Headless Screw Fixation Lowers Re-Operation Rate Following Tibial Tubercle Osteotomy: A Cohort Study

Authors: Ran Atzmon MD[1], Aimee Steen BA[2], Kinsley Pierre BS[1], Monica S. Vel BS[1], Kenneth Lin MD[1], Seth L. Sherman MD[1]

Affiliations: [1] Stanford University Department of Orthopaedic Surgery,
[2] Western University College of Osteopathic Medicine

Contact: Seth L. Sherman MD, shermans@stanford.edu

Stanford MEDICINE

Disclosures

→ For an up-to-date list of Dr. Sherman's disclosures please see the AAOS website. The remaining authors have nothing to disclose.

Stanford MEDICINE

Purpose

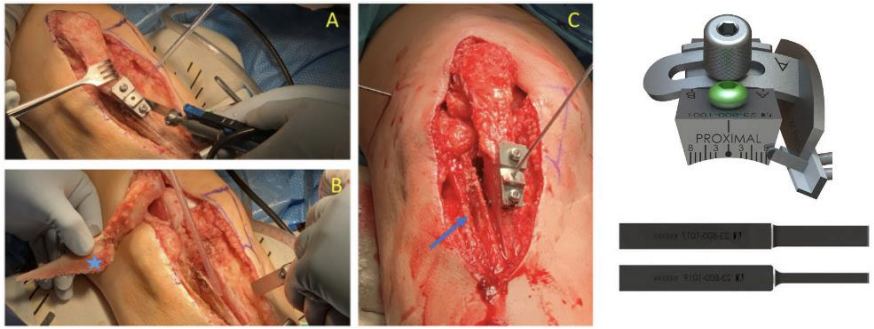
- Hardware removal is a well-documented occurrence after tibial tubercle osteotomy with typical rates between 12.6% and 37.8%[1,2].
- Despite tools such as lag screws and lag technique, that can be utilized to achieve osteotomy compression to facilitate bone healing, **there is no clear solution for symptomatic hardware requiring surgical removal following TTO surgery.**
- This study investigates the preliminary risk of hardware removal after TTO fixation using two 5.0 mm large titanium headless FT (fully threaded) compression screws (Arthrex Inc., Naples, FL, USA).

Stanford MEDICINE

Methods

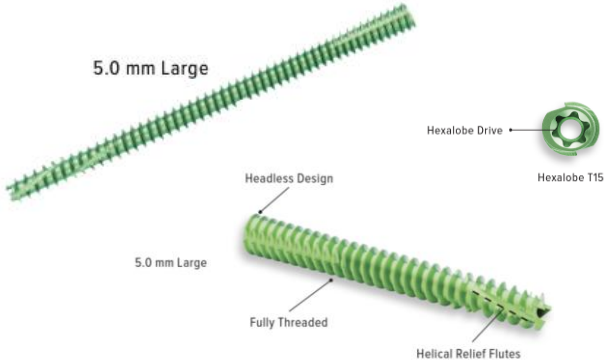
- Retrospective review of prospectively gathered data from **23 knees.**
- Minimum 12 months follow-up.

- MD3T™ system used for TTO procedures involving anteriorization, anteromedialization (AMZ), medialization with distalization and AMZ with distalization. *(Below)*



(A, B, C): Showing the intra-operative tibial tubercle osteotomy surgery using the MD3T system; (A) Cutting the primary bone wedge, (B) primary bone wedge (blue asterisk), (C) Osteotomy site (blue arrow)[3]

- Osteotomies fixed with two 5.0 mm headless, titanium, compression screws (Arthrex™ titanium Compression FT screws 5.0mm Large) *(Below)*



(Arthrex Inc., Naples, FL, USA)

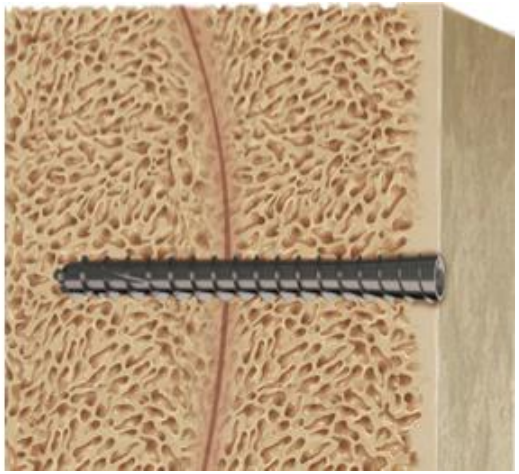
Stanford MEDICINE

Results

- Hardware removal was offered to all symptomatic patients after radiographic evidence of complete osteotomy healing and no less than six months post-operatively.
- **One case** (4%) of symptomatic hardware removal with lysis of adhesions at 7 months post-op.
  - Following hardware removal, the patient proceeded to heal without further complication.
- During the study period, there were no re-operations for fracture, non-union, or revision TTO.

Stanford MEDICINE

Discussion



(Arthrex Inc., Naples, FL, USA)

- Fully-threaded-variable-stepped thread pitch and tapered proximal profile.
- The screw tip's wider thread pitch enters the bone faster than trailing threads, gradually compressing the fragments as the screw is advanced.
- Allows for compression of bone fragments and minimal protrusion of construct into the anterior soft tissue structures.

Stanford MEDICINE

Main Takeaways

- TTO fixation with two 5.0 mm large titanium headless FT (fully threaded) compression screws showed comparatively low (4%) rates of hardware removal.
- No re-operations for fracture, non-union, or revision TTO.
- Fixation with headless compression screws offers:
  - Adequate compression to achieve osteotomy healing.
  - Minimal protrusion of construct into the anterior soft tissue structures.
- Limitations and future directions:
  - Short to midterm follow-up, including long-term follow-up would be ideal in the future.
  - Lack of direct comparison to a control or group with different screw types i.e. traditional “headed” screws.

Stanford MEDICINE

References

1. Payne J, Rimmke N, Schmitt LC, Flanigan DC, Magnussen RA. The Incidence of Complications of Tibial Tubercle Osteotomy: A Systematic Review. *Arthroscopy: The Journal of Arthroscopic & Related Surgery*. 2015;31(9):1819-1825. doi:10.1016/j.arthro.2015.03.028

2. Saltzman BM, Rao A, Erickson BJ, et al. A Systematic Review of 21 Tibial Tubercle Osteotomy Studies and More Than 1000 Knees: Indications, Clinical Outcomes, Complications, and Reoperations. *Am J Orthop*. 2017;46(6):E396-E407.

3. Atzmon R, Steen A, Vel MS, Pierre K, Murray IR, Sherman SL. Tibial tubercle osteotomy to unload the patellofemoral joint. *Journal of Cartilage & Joint Preservation*. Published online January 2023:100112. doi:10.1016/j.jcjp.2023.100112

Stanford MEDICINE