary impaction and mandibular setback with sagittal split ramus osteotomy followed by semirigid fixation with miniplates were performed. Changes in the cephalometric landmarks were compared between the groups at the preoperative, immediately postoperative, and 12-month postoperative periods. The presurgical comparison showed significant dental differences between the 2 groups. This was expected because the SFA group did not undergo presurgical orthodontic treatment. Changes in the skeletal landmarks over time showed no statistically significant differences between the groups. Dental parameters showed convergent patterns over time, indicating that SFA treatment could provide results similar to the traditional approach. The authors' findings indicate that surgery first can be a viable

alternative to traditional treatment if the patients are judiciously selected and correct simulations are performed.

*Reviewed by Ajay Singh*

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## Overbite and stability in surgery-first approach

**Ko EW, Lin SC, Chen YR, Huang CS. Skeletal and dental variables related to the stability of orthognathic surgery in skeletal Class III malocclusion with a surgery-first approach. *J Oral Maxillofac Surg* 2013;71:e215-23.**

The authors of this retrospective cohort study evaluated and compared the dental and skeletal changes between stable and unstable skeletal Class III patients treated with the surgery-first approach. Forty-five Class III patients (mean age, 23.2 years) underwent combined LeFort I and bilateral sagittal split osteotomies followed by orthodontic treatment by the same surgeon and orthodontist. Serial lateral cephalograms were obtained before treatment, 1 week postoperatively, and at the end of treatment. Relapse was assessed as the amount of horizontal movement at B-point with the best-fit superimposition of the anterior cranial base and sella turcica. The sample was divided into 2 groups: less stable and highly stable, based on relapse of the skeletal correction achieved. The less-stable group had a mean forward movement of B-point of  $\geq 2$  mm, and the highly stable group had movement of B-point from 1 mm backward to 1 mm forward. On comparison, the highly stable group initially had a statistically significant longer lower anterior facial height, less severe anterior crossbite, less accentuated curve of Spee, less overbite among the patients with positive overbite, and less surgical horizontal mandibular setback. The highest correlation was observed between the amount of relapse and the initial positive overbite, the curve of Spee, the amount of surgical setback, and overjet. A positive overbite explained 25.9% of the horizontal relapse of the mandible. The mean relapse at B-point increased by 0.449 mm for each millimeter of increased overbite before surgery. The authors suggested that with the surgery-first approach in patients with skeletal Class III malocclusion and a deep lower curve of Spee, sagittal relapse can be minimized by leveling before surgery, including a lower anterior sub-apical osteotomy, and overcorrecting the mandibular setback.

*Reviewed by Grace Sun Ae Hur*

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