Title: Key factors in molar uprighting and protraction with TADs

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Three learning objectives:

- Discuss clinical applications and biomechanical considerations during molar protraction with TADs;
- Describe factors affecting vertical eruption of impacted third molars after mesialization of second molars;
- Evaluate whether impacted third molars vertically erupt better after mesialization of second molars

Temporary anchorage devices (TADs) are currently being used to mesialize molars into edentulous areas. Recently, with the development of the orthodontic miniscrew, there have been reports of the orthodontic closure of spaces caused by missing mandibular first molars or second premolars. These treatments are more difficult to conduct on mandibles, where the bone is denser than that in the maxilla. Because the space from a missing first molar or deciduous second molar is large, the third molar is often considered a substitute for these missing teeth. In this lecture, considerations during molar protraction, as well as the vertical eruption patterns of impacted mandibular third molars after the mesialization of second molars using miniscrews will be discussed.
If the molars are being protracted, the occlusal plane will rotate around the center of resistance, and anterior open bite can occur. During molar protraction, the mandibular molars can also tip mesially.

**Solution 1**

During molar protraction, a long buccal hook can be used to prevent tipping of the posterior teeth.

**Solution 2**

An uprighting spring (017 X 025 TMA AW) can also be used.
During molar protraction, occlusally, mesiolingual rotation and buccal crown tipping can occur. A net lingual movement will be observed because buccal crown tipping is expected to be relatively smaller in magnitude.

Solution 1

When protracting terminal teeth, a balancing lingual force can be used to prevent mesiolingual rotation and buccal crown tipping.

Solution 2
This problem can be also minimized by inserting a toe-in bend in the posterior portion of the archwire.

Small but statistically significant external apical root resorption (mean, 0.80 mm) and alveolar bone loss (mean, 0.56 mm) occurred after the protraction, but both were in the clinically acceptable range. Greater amounts of root movement and increased patient age were risk factors for external apical root resorption and alveolar bone loss, respectively. Mandibular molar protraction can be considered as an alternative treatment to conventional prosthetic treatment for the edentulous area, especially in young adults.

Orthodontic uprighting of a horizontally impacted third molar and protraction of mandibular second and third molars into the missing first molar space for a patient with posterior crossbites

Baik et al. AJO-DO 2017;151:572-582.
During molar protraction, there can be flaring of the lower anterior teeth if a continuous wire is used with direct anchorage due to the friction between the molar tube and archwire. To prevent this side effect, indirect anchorage on the mandibular first premolars should be considered.
Conclusions

- Corticotomoy is effective and safe for accelerating tooth movement.
- Low-level laser therapy does not accelerate tooth movement.
- Effects of electrical current and pulsed electromagnetic fields cannot be determined from current literature.
- Dentoalveolar distraction requires more evidence.

*Systematic Review Article*

Interventions for accelerating orthodontic tooth movement

*A systematic review*

Hu Long*; Ujjwal Pyakurel*; Yan Wang*; Lina Liao*; Yang Zhou*; Wenli Lai*

Conclusions

• Impacted mandibular third molars vertically erupt as a result of uprighting with mesialization of the second molars.
• Initial vertical location of the impacted third molar and available space affect vertical eruption.

Summary

• During molar protraction, in order to prevent side-effects such as posterior teeth tipping, mesial rotation, and buccal crown tipping, a long buccal hook, uprighting spring, toe-in bend in the posterior portion of the archwire, or a balancing lingual force can be used.

• Corticotomy is effective to accelerate tooth movement.

• Impacted mandibular third molars vertically erupt as a result of uprighting with mesialization of the second molars.

• Initial vertical location of the impacted third molar and available space affect vertical eruption.
References


**Short Bio**

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Dr. Jae Hyun Park (JPark@atsu.edu) is a Professor and Chair of the Postgraduate Orthodontic Program at the Arizona School of Dentistry & Oral Health. He is a Diplomate of and Examiner for the American Board of Orthodontics. Dr. Park has received several awards for scientific and clinical excellence including the Charley Schultz Award (1st Place Winner in the Scientific Category at the Orthodontic Resident Scholars Program) and the Joseph E. Johnson Award (1st Place Winner at the AAO Table Clinic Competition) from the AAO. He also serves as an editorial board member of several peer-reviewed orthodontic and dental journals. He was recently invited to be a guest editor of "Seminars in Orthodontics." He was the chief editor of a recently published book entitled, "Computed Tomography: New Research," and recently co-authored a book, "Molar Protraction: Orthodontic Substitution of Missing Posterior Teeth." While working as a full-time faculty member since 2008, he has published more than 140 scientific and clinical articles in peer-reviewed orthodontic and dental journals including two cover pages in the AJO-DO. He also lectures nationally and internationally. Dr. Park is currently Editor-in-Chief of the Pacific Coast Society of Orthodontists, Past President of the Arizona State Orthodontic Association and an active member of Northern California Edward H. Angle Society of Orthodontists.