Can Vibrational Devices Accelerate Orthodontic Tooth Movement? CAT Summary

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CLINCAL PROBLEM

- The worldwide prevalence of malocclusion is 56%.[1]
- Fixed orthodontic treatments last approximately 20 months[2] and may be associated with complications such as enamel demineralization, increased caries risk, root resorption, orthodontic pain, etc.
- Non-invasive methods of reducing treatment length are desirable for both patients and clinicians.
- Vibrational forces have been shown to play a role in stimulation of the osteoclastogenesis pathways[3] and have been studied as potential accelerators of tooth movement.
- Higher frequencies of vibration were found to be the most effective. However, increasing magnitude did not provide any benefits.[4]

CLINICAL QUESTION

Among individuals undergoing fixed orthodontic treatment, to what extent does the addition of light vibrational forces (LVF; high frequency, low magnitude) to the standard fixed orthodontic appliances (FOA) affect the rate of orthodontic tooth movement (OTM) compared to the use of FOA alone?

EVIDENCE SEARCH

- Search date: November 29, 2023
- Keywords and MeSH terms: tooth movement, orthodontic, orthodontic appliances, tooth movement techniques, vibration devices, vibration, vibrate, vibrating
- Additional search: Journal of Clinical Orthodontics (JCO)
- **Evidence selected:** El-Angbawi A et al., Non-surgical adjunctive interventions for accelerating tooth movement in patients undergoing orthodontic treatment, Cochrane Systematic review, 2023.

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★ CLINICAL BOTTOM LINE ★

Limited evidence suggests the addition of LVF to conventional FOA does not show clinically meaningful effect on OTM in the space closure stage.

https://orthodonticproductsonline.com/industry-news/company-news/orthoaccel-enters-exclusive-distribution-agreement-henry-schein-orthodontics-acceledent-optima/

RESULTS

- 2 RCTs: Woodhouse 2015[5], Miles 2018[6]
- Woodhouse n=81, mean age = 14.1y; 18.6-month treatment duration
- Miles n=40, age = adolescents up to 16y; 20-month treatment duration
- Both RCTs included treatments with extraction of premolars, and extraction space closure using AcceleDent (Orthoaccel, USA) 30Hz, 0.2N vibration, 20 min/day

- **Mean difference (MD), space closure** (FOA+LVF vs FOA) = 0.10mm/month (in favor of FOA+LVF)
  (95% CI: -0.08, 0.29)

INTERPRETATION

- The OTM during space closure stage increased by 0.10 mm/month in FOA+LVF group compared to FOA group.

- The results are NOT statistically significant (there might be a trend), NOT clinically meaningful and NOT clinically decisive (meaningful difference for space closure: 0.25 mm/month)

STRENGTHS

- Systematic review: 5 databases, grey literature; clearly defined inclusion/exclusion criteria; no dates and language limits; no restrictions for age, gender, socioeconomic status.
- Two independent reviewers (blinded) and arbitrator.
- PRISMA diagram, summary tables and GRADE approach.
- RCT study designs.
- Validated risk of bias tool (Cochrane).
- Risk of bias diagram provided.

LIMITATIONS

- Only two RCTs related to clinical question.
- Small sample sizes.
- High risk of bias or unclear risk of bias in each included study (blinding: participants/personnel, outcome assessment; incomplete outcome data).
- Potential publication bias: no funnel plot analysis
- The results are neither statistically significant, clinically meaningful, nor clinically decisive.

APPLICABILITY

- Individuals up to 20 years of age undergoing orthodontic treatment. No gender or socioeconomic restrictions.
- Selected RCTs were carried out in Australia and the UK.
- Treatment durations in the selected RCTs were sufficient to assess clinical space closure.
- Participants recruited from orthodontic departments of dental schools and hospitals - may differ from private practices.
- The assessed outcome of accelerated tooth movement during space closure is relevant to clinical practice.

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