

## Revising the stiff TKA



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## Warm up: Case NV



## Literature

- Bong MR, Di Cesare PE. Stiffness after total knee arthroplasty. *J Am Acad Orthop Surg* 2004;12:164-171
- Scranton PE. Management of knee pain and stiffness after total knee arthroplasty. *J Arthroplasty* 2001; 16:429-435
- Dalsga D, Lombardi AV, Mallory TH, Vaughn BK. Knee manipulation following total knee arthroplasty: analysis of prognostic variables. *J Arthroplasty* 1991; 6:119-128
- Mauertan DR, Mokris JG, Ly A, Kiezbak GM. Relationship between length of stay and manipulation rate after total knee arthroplasty. *J Arthroplasty* 1998; 13:896-900
- Christensen CP, Crawford JJ, Olin MD, Vail TP. Revision of the stiff total knee arthroplasty. *J Arthroplasty* 2002; 17:409-415
- Nicholls DW, Dorr LD. Revision surgery for stiff total knee arthroplasty. *Arthroplasty* 1990; 5 (suppl): 73
- Gandhi R, De Beer J, Leone J, Petruccioli D, Winemaker M, Adli A. Predictive risk factors for stiff knees in total knee arthroplasty. *J Arthroplasty* 2006; 21:46-52
- Kim J, Nelson CL, Lotke PA. Stiffness after total knee arthroplasty: prevalence of the complication and outcomes of revision. *J Bone Joint Surg* 2004; 86A:1479
- Haidukewych GJ, Jacofsky DJ, Pagnano MW, Trousdale RT. Functional results after revision of well-fixed components for stiffness after primary total knee arthroplasty. *J Arthroplasty* 2005; 20:133-138
- Hutchinson JR, Parrish EN, Gross MJ. Results of open arthrolysis for the treatment of stiffness after total knee replacement. *J Bone Joint Surg* 2005; 87-B:1357-1360
- Babis GC, Trousdale RT, Pagnano MW, Morrey BF. Poor outcome of isolated tibial insert exchange and arthrolysis for the management of stiffness following total knee arthroplasty. *J Bone Joint Surg* 2001; 83A: 1534-1536

## Definition

- Arc of motion  $< 70^\circ$  (Christensen et al 2002)
- FFC  $> 20^\circ$  or Arc of motion  $< 45^\circ$  (Nicholls & Dorr 1990)
- FFC  $> 15^\circ$  or Flexion  $< 75^\circ$  (Kim et al 2004)
- Flexion  $< 85^\circ$  (Scranton 2001)
- Flexion  $< 90^\circ$  (Gandhi et al 2006)
- Painful vs. Pain free

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- Flexion  $< 90^\circ$  (Gandhi et al 2006)
- Painful vs. Pain free
- A knee is stiff when the patient is disappointed with the arc of motion

## Flexion requirements for ADL

- Stair climbing:  $80^\circ$
- Sitting:  $90^\circ$
- Shoelace tying:  $105^\circ$
- Lifting object from the ground:  $70^\circ$
- Individual variation, depending on patient height and hip mobility
- The smaller the patient, the more flexion is needed

### Incidence

- 8-12%
  - Daluga D, Lombardi AV, Mallory TH, Vaughn BK: Knee manipulation following total knee arthroplasty; analysis of prognostic variables. J Arthroplasty 1991; 6:119-128
  - Mauerhan DR, Mokris JG, Ly A, Kiezbak GM: Relationship between length of stay and manipulation rate after total knee arthroplasty. J Arthroplasty 1999; 13:896-900
  - Scranton PE: Management of knee pain and stiffness after total knee arthroplasty. J Arthroplasty 2001; 16:428-435
- 3.7%
  - Gandhi R, De Beer J, Leone J, Petrucelli D, Winemaker M, Adili A: Predictive risk factors for stiff knees in total knee arthroplasty J Arthroplasty 2006; 21:46-52
- 1.3%
  - Kim J, Nelson CL, Lotke PA: Stiffness after total knee arthroplasty: prevalence of the complication and outcomes of revision. J Bone Joint Surg 2004; 86A:1479

### Stiff TKA, leading to revision TKA

Category	Early (%)	Late (%)
PE wear	10	40
Loosening	15	35
Instability	15	25
Infection	30	5
Arthrofibrosis	15	10
Malalignment or Malposition	10	15
Extensor mechanism deficiency	10	5
AVN patella	5	5
Periprosthetic fracture	5	5
Isolated patellar resurfacing	5	5
Unexplained stiffness	5	5

Sharkey PF, Hozack WJ, Rothman RH, Shastri S, Jacoby SM Clin Orthop. 2002 Nov; (404):7-13. Insall Award paper. Why are TKA's failing today?

### Risk Factors

- Pre-Operative
  - Limited ROM
  - Obesity
  - Prior surgery

### Risk Factors

- Intra-Operative
  - Gap imbalance
  - Oversizing
  - Inadequate tibial resection
  - Joint line elevation
  - Remaining posterior osteophytes
  - Inverse tibial slope


### Risk Factors

- Post-Operative
  - Poor patient motivation and compliance
  - Deep infection
  - Arthrofibrosis
  - Extensor mechanism complications
  - Heterotopic ossifications

### Arthrofibrosis / RSD

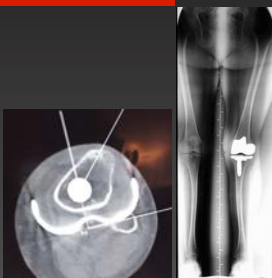
- Osteoporosis
- Peripatellar fibrosis → Patella baja

### Arthrofibrosis




Paulos LE et al: Infrapatellar contracture syndrome. Diagnosis, treatment and long-term follow up. Am J Sports Med 1994; 22(4): 440-449

### Malrotation



### Etiology


- Intrinsic
- Biological
- Mechanical
- Extra-Articular
- Psychological



### Etiology

- Intrinsic
- Biological
- Mechanical
- Extra-Articular
- Psychological

*Before you take your knife to revise this stiff TKA, wouldn't you consider the potential for change of these parameters that could lead to a better result?*



### Risk Factors

- Pre-Operative
  - Limited ROM
  - Obesity
  - Previous surgery

### Risk Factors

- Intra-Operative
  - Gap imbalance
  - Oversizing
  - Inadequate tibial resection
  - Joint line elevation
  - Remaining posterior osteophytes
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## Risk Factors

- Post-Operative
  - Poor patient motivation and compliance
  - Deep infection ✓
  - Arthrofibrosis
  - Extensor mechanism complications ✓
  - Heterotopic ossifications

## Alternatives to revision - conservative

- Time: do not revise before 1 year post-op
- Rehab
  - ✓ Intensify frequency of exercises
  - ✓ Slow down on intensity of exercises
- Pain control
- Medication: NSAID's
- Lumbar sympathetic blockade + CPM
- Closed manipulation (preferably before week 12)

## Alternatives to revision - operative

- Arthroscopic arthrolysis
- Open arthrolysis and PE exchange
  - ✓ Hutchinson JR, Parish EN, Cross MJ: Results of open arthrolysis for the treatment of stiffness after total knee replacement. J Bone Joint Surg 2005; 87-B:1357-1360
    - 13 patients
    - Arc of motion: 55° ⇌ 91°
  - ✓ Babis GC, Trousdale RT, Pagnano MW, Morrey BF: Poor outcome of isolated tibial insert exchange and arthrolysis for the management of stiffness following total knee arthroplasty. J Bone Joint Surg 2001; 83A:1534-1536

## Revision of the stiff TKA

- 13 knees
- ROM < 45° or flexion contracture > 20°
- Mean extension gain: -32° ⇌ -7°
- Mean flexion gain: 18° ⇌ 44°
- Arc of motion gain unpredictable
- 60% of patients poor result

Nichols DW, Dorr LD: Revision surgery for stiff total knee arthroplasty. Arthroplasty 1990, 5 (suppl): 73

## Revision of the stiff TKA

- 11 knees, ROM < 70°
- No effect of type of anesthesia on outcome
- 4/11 Quad's snip
- Mean flexion gain: 40° ⇌ 83°
- Mean extension gain: -12° ⇌ -3°
- 3/11 patients with remaining stiffness
- = 27% poor results

Christensen CP, Crawford JJ, Olin MD, Vail TP: Revision of the stiff total knee arthroplasty. J Arthroplasty 2002; 17:409-415

## Revision of the stiff TKA

- 56 knees, FFC > 15° and/or Flexion < 75°
- Mean flexion gain: 65° ⇌ 85°
- Mean extension gain: -11° ⇌ -3°
- 93% of patients increased arc of motion
- "benefits are modest"

Kim J, Nelson CL, Lotke PA: Stiffness after total knee arthroplasty: prevalence of the complication and outcomes of revision. J Bone Joint Surg 2004; 86A:1479

## Revision of the stiff TKA

- 16 knees, ROM < 70°
- No effect of type of anesthesia on outcome
- 6/11 Quad's snip
- 1/11 Medial femoral condylar osteotomy
- Mean arc of motion gain: 40° ⇔ 73°
- 4/16 patients with remaining stiffness
- = 25% poor results

Haidukewych GJ, Jacofsky DJ, Pagnano MW, Trousdale RT: Functional results after revision of well-fixed components for stiffness after primary total knee arthroplasty. *J Arthroplasty* 2005; 20:133-138

## Painfree stiff TKA

- FFC > 20°
  - Consider revision
  - Careful counseling of the patient
- Limited Flexion and Full Extension
  - Leave it alone

## Do not go in again



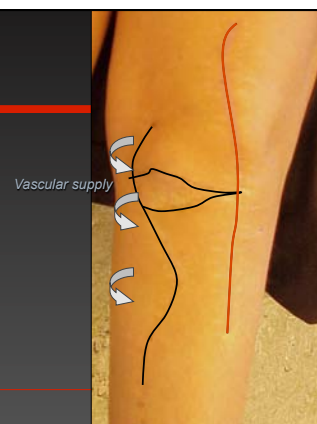
## Painful stiff TKA

- Exclude infection
  - ✓ ESR, CRP
  - ✓ Aspiration
- Exclude intrinsic, biological or psychological causes
- Determine mechanical causes

## Specific hurdles in the revision of the stiff TKA

- Exposure
- Removal of components
- Patella baja
- Post-operative pain control
- Rehabilitation

## Skin



### Subcutaneous fat

- Avoid making unnecessary flaps
- Respect superficial fascia (adherent skin)



### Subcutaneous fat

- Avoid making unnecessary flaps
- Respect superficial fascia (adherent skin)



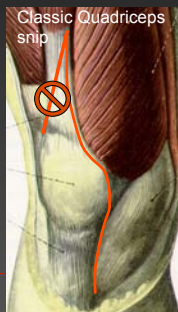
### Extensor mechanism

- Synovectomy
- Fibrotic fat pad

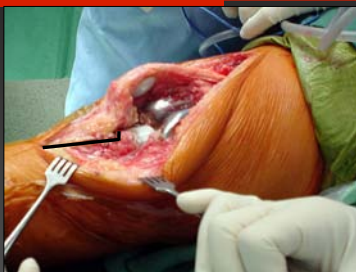


### Extensor mechanism

- Classic Quadriceps snip
- Inverted Quadriceps snip

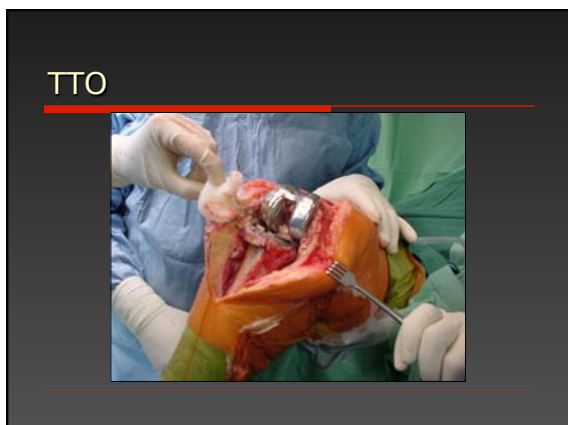
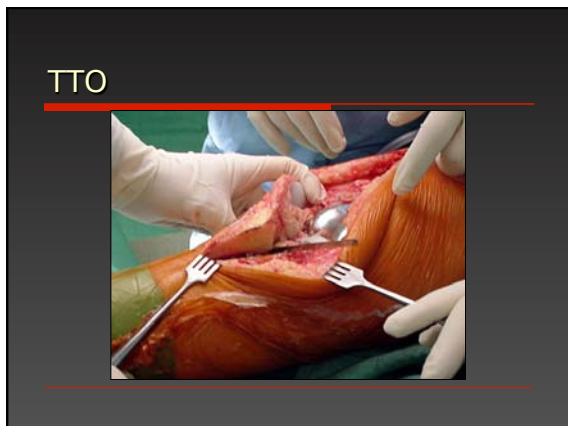


### TTO



### TTO





Case VM

- Female, age 70
- TKA 3y post-op
- Very painful L knee
- Hyperextension
- Limited flexion (70°)
- Very limited walking capacity except for inhouse transfers

Case VM

- Valgus malalignment
- Tight quadriceps mechanism
- Very painful joint

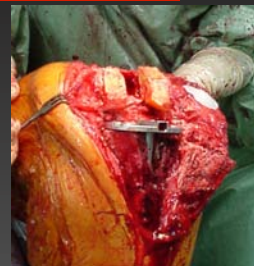
Case VM

- Valgus malalignment
- Tight quadriceps mechanism
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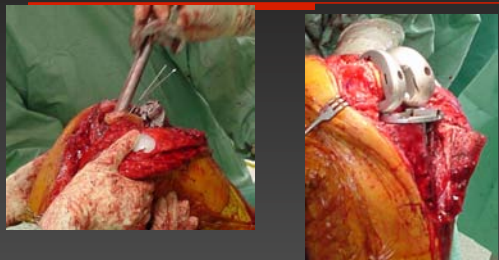
Removal of components



Build-up distal femur



Build up distal femur



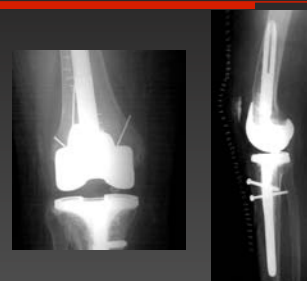
Case VM



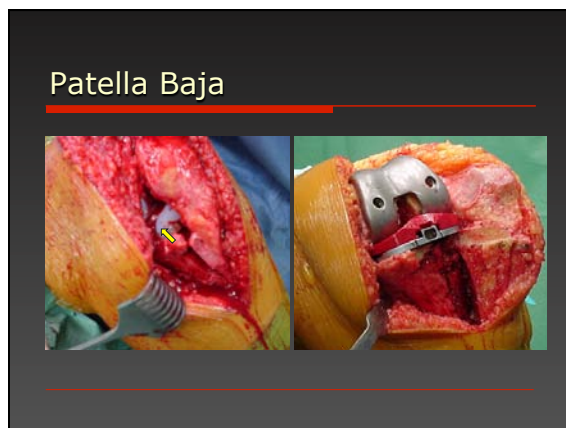
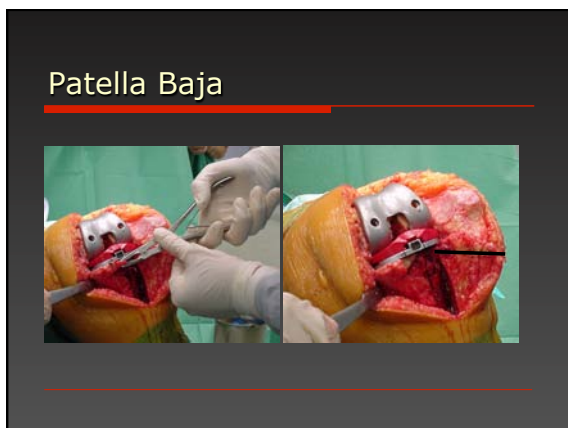
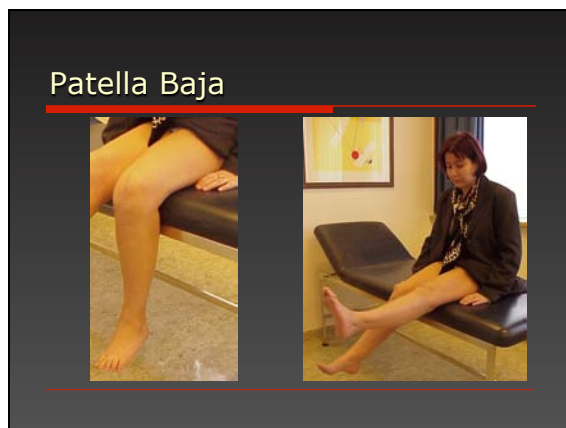
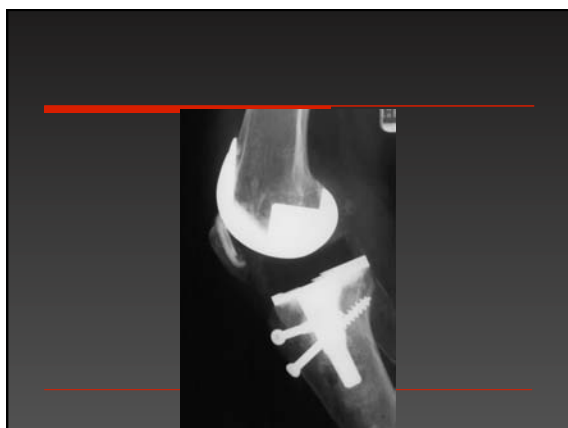
Case VM



Case VM







## PROXIMALISATION OF TT

CASE	AGE	F.U.	HISTORY
D.D.	60	7Y	HTO
L.M.	46	6Y	TIBIA&FEMUR#/ OSTEOTOMY
V.K.	32	4Y	TIBIA#/OSTEOTOMY/SEPSIS
D.A.	72	4Y	MAQUET OSTEOTOMY
C.R.	48	3Y	TIBIA&FEMUR#
V.F.	69	1Y	TIBIA&FEMUR#/OSTEOTOMY/TKA
S.M.	45	6M	TIBIA#/OSTEOTOMY/TKA/RSD
P.H.	72	6M	TKA/TIBIA#

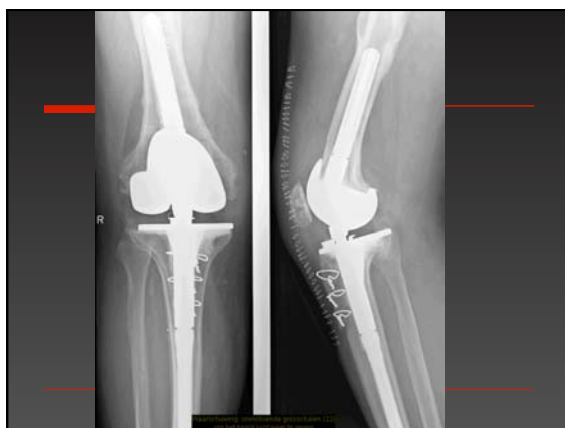
## PROXIMALISATION OF TT

- Mean proximal shift: 12.2 mm (8-15)
- Fixation with 2 screws or cerclage
- 0/8 patients with extension lag

## Conclusion

- Stiffness is a difficult complication of TKA
- Mixed reported outcomes of revision TKA
- Strict patient selection
- Realistic expectations
- Technical hurdles to take

## Warm up: Case NV



# THANK YOU

