Clinica Ortopedica e Traumatologica
Università degli Studi di Pavia

Fondazione IRCCS Policlinico San Matteo

Chairman: Prof. F. Benazzo

TT osteotomy

F. Benazzo

5th Advanced Course on Knee Surgery

ESSKA EFOST

Key Points

- Indications
- Approaches: where TTO can be positioned?
- Technique overview
- Cases
- Pros and Cons
- Summary

TT osteotomy indications

- Stiff knee
- Patella baja
- Difficult implant removal without the proper access to the joint and to the canal

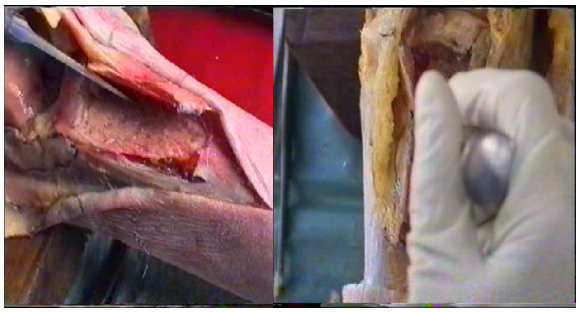
TTO

- V-Y turn down
- Femoral slot

- Straight medial parapatellar arthrotomy
- Medial release
- Arthrolysis and gutters addressed
- Patellar tendon release
- Quad snip

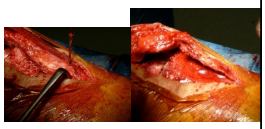
- TTO
- Epicondyle osteotomy

TT osteotomy technique



TT osteotomy technique

- Long vs. short bone segment
- Adequate thickness (≥ 10mm)
- Can be done with medial or lateral approach



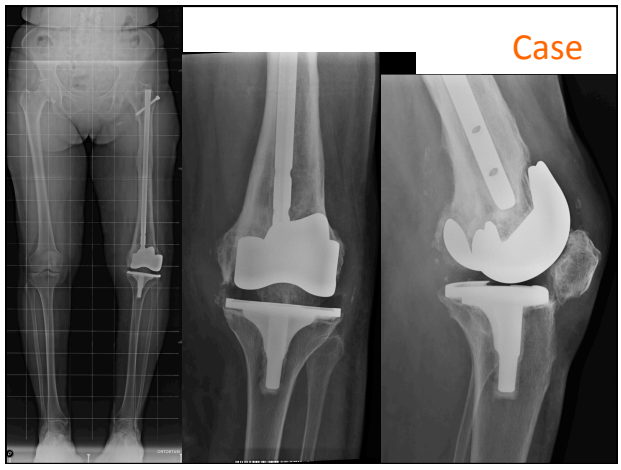
TT osteotomy technique

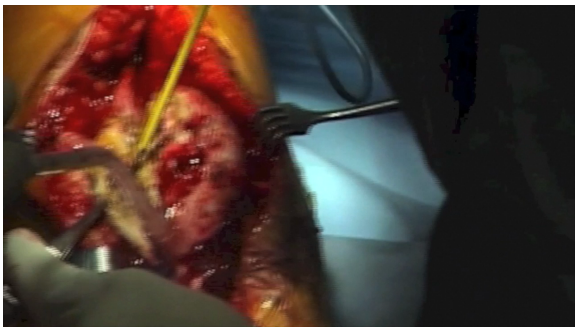
- Respect of soft tissues blood supply
- Drill holes to guide the osteotomy
- Different options to secure the bone back: wiring, screws, both

TT osteotomy technique

- Multiple wires > screws
- Screw diameter: according to the available space (cortical)
- Oblique direction of the holes

Case

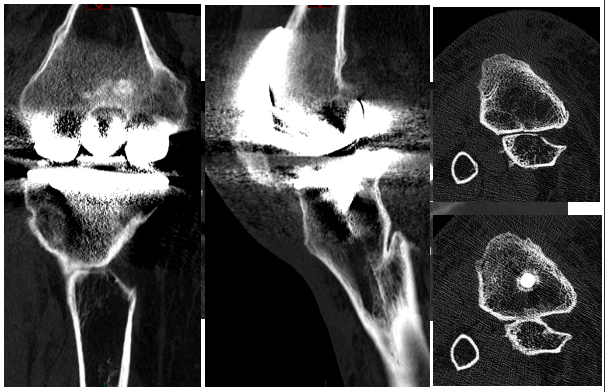




Case

- Male
- 52 ys
- Femur, tibia and fibula fractures (1977)
- TKA (2011)
- Tibial fracture during MUA
- Painful, FFC (30°)
- Warm knee
- CRP, ESR high
- Aspiration negative

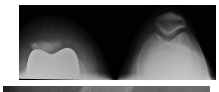
Case



Hoffman procedure

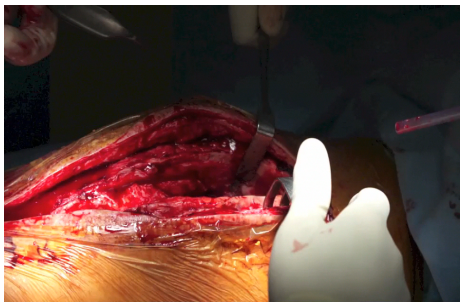
Pre-operative x-rays

- After 40 days

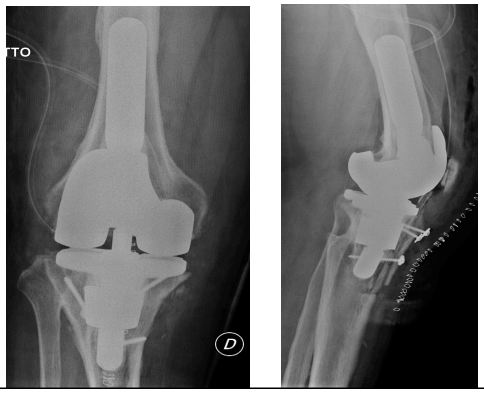


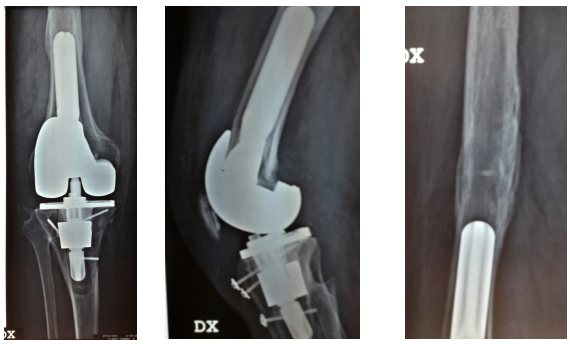
Evaluation under anesthesia

Approach with TTO



Post-operative x-rays





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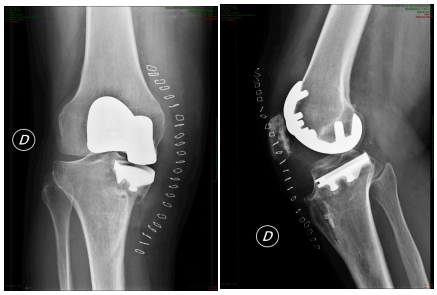
Case

- Female, 50 years
- Right TT advancement (1983)
- Right THA (2003)
- Right PFJ (2011)
- Arthroscopy (2012)
- Medial UKA (2013) with medial plateau fracture
- **TKA revision (2013) with medial TM augment (10 mm), new medial subsidence**

Case

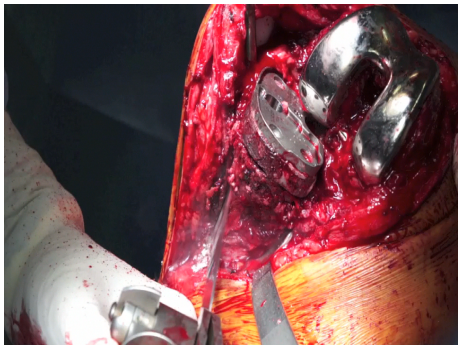
Fracture of medial plateau in UNI+PFJ



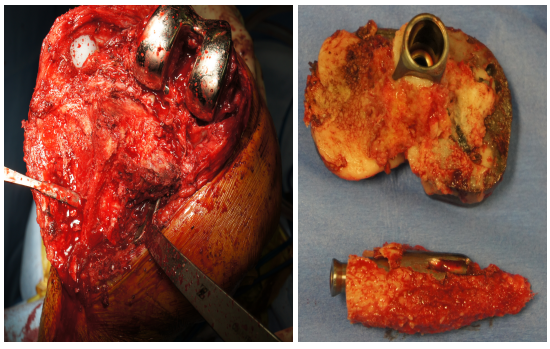
Failed revision

Clinical exam

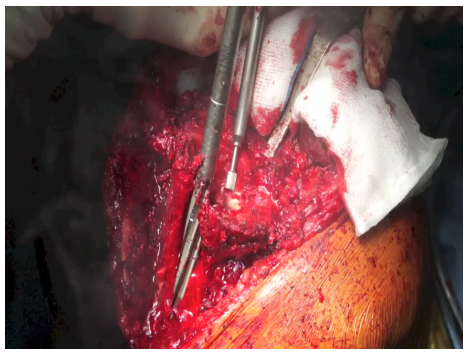
Component removal



Component removal



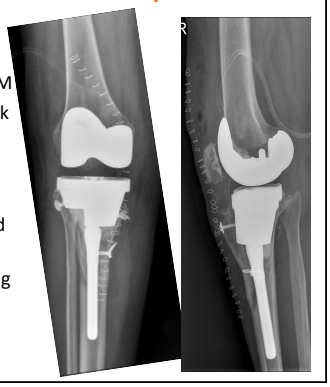
Tibia



Tibia

Post-operative x-rays

- Tibia 3, 2 half blocks - 5 mm
- Step- cut cone (medium) in TM
- Metaphyseal walls pulled back to cone (screws)
- Stem 11x100 mm straight
- Liner PS 14 mm
- TT pulled back with screw and wiring
- Medial soft tissue retensioning



6 months f-u

TTO results

- 42 patients, 8 years F-U
- 73% good excellent results
- 25% no ext lag,
- 66% ext lag resolved within 6 months
- 5% major complication
- Average union time 14 weeks

Young et al
Journal of arthroplasty, 2008

- 67 patients
- Mean F-U 2.5 years
- 87% good excellent results
- 7% major complication rate

Mendes et al
Journal of arthroplasty, 2004

Literature

We have shown that coronal tibial tubercle osteotomy is a safe and reliable procedure which affords excellent exposure

W.J. Bruce et al.,
Exposure in difficult total knee arthroplasty using coronal tibial tubercle osteotomy,
Journal of Orthopaedic Surgery, Vol. 8 No. 1, June 2000

Tibial tubercle osteotomy should only be performed when necessary, as in cases of preoperative or intraoperative difficulties when gaining adequate surgical exposure

S.R. Piedade et al.,
Tibial tubercle osteotomy in primary total knee arthroplasty: A safe procedure or not?
The Knee 15 (2008) 439–446

Pros

Good results in revision for

- infected tka
- very stiff knee with scarring of the periarticular tissue, which would limit exposure
- high risk for extensor mechanism disruption

H.R. Choi et al.,
The Outcome of Sequential Repeated Tibial Tubercle Osteotomy Performed in 2-Stage Revision Arthroplasty for Infected Total Knee Arthroplasty,
The Journal of Arthroplasty Vol. 27 No. 8 2012

TTO can be a useful extensile surgical approach in patients undergoing staged revision in the setting of periprosthetic infection after TKA

H.R. Choi et al.,
Utility of tibial tubercle osteotomy in the setting of periprosthetic infection after total knee arthroplasty,
International Orthopaedics (SICOT) (2012) 36:1609–1613

Pros

- Opportunity to lengthen or redirect the extensor mechanism (patellar subluxation and tilt can be minimized)
- Reduce patella baja and decrease quadriceps tension,

M.D. Ries, J.A. Richman,
Extended Tibial Tubercle Osteotomy in Total Knee Arthroplasty,
The Journal of Arthroplasty Vol. 11 No. 8 1996

- benefit of bone- to-bone healing and it does not jeopardize the supply of blood to the patella or the surrounding soft tissues like quadriceps turndown
- safe and reproducible procedure if strict attention is paid to technique and fixation (with small fragment screws)

C.M. van den Broek et al., The Knee 13 (2006) 430–434

Complications

Possible minor complications:

- Proximal slippage of osteotomy (<2 cm)
- Local tenderness
- Delayed wound healing, skin necrosis
- Transient peroneal nerve palsy
- Nondisplaced tibial stress fracture
- Stable fibrous union of osteotomy

M.W. Mendes et al.
The Results of Tibial Tubercle Osteotomy for Revision Total Knee Arthroplasty, The Journal of Arthroplasty Vol. 19 No. 2 2004

Complications

Most significant complications:

- Fracture and avulsion of the tubercule
- Patella infera
- TKA loosening
- Laxity

M.D. Ries, Extended Tibial Tubercle Osteotomy in Total Knee Arthroplasty, The Journal of Arthroplasty Vol. 11 No. 8 1996

Cons

- Necrosis of the patella

→ lateral retinacular release should be avoided to prevent complications with potential avascular necrosis of the patella

C.F. Young, Tibial Tubercle Osteotomy in Total Knee Arthroplasty Surgery , The Journal of Arthroplasty Vol. 23 No. 3 2008

- Except in patients with severe osteopenia of proximal tibia
- Technically demanding (more than quadriceps turndown)

H. R. Choi et al.,
The Outcome of Sequential Repeated Tibial Tubercle Osteotomy Performed in 2-Stage Revision Arthroplasty for Infected Total Knee Arthroplasty,The Journal of Arthroplasty Vol. 27 No. 8 2012

TTO, summary

- Wide exposure
- Good for implant removal
- Heals reliably
- Allows ext mech lengthening/ modifications on patellar height
- Exposes IM canal
- Technically demanding
- Stress riser may lead to fracture
- Necrosis
- Rehab modification if insufficient fixation