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High Success and Low Complication Rates Following Revision Tibial Tubercle Osteotomy

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Faculty Disclosure Information

- Our disclosure(s) are:
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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 malignment
    - 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 **<u>persistent malalignment rTTOs</u>** (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 **<u>fracture/non-union rTTOs</u>** (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