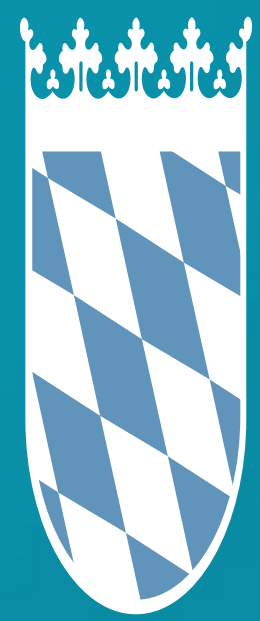




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# High Success and Low Complication Rates Following Revision Tibial Tubercle Osteotomy

Nathan H. Varady, MD, MBA, Tyler Uppstrom, MD, Aakash Shah, BA, Morgan Rizey, BA, Ava Neijna, BA, Andreas H. Gomoll, MD, Sabrina M. Strickland, MD

Department of Sports Medicine, Hospital for Special Surgery, New York, NY



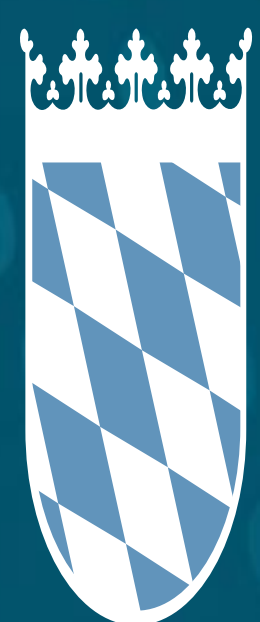


# Faculty Disclosure Information

- Our disclosure(s) are:
- A.H.G. has received speaking fees from Bio-ventus and Organogenesis; research support from Cartiheal, JRF, Moximed, Organogenesis, and Vericel; consulting fees from JRF, Moximed, Smith & Nephew, Flexion Therapeutics, and Vericel; nonconsulting fees from Linvatec and Pacira Pharmaceuticals; honoraria from Fidia Pharma; and royalties from Organogenesis; he also holds stock or stock options in Engage and Stryker.
- S.M.S. has received consulting fees from Smith & Nephew, Miach, Vericel, and Flexion Therapeutics; research support from Miach and Vericel; and honoraria from JRF; she also holds stock or stock options in Engage and Stryker.



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## Introduction

- **Background:** While tibial tubercle osteotomy (TTO) is effective for patellofemoral malalignment, some patients may have recurrent symptoms after surgery.
- **Problem:** Little data on revision TTO (rTTO)—whether rTTO is either safe or efficacious is unknown.
- **Goal:** Evaluate the reasons for and complications following rTTO.

## Methods

- **Design:** Retrospective review of all rTTOs from 2016 to 2023 by single high-volume patellofemoral surgeon
- **Data:** Demographic characteristics, indications for primary and revision surgery, operative characteristics, concomitant procedures, range of motion, radiography, and complications collected
- **Primary Outcomes:** 1.) Indication for rTTO and 2.) complications following rTTO
- **Statistics:** Univariate analyses to compare groups

## Discussion / Conclusions

- Patients undergoing rTTO demonstrated low complication rates and high union rates.
- There is a high prevalence of chondral damage requiring concomitant intervention among patients undergoing rTTO for persistent malalignment.
- While this is a relatively rare procedure, these data suggest rTTO can be a safe and effective option for patients with recurrent symptoms or fracture/non-union after primary TTO.

## Results

- 16 rTTOs (14 patients) (**Table 1**)
  - 10 (63%) for persistent malalignment
    - All had chondral damage requiring concomitant intervention
  - 6 (38%) for fracture/non-union
- Malalignment rTTOs were 90% female vs. 33% female for fracture/non-union (p=0.04)
- Mean time to revision was 12.3 years for persistent malalignment vs. 1.8 years for fracture/non-union (p=0.02)
  - When excluding one chronic fracture: mean time to revision for fracture/non-union patients was 3 months (p<0.001 vs. persistent malalignment)
- For **persistent malalignment rTTOs** (mean f/u 3.9 years):
  - Mean ROM at 12-weeks 0-130°
  - All (10/10) knees achieved union
  - Only complication (10% [1/10]) was arthrofibrosis (0-65° at 6-weeks) requiring arthroscopic lysis of adhesions (0-140° at 12-weeks) (**Table 2**)
  - No cases of new or recurrent patellar instability
- For **fracture/non-union rTTOs** (mean f/u 2.7 years):
  - All (6/6) knees achieved union
  - Delayed union requiring percutaneous bone marrow grafting at 4-months was the only complication

**Table 1. Patient characteristics of revision tibial tubercle osteotomies.**

Characteristic	Malalignment (n=10)	Fracture/Non-union (n=6)	Total (N=16)	P
Male, n (%)	1 (10%)	4 (67%)	5 (31%)	0.036
Age, Years (range)	35 ± 9 (22-55)	25 ± 10 (16-42)	31 ± 10 (16-55)	0.07
Smoking History, n (%)	0 (0%)	0 (0%)	0 (0%)	1
Oral Contraceptive Use, n (%)	5 (50%)	0 (0%)	5 (31%)	0.09
Time to Revision, Months (range)	148 ± 93 (8-251)	22 ± 45 (1-113)	100 ± 99 (1-251)	0.008
Post-Op Time, Months (range)	47 ± 29 (7-86)	26 ± 26 (4-55)	40 ± 29 (4-86)	0.35
	Malalignment (n=10)	Acute Fracture/Non-union (n=5)*	Total (N=15)	P
Male, n (%)	1 (10%)	4 (80%)	5 (33%)	0.017
Age, Years (range)	35 ± 9 (22-55)	22 ± 7 (16-34)	33 ± 10 (16-55)	0.015
Time to Revision, Months (range)	148 ± 93 (8-251)	3 ± 2 (1-5)	100 ± 102 (1-251)	<0.001

Continuous data presented as mean ± standard deviation. \*Subgroup comparison including only fracture/non-union patients occurring in the acute setting after surgery; one outlier patient who fractured 9.4 years after surgery is excluded in this sub-analysis. No changes to the malalignment patient population.

**Table 2. Outcomes following revision tibial tubercle osteotomy (TTO) for malignment.**

Outcome	Revision TTO (n = 10)
3 Month Extension (range)	0 ± 0 (0-0)
3 Month Flexion (range)	130 ± 7 (120-140)
≥1 Complication, n (%)	1 (10)
TTO Reoperation, n (%)	0 (0)
Clinical Nonunion, n (%)	0 (0)
Arthrofibrosis, n (%)	1 (10)
Deep Vein Thrombosis, n (%)	0 (0)
Broken Screw, n (%)	0 (0)
Tibial Fracture, n (%)	0 (0)
Delayed Union, n (%)	0 (0)
Wound Breakdown, n (%)	0 (0)
Sensory Deficit, n (%)	0 (0)
Fascial Hernia, n (%)	0 (0)
Hematoma, n (%)	0 (0)
Quad Dysfunction, n (%)	0 (0)

Continuous data presented as mean ± standard deviation. Categorical data presented as n (%).



# References

- Not applicable



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