Microvibration and Acceledent: What's the Buzz? (Peter Miles)

Do patients want faster treatment?

- Uribe et al. AJODO 2014;145:S65-73.
- Patient's, parent's, and orthodontist's perceptions of the need for and costs of additional procedures to reduce treatment time.
- Parent's want Tx done in 12-18 mths
- Adult patients want Tx done in 6-12 mths
- Adolescents was Tx done in 6 mths or less

How much are we/they willing to pay for faster treatment?

- Uribe et al. AJODO 2014;145:S65-73.
- Most orthodontists are only willing to pay up to 20% of their treatment fee to companies for technology to reduce treatment times.
- Most patients/parents willing up to 20%
- Almost 2/3 of orthodontists felt that reducing treatment time would become a problem for fee collection

Patient/parent willingness to have a procedure?

Technique	Willing
Customised appliances	54 – 81%
Intraoral vibrating appliances	51 – 62%
Intraoral injected drugs	25 – 34%
Piezocision & Corticotomies	11 – 20%

Bone remodelling

- The process for bone remodelling has two main theories that have been proposed:
  - 1) pressure-tension within the PDL
  - 2) piezoelectricity generated in the alveolar bone

Piezoelectric charges

- When bone is deformed, this generates piezoelectric charges and microcurrents to flow through bone and may enhance tooth movement by stimulating osteoblastic and osteoclastic activity.
- The microcurrents flow only during the application or release of stress and are not observed where continuous orthodontic forces are used.

Frequency effects on bone

- Conventional mechanics involves static or intermittent forces (not cyclic/pulsatile).
- Static and intermittent forces have no frequency, and therefore affect cells only when activated.
- Cyclic forces impact cells multiple times (frequency in Hz).

Vibration effects research to be discussed

- Shapiro et al. AJO 1979;76:59-66.
- Darendeliler et al. Australian Dent J 2007;52:282-287
- Nishimura et al. AJODO 2008;133:572-83
- The effect of varying frequencies of mechanical vibration on the rate of orthodontic tooth movement in mice. Thomas Dobie Univ. Connecticut thesis Nov 2013.
- The effect of mechanical vibration (Acceledent) on root resorption and tooth movement after application of orthodontic force. A micro−CT study. Daniel Tan Univ Sydney thesis 2011.
- Kau et al. Orthodontic Practice. US 2010;1(1)
- Angle 2015. Online. Leethanakul et al.
- Acceledent clinical trial (University of Texas Health Science Center - San Antonio)
- Miles, Smith, Weyant, Rinchuse. Aust Orth J 2012;28:213-8.
- Bowman – JCO 2014 and AAO, New Orleans
- Woodhouse et al. J Dent Res. March 2015 online.

Miles et al. New blinded RCT of the Acceledent appliance

- Initial alignment – discomfort, irregularity and arch perimeter
- Extraction space closure in mm/mth (future)
- Overall treatment duration (future)

- 40 Class II adolescent upper bicuspid extraction subjects randomly assigned to control or Acceledent
- 36 of 40 recruited, 4 declined – clinician blinded
- Initial alignment and discomfort results of first 30 subjects to be presented