PF Instability: *Complications of MPFL Reconstruction*

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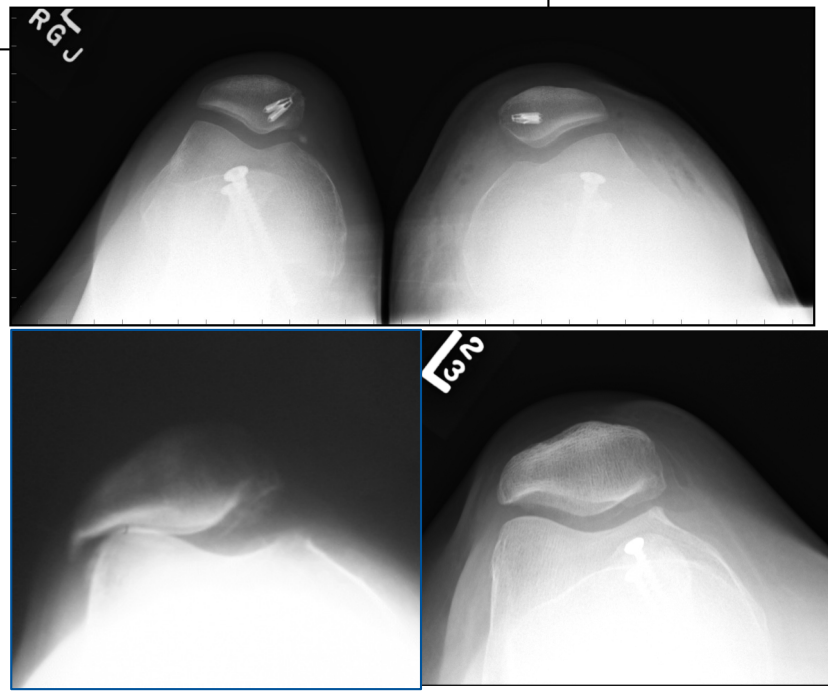


PF Joint Instability

- **Considerations for treatment:**

1. **Figure out the problem**
   - Limb Alignment
     - Increased TT-TG
     - Valgus knee
     - Femoral/ tibial Rotational deformity
     - Patella Alta
   - Trochlear Dysplasia
   - **Traumatic Dislocation / MPFL injury**

Outcomes of MPFL Reconstruction

Isolated Medial Patellofemoral Ligament Reconstruction for Patellar Instability Regardless of Tibial Tubercle–Trochlear Groove Distance and Patellar Height

Outcomes at 1 and 2 Years

Brandon J. Erickson,*† MD, Joseph Nguyen,‡ BS, Katelyn Gasik,‡ ATC, Simone Gruber,‡ MS, Jacqueline Brady,§ MD, and Beth E. Shubin Stein,‡ MD
Investigation performed at Hospital for Special Surgery, New York, New York, USA

- 90 pts (age 19.4 +/- 5.6 years)
- 96% at 1 yr, 100% at 2 years no further instability
- Mean RTS 8 mos

- Mean TT-TG distance 14.7 +/- 5.4 (range -2.2- 26.8 mm)
- Mean P Height 1.2+/- 0.11 (range 0.89- 1.45)
- Mean Trochlear Depth : 1.8+/- 1.4 (range 0.05-6.85)

The Ability of Medial Patellofemoral Ligament Reconstruction to Correct Patellar Kinematics and Contact Mechanics in the Presence of a Lateralized Tibial Tubercle

Joanna M. Stephen,* PhD, Alexander L. Dodds,* FRCS (Orth), Punyawan Lumpaopong,*† PhD, Deiary Kader,‡ MD, Andy Williams,§ FRCS (Orth), and Andrew A. Amis,*||¶ FREng, DSc
Investigation performed at Imperial College London, London, UK

- Cadaveric study of PFJ kinematics in 8 knees
- Isolated MFPL reconstruction restored tilt and translation with TT-TG up to 15 mm
- Both tilt and translation significantly altered if TT-TG greater than 15mm

Stephen et al, 2015

Effect of Trochlear Dysplasia on Outcomes After Isolated Soft Tissue Stabilization for Patellar Instability

Laurie A. Hiemstra,*†‡ MD, PhD, FRCSC, Sarah Kerslake,†§ MSc, Michael Loewen,† MD, FRCSC, and Mark Lafave,‖ CAT(C), PhD
Investigation performed at Banff Sport Medicine, Banff, Canada

- 203 cases of isolated MPFL reconstruction
  (21 no dysplasia, 89 Dejour A, 93 Dejour B-D)

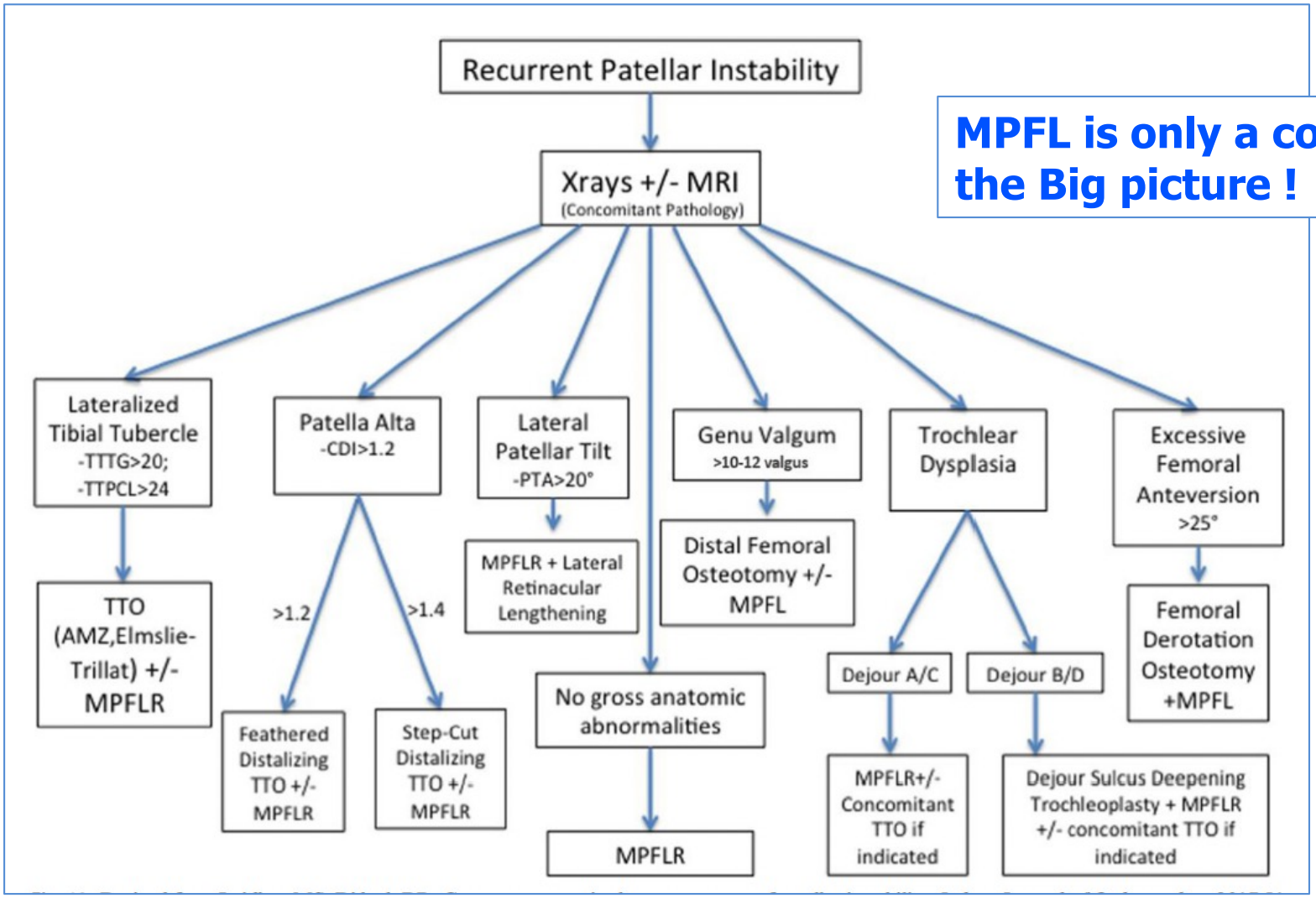
- Worse dysplasia and >5mm supratrochlear bump correlated with worse outcomes (Banff Patella Score and VAS)

Clinical Outcomes After Isolated Medial Patellofemoral Ligament Reconstruction for Patellar Instability Among Patients With Trochlear Dysplasia

Joseph N. Liu,*† MD, Jacqueline M. Brady,‡ MD, Irene L. Kalbian,§ BA, Sabrina M. Strickland,‖ MD, Claire Berdelle Ryan,¶ MD, Joseph T. Nguyen,# MPH, and Beth E. Shubin Stein,‖ MD
Investigation performed at Hospital for Special Surgery, New York, New York, USA

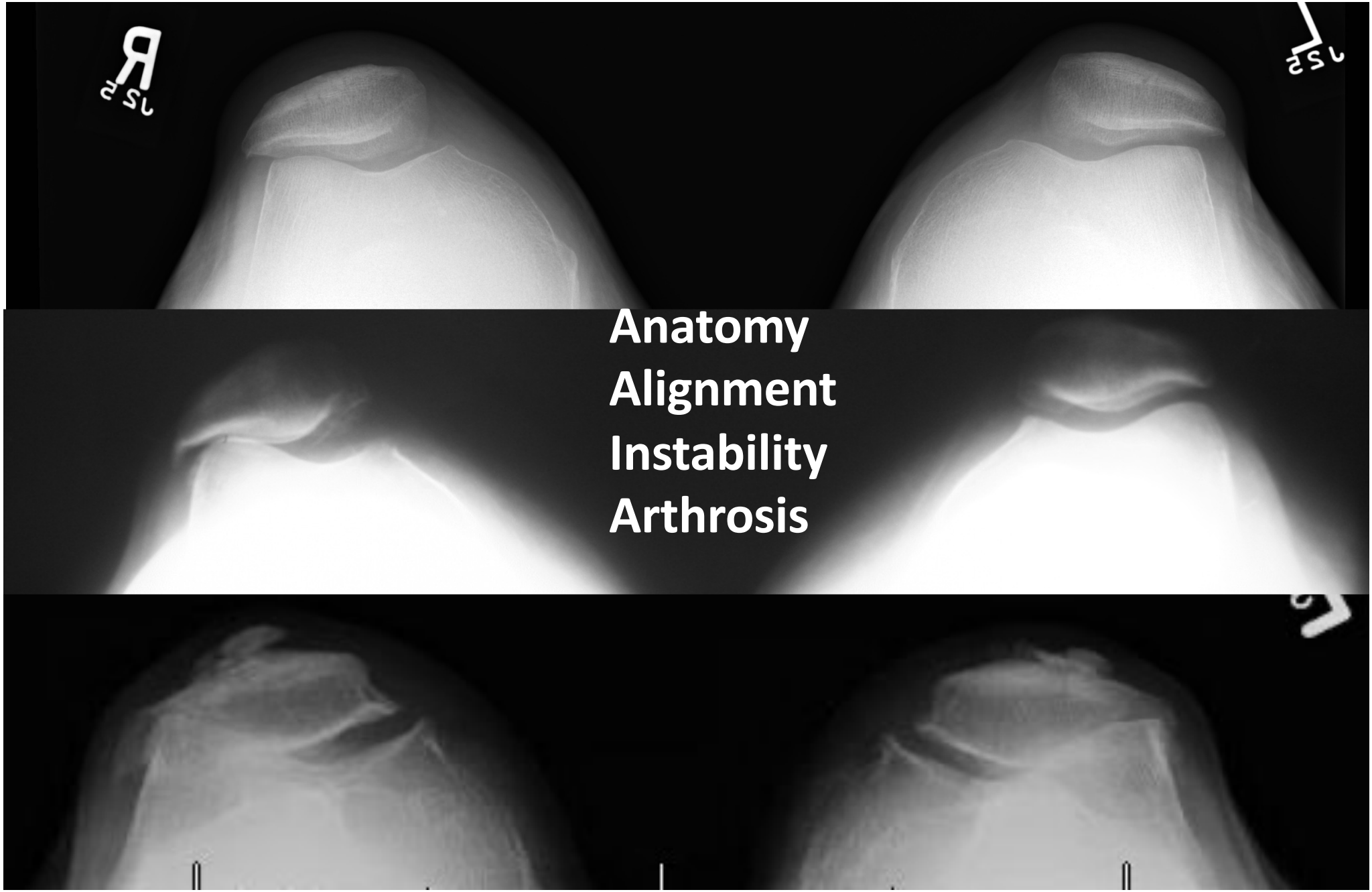
- 121 repeat dislocators (4.4 events) almost all dysplastic (92% Dejour B,C,D)
- Recommended TTO if >20mm TT-TG or CD>1.4
- 3 dislocations (2.5%) in 24 mo (mean 44) follow up
- All dislocators severely dysplastic (B-D) and CD>1.32

PF Instability : Treatment



Diduch et al, Advances in PF Surgery, 2018

Spectrum of PF disease



Instability : Spectrum of Severity

- 45 yo M
- Chronic dislocation
- Dysplasia

Complications of MPFL reconstruction

Shah et al , AJSM , 2021

- 25 articles identified / heterogeneous data/ level 4 studies
- 164 complications/ 629 knees (26.1%)
- ***Residual instability***
- Patellar fractures (tunnels)
- ***26 reoperations***
  - Recurrent instability
  - Arthrofibrosis
  - Hardware removal

Complications of MPFL reconstruction

A Systematic Review of Complications and Failures Associated With Medial Patellofemoral Ligament Reconstruction for Recurrent Patellar Dislocation

Jay N. Shah,* MD, MS, Jennifer S. Howard,† PhD, ATC, David C. Flanigan,‡ MD, Robert H. Brophy,§ MD, James L. Carey,‖ MD, MPH, and Christian Lattermann,*¶ MD
Investigation performed at the Department of Orthopaedic Surgery and Sports Medicine, University of Kentucky, Lexington, Kentucky

AJSM 2012

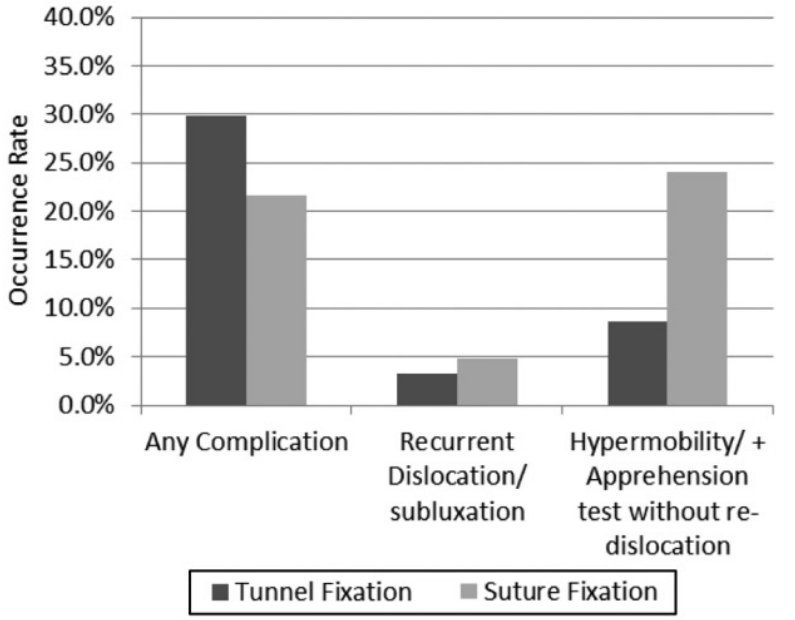


Figure 2. Occurrence of complications by fixation technique.

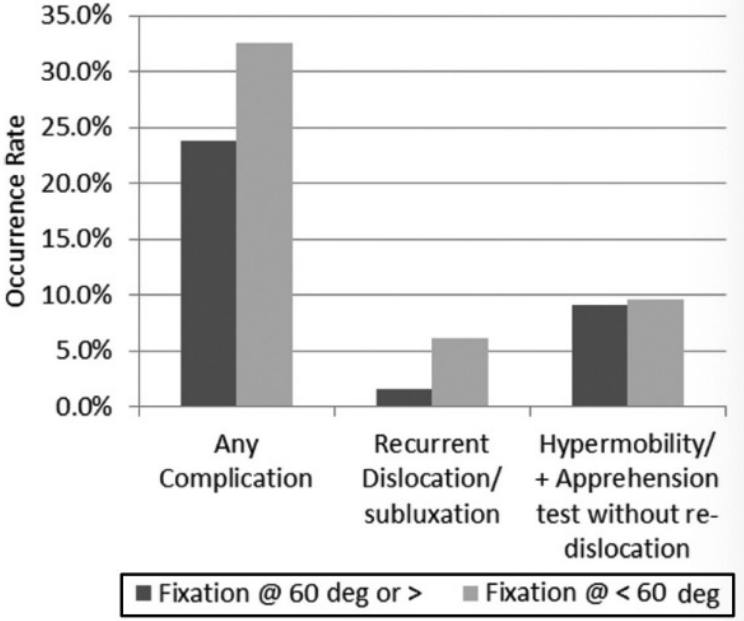
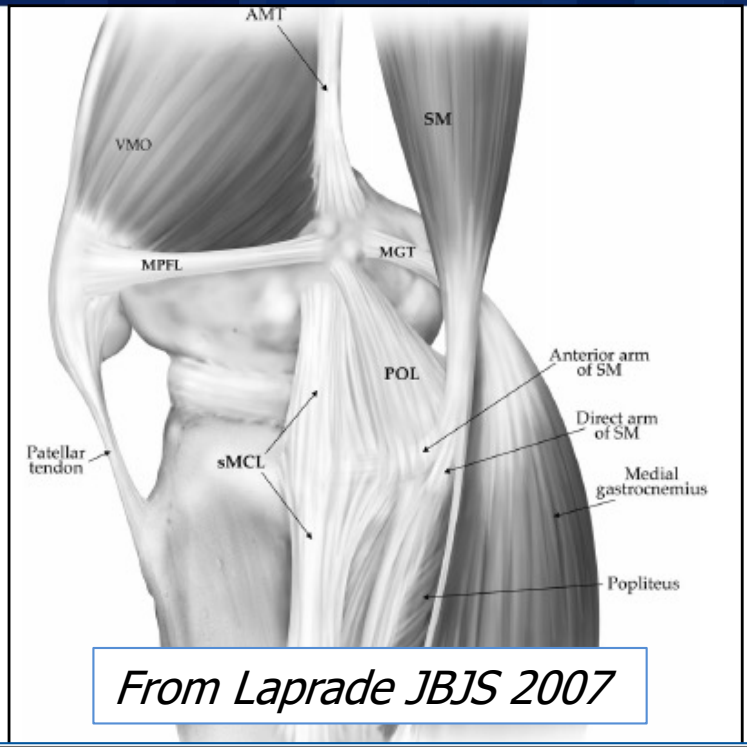


Figure 3. Occurrence of complications by fixation angle.

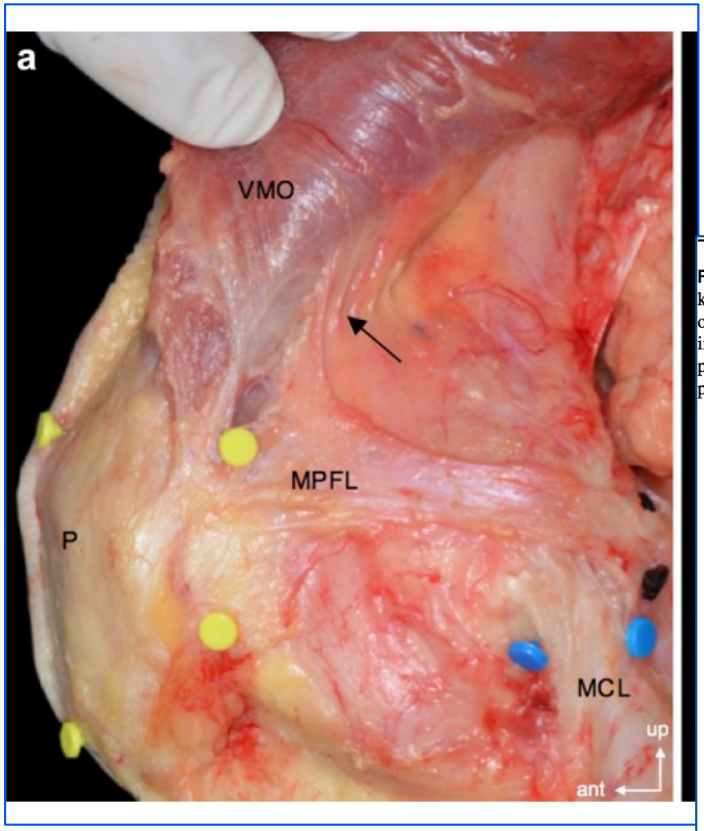
Femoral Tunnel placement / Tensioning

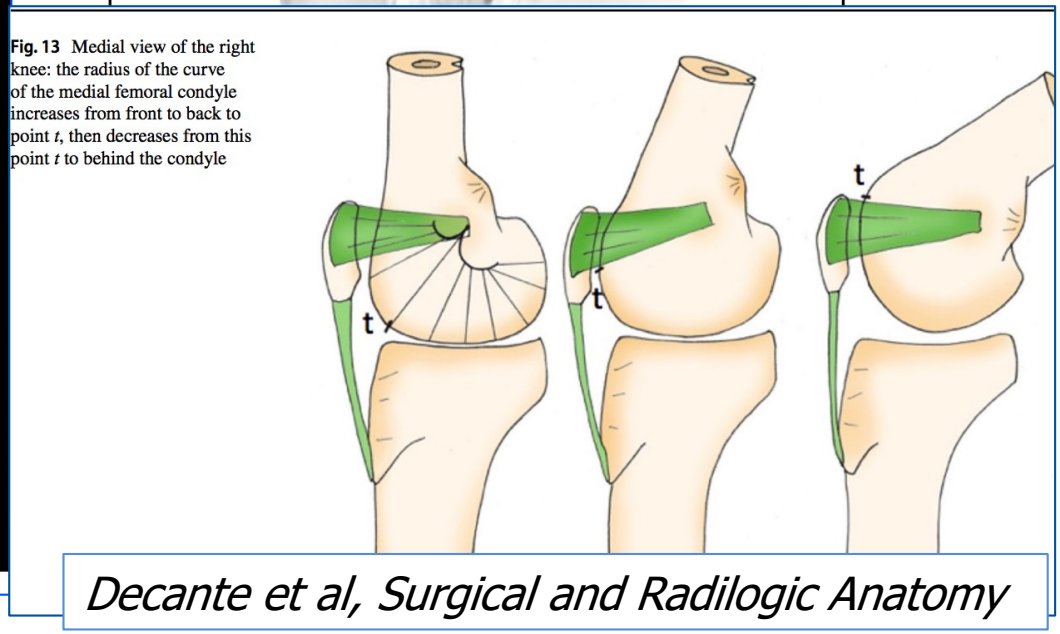
Anatomy + function

- VMO anatomy / MCL
- Imbrication/ advancement
- Knee flexion angle



From Laprade JBJS 2007





Decante et al, Surgical and Radilogic Anatomy

Revision MPFL Reconstruction

Knee Surgery, Sports Traumatology, Arthroscopy
https://doi.org/10.1007/s00167-021-06603-x

KNEE

Femoral tunnel malposition is the most common indication for revision medial patellofemoral ligament reconstruction with promising early outcomes following revision reconstruction: a systematic review

Madison Walker[1] · Larissa Maini[1] · Jeffrey Kay[2] · Ali Siddiqui[3] · Mahmoud Almasri[2,4] · Darren de SA[2]

Received: 21 January 2021 / Accepted: 30 April 2021

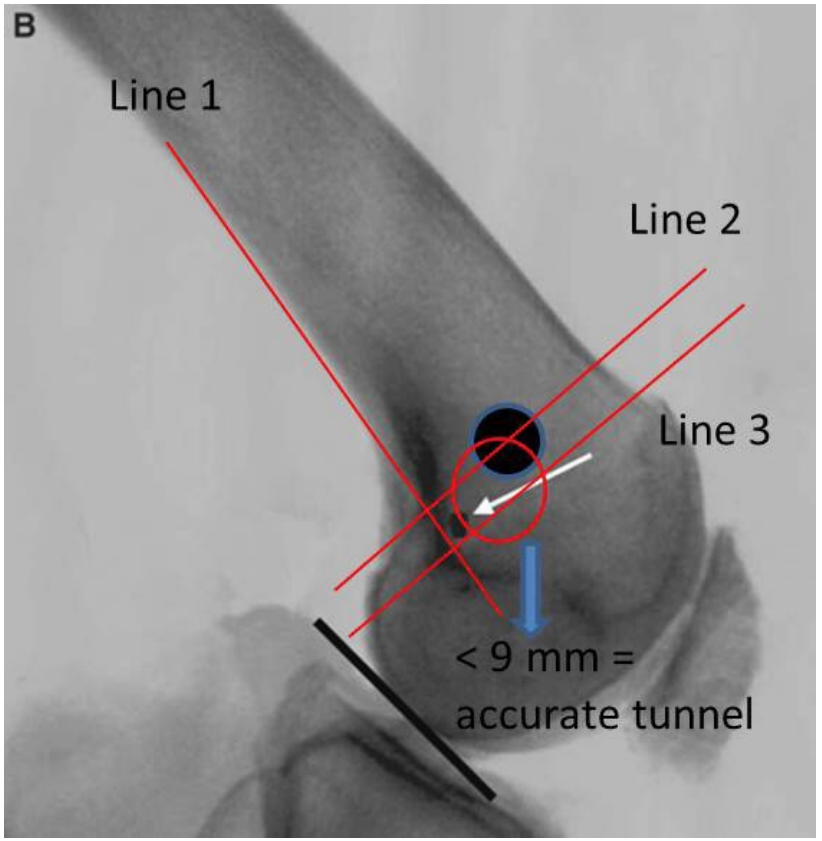
Reasons for Revision Surgery:

- Not addressing associated pathology
  - Alignment , dysplasia
- Tunnel malposition

PF Instability : Complications of MPFL Reconstruction

- MPFL reconstruction technique
  - Non anatomic placement (femur)
  - Patellar fracture (drill holes)

PF Instability : Complications of MPFL Reconstruction



Schottle et al AJSM 2007

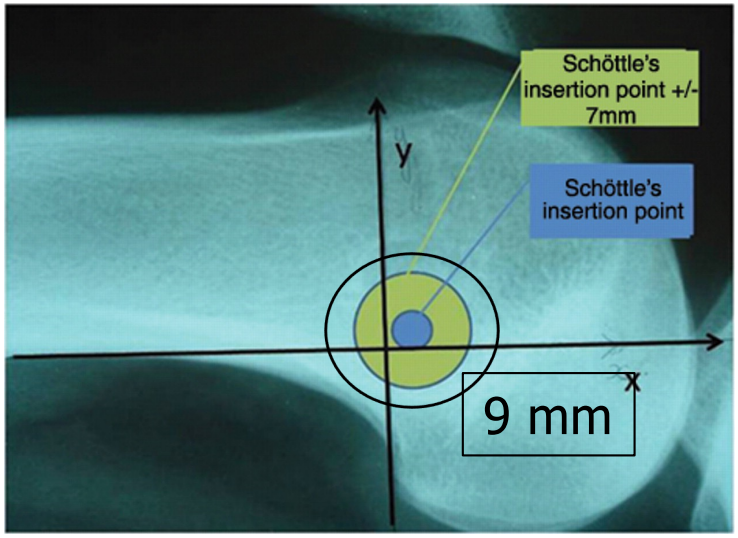
Complications of MPFL Reconstruction

FEMORAL TUNNEL PLACEMENT IN MEDIAL PATELLOFEMORAL LIGAMENT RECONSTRUCTION

Mark McCarthy, MD[1], TJ Ridley, BS[2], Matthew Bollier, MD[1],
Brian Wolf, MD[1], John Albright, MD[1], Annunziato Amendola, MD[1]

~~IOJ 2014~~

- Reviewed 50 patients, 40 F
- 9 mm acceptable location



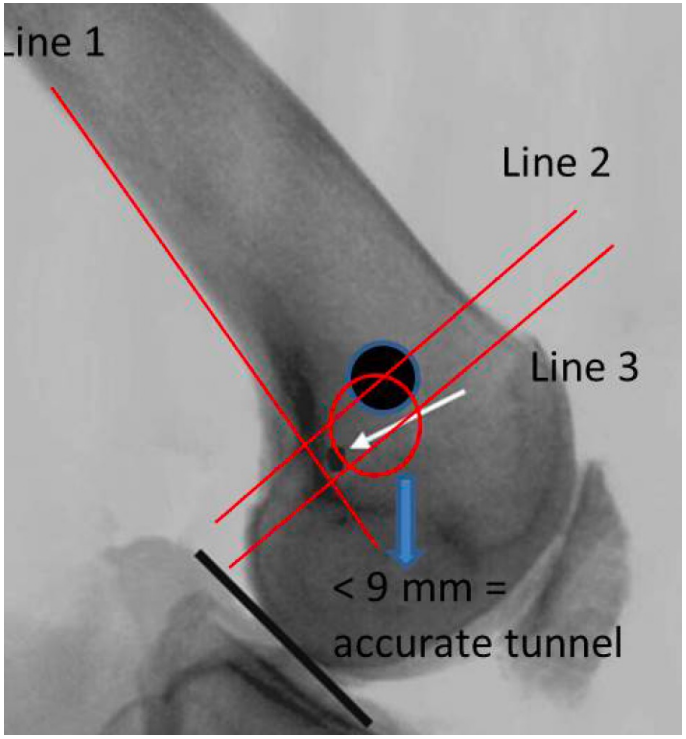
McCarthy et al, IOJ 2014

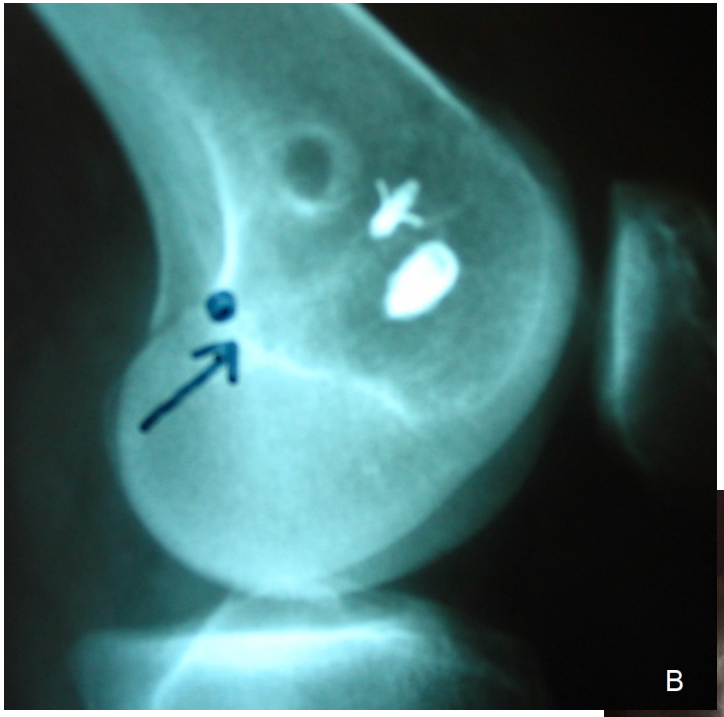
Table 1: Data on demographics, KOOS scores, radiographic tunnel placement and correlation

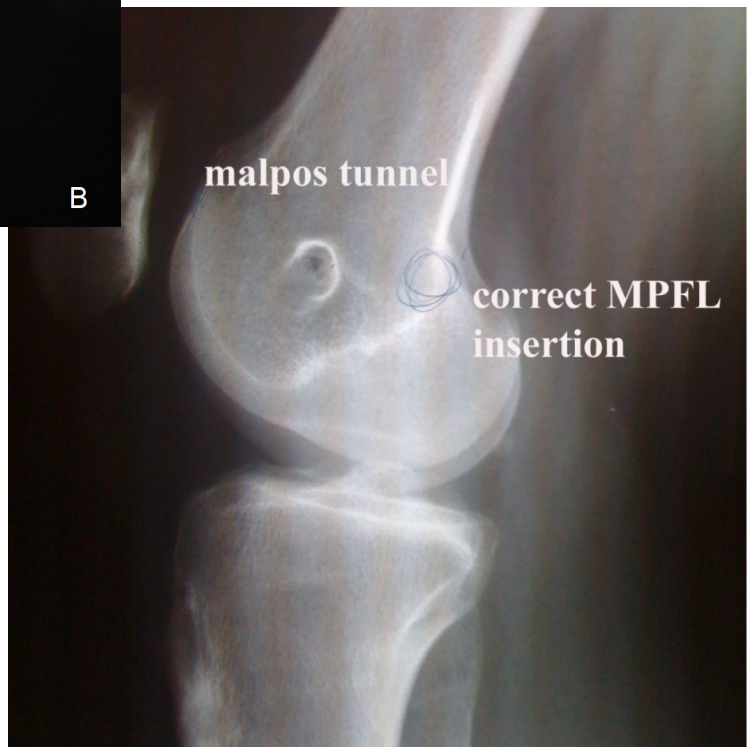
Age: Average: 31.3, Range: 14-54	Sex: 10 males, 40 females
Tunnels within 9 mm isometric point (accurate placement): 16	Tunnel greater than 9 mm from isometric point (inaccurate placement): 34
Accurate tunnel placement: 36% Inaccurate tunnel placement: 64%	Average distance tunnel placement from isometric point: 13.25 mm (range: 4-28.4)
Average pre-operative KOOS scores: 42.0	Average post-operative KOOS scores: 47.65
Pearson correlation coefficient: 0.23-Indicative of no correlation between femoral tunnel placement and post-operative KOOS scores.	

- 50 patients with MPFL reconstruction
- 64% abnormal (>9mm from ideal) tunnel position
- Did not correlate with patient reported outcomes

McCarthy et al , IOJ 2010

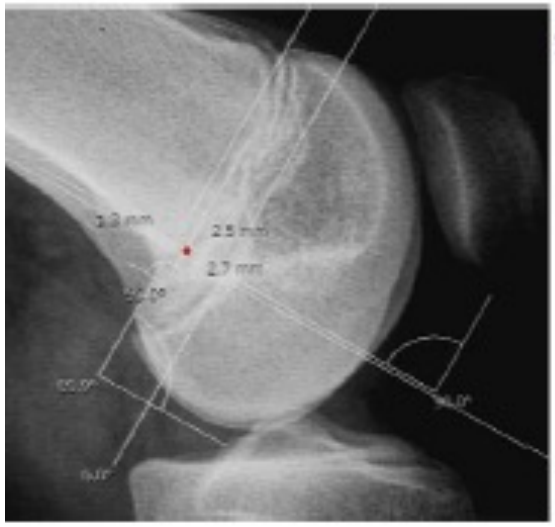


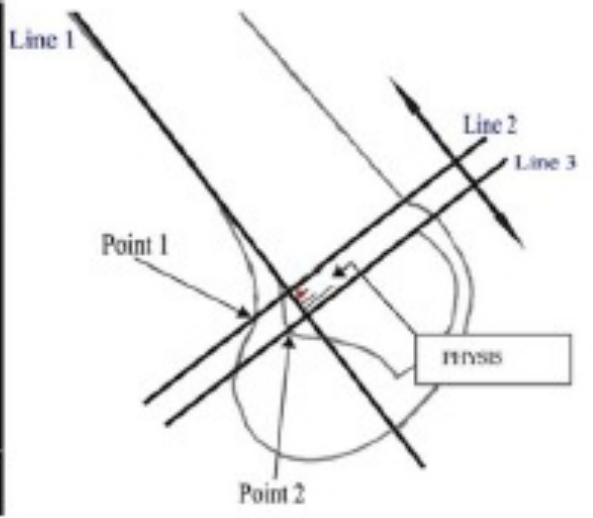




Anatomy

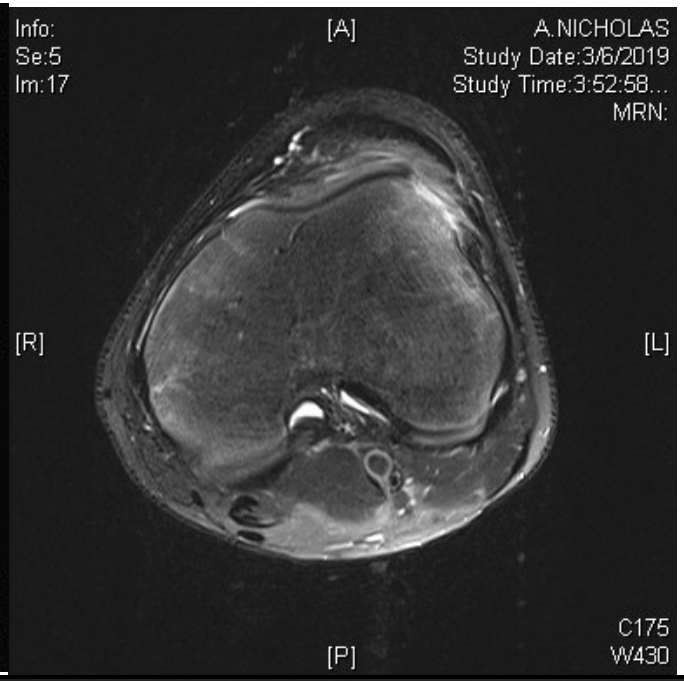
- Open physes and PF instability
  - MPFL origin close to the femoral physis
    - Nelitz et al (2011) : distal
    - Shea, Burks et al (2009) :Proximal

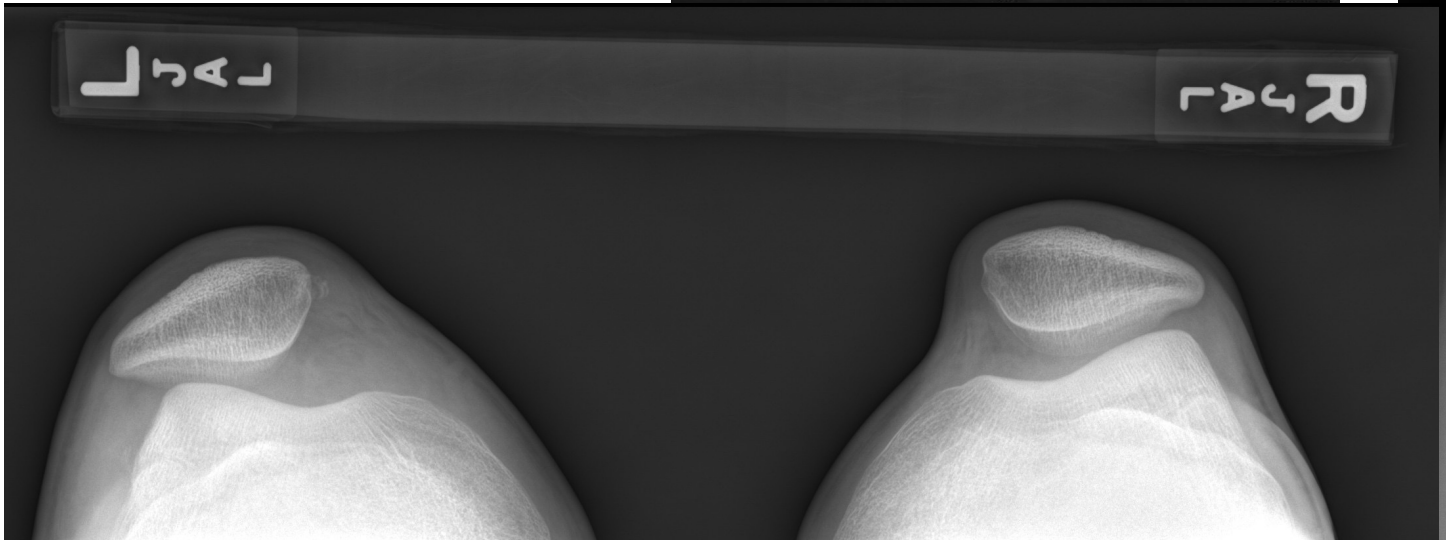




Technical considerations

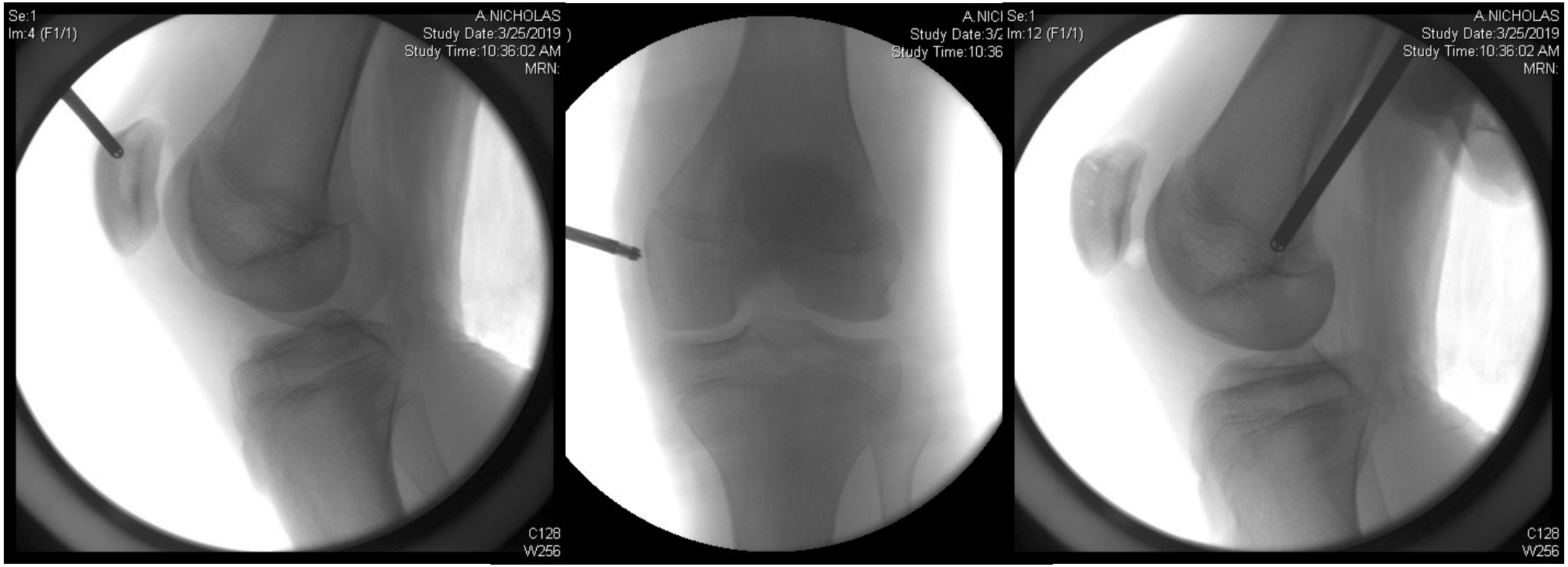
MPFL fixation : growth plates





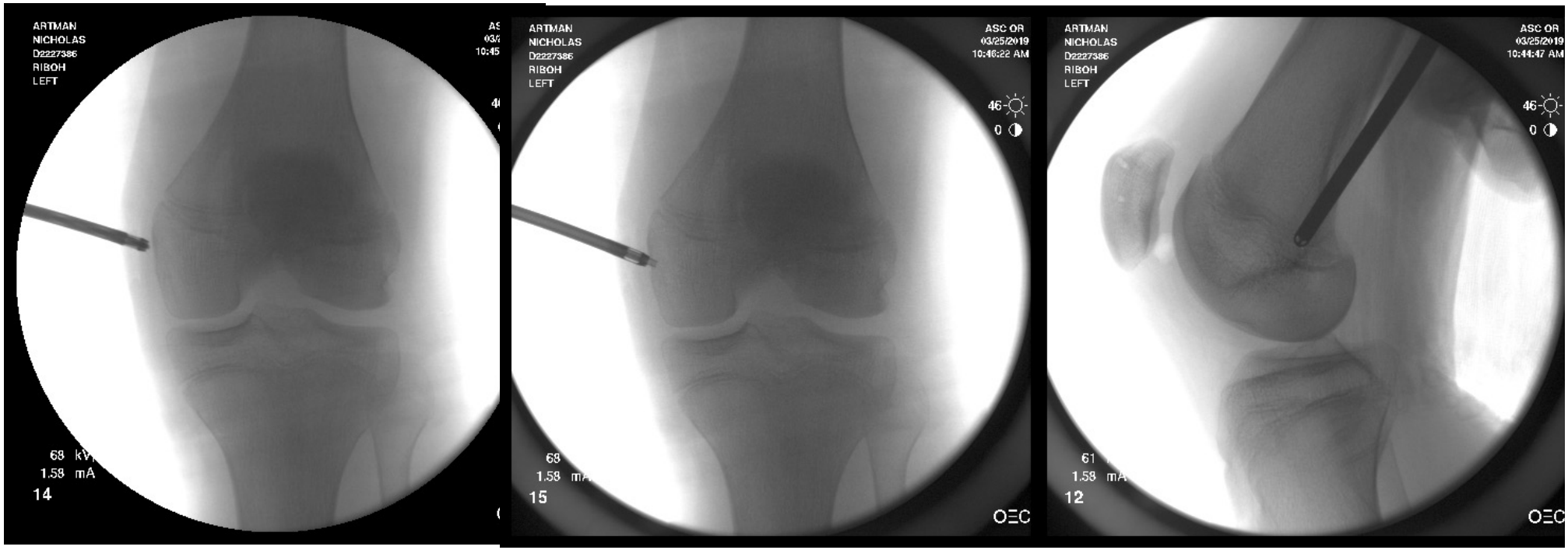
Technical considerations

MPFL fixation : growth plates



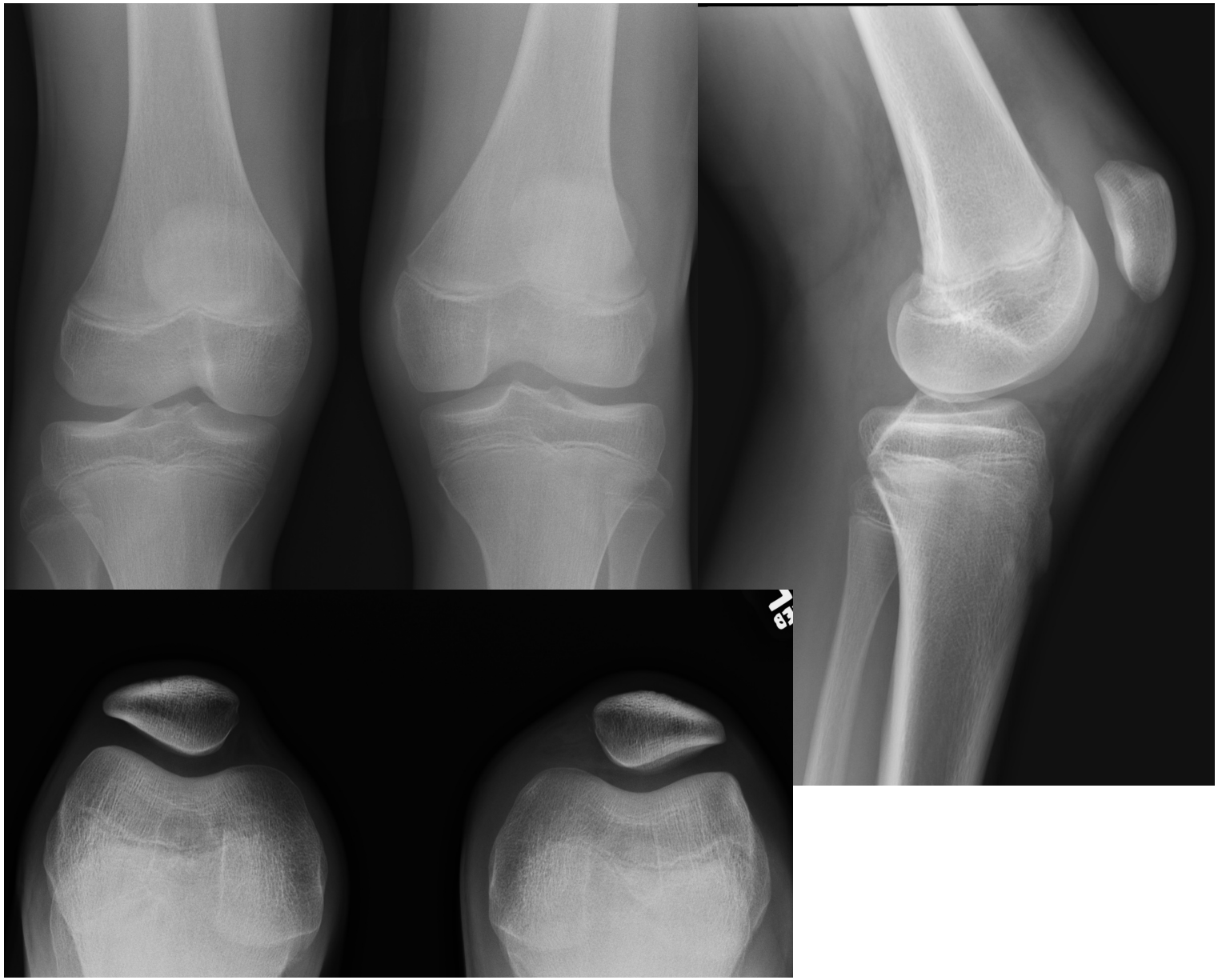
- **(Anatomic) Anchor fixation on both the patella and femur**

Poor tunnel placement : open physis/ patella alta



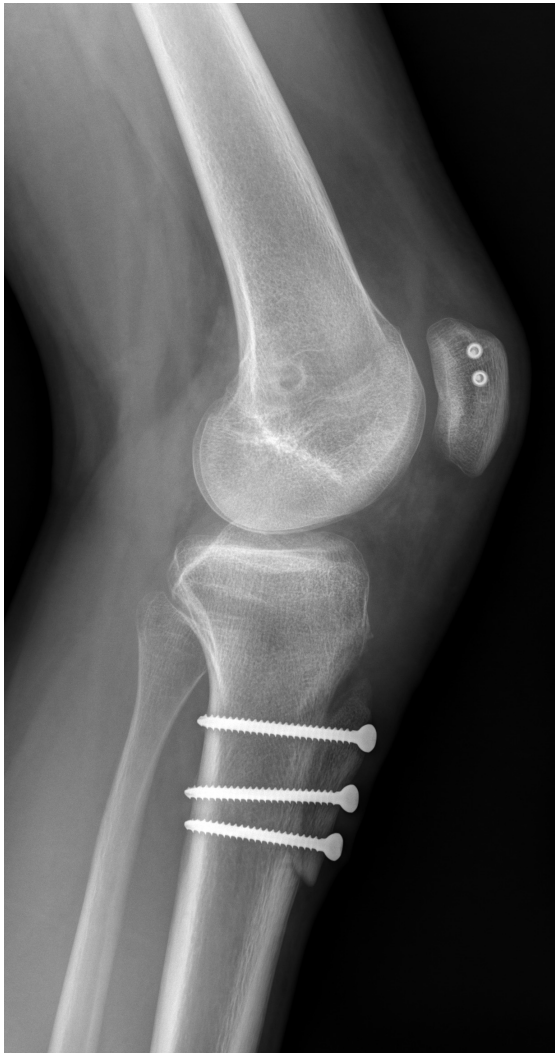
Poor tunnel placement : open physis patella alta

Poor tunnel placement : open physis

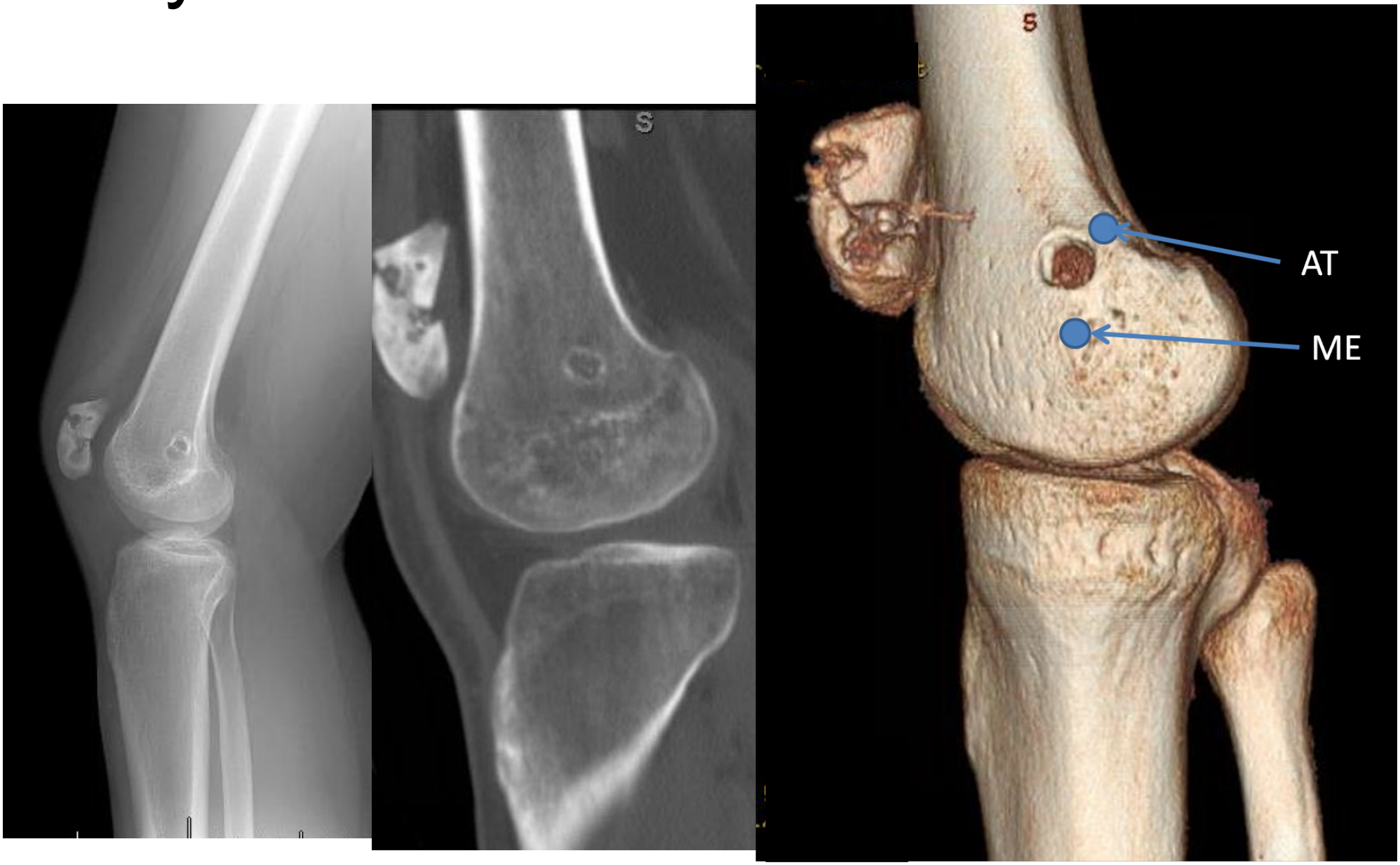


13 yo

Poor tunnel placement : open physis/ patella alta



23 yo F 2x MPFL reconstruction



Technical considerations

MPFL fixation

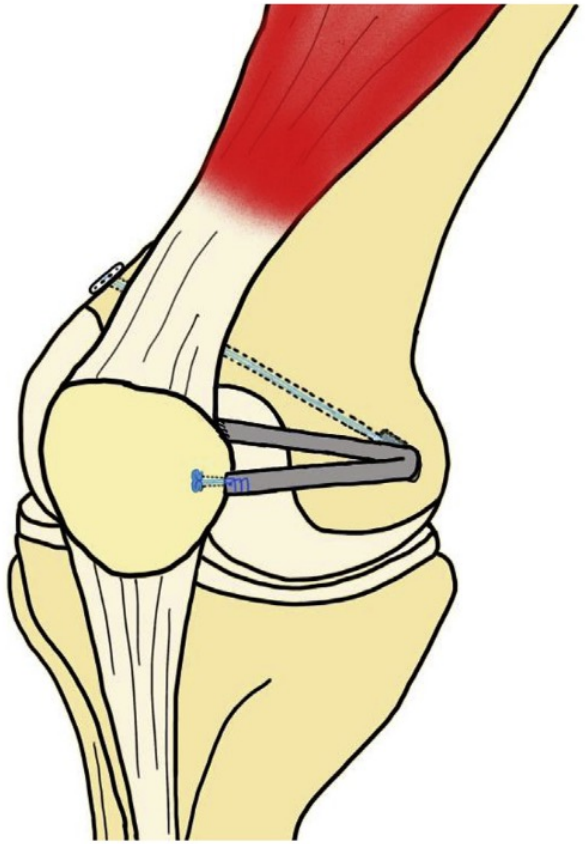
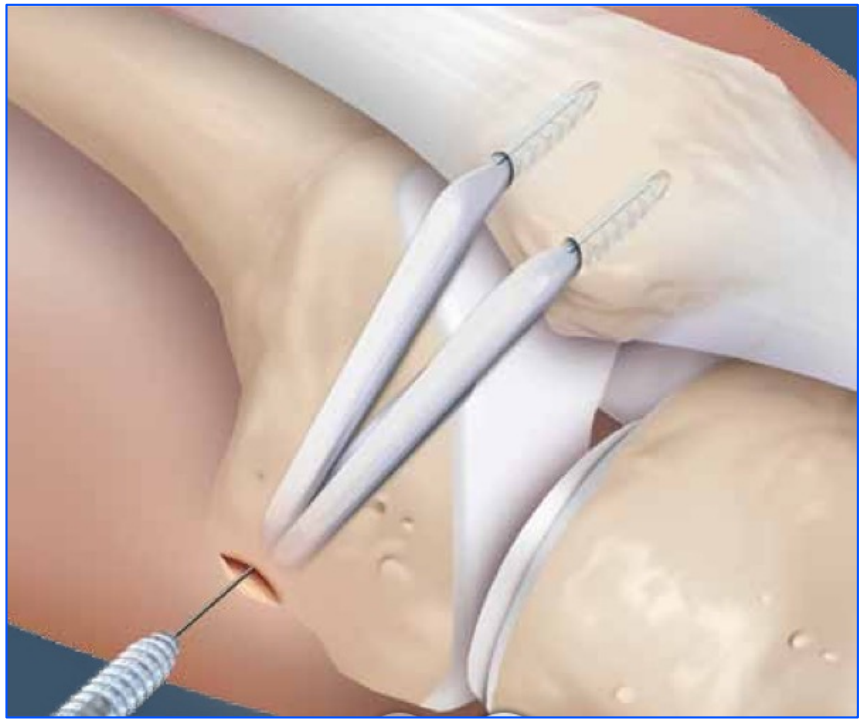
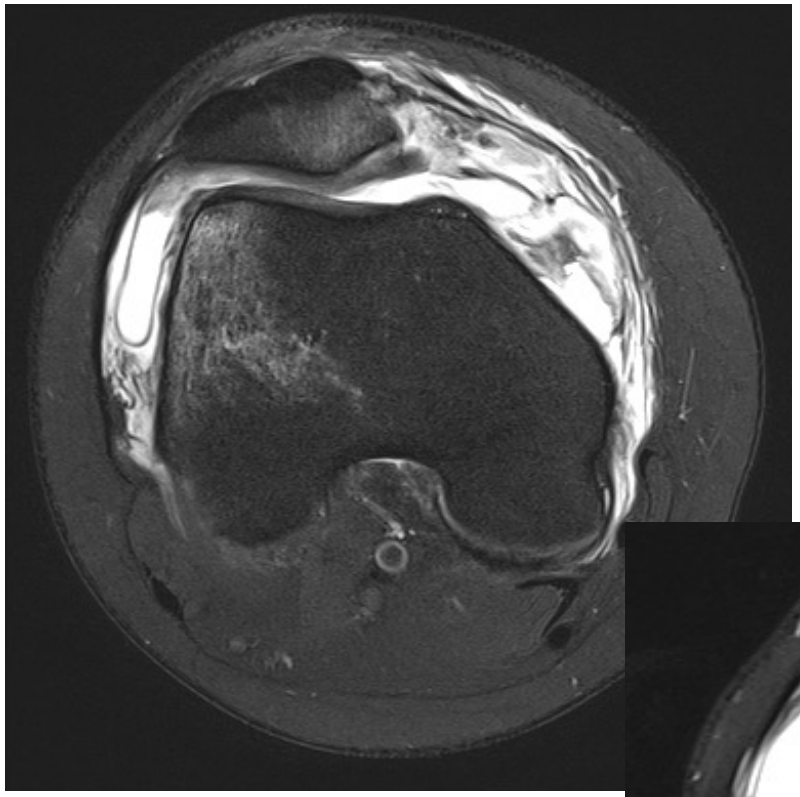


Fig. 4. Schematic drawing of isolated Medial Patellofemoral Ligament Reconstruction by using Soft Suture Anchor and adjustable cortical fixation system.

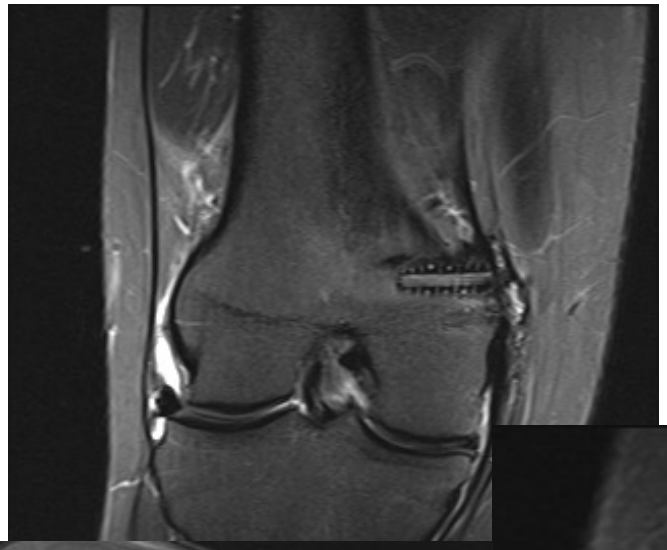


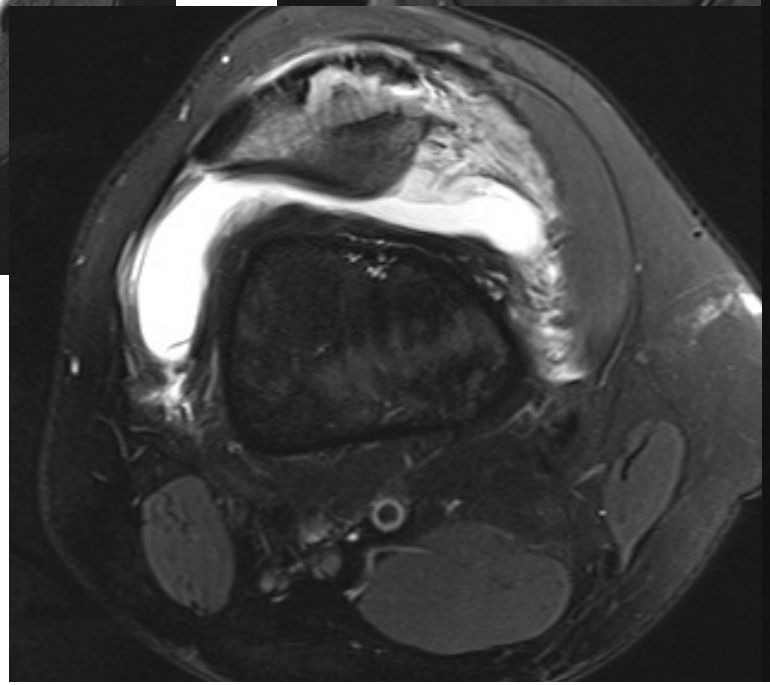
From Arthrex website

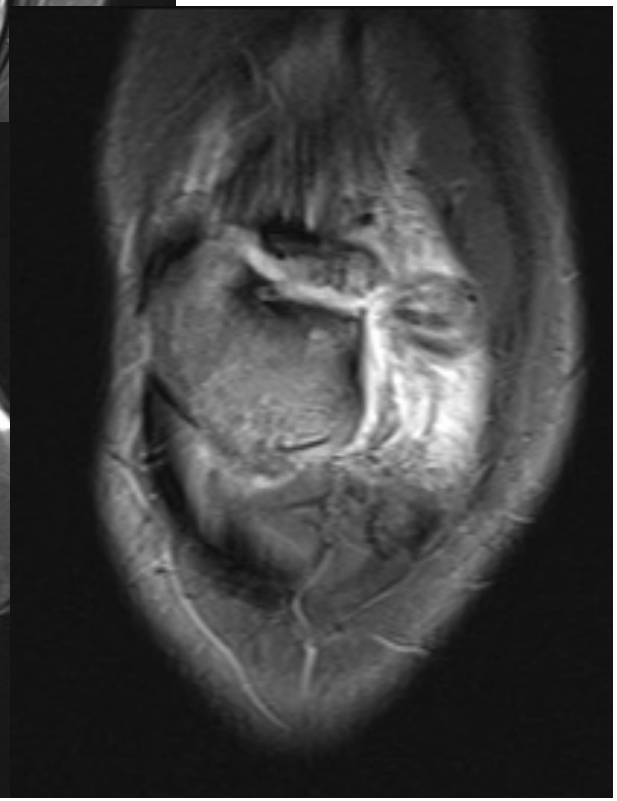
MPFL Complications : Patellar fracture



Pre-op

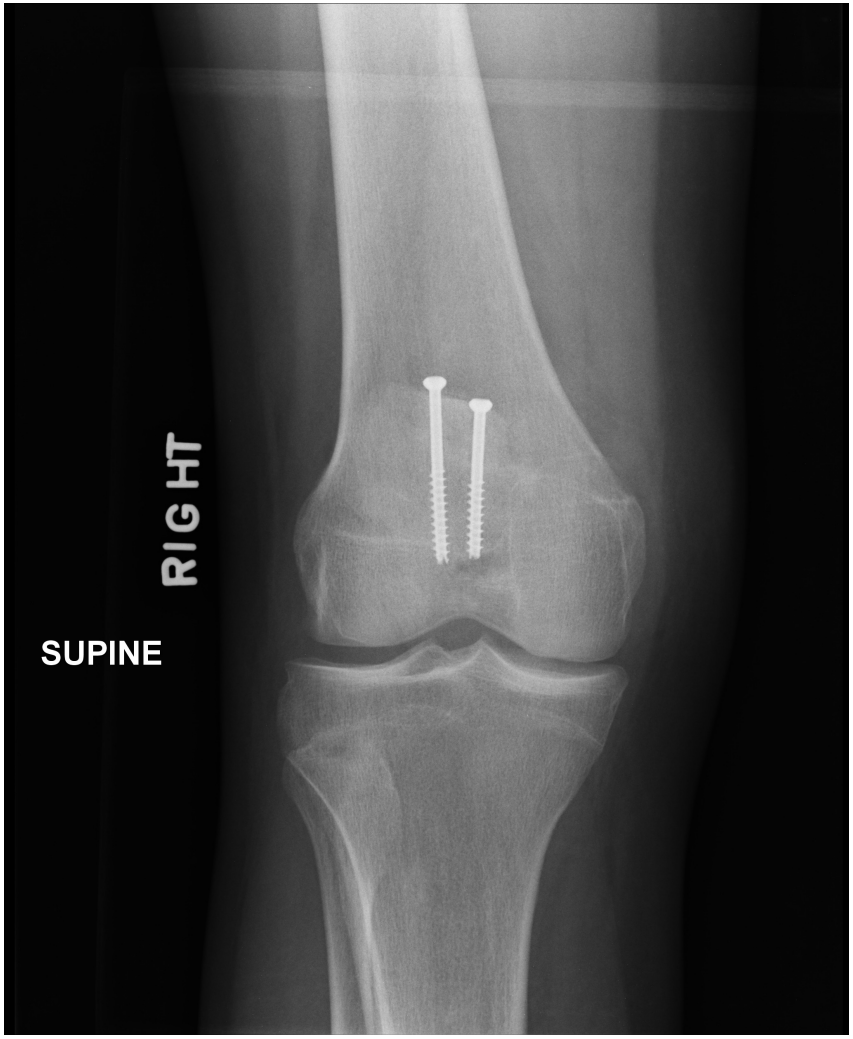


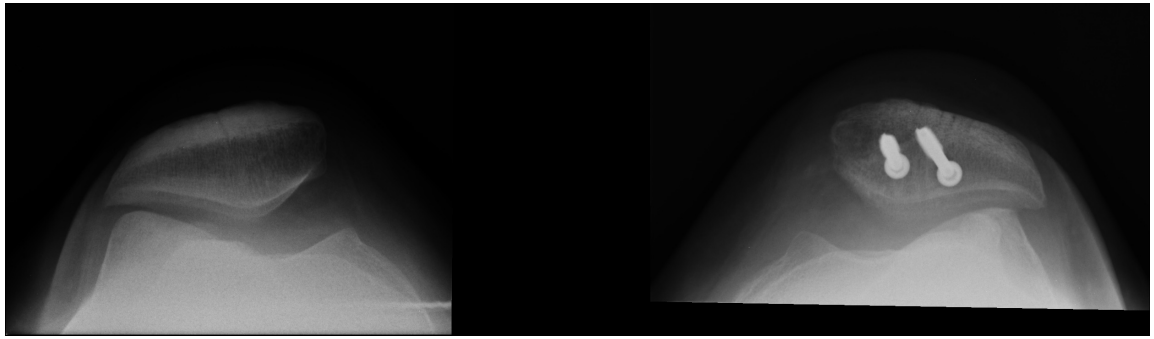




Post op

MPFL Complications : Patellar fracture





Outcomes of MPFL Reconstruction

Arthroscopy: The Journal of Arthroscopic & Related Surgery
Available online 15 April 2019
In Press, Corrected Proof

Systematic Review

Systematic Review of Medial Patellofemoral Ligament Reconstruction Techniques: Comparison of Patellar Bone Socket and Cortical Surface Fixation Techniques

Vishal S. Desai B.S., Adam J. Tagliero M.D., Chad W. Parkes M.D., Christopher L. Cam
M.D., Michael J. Stuart M.D., Diane L. Dahm M.D., Aaron J. Krych M.D.

Table 2. Incidence of Patellar Fracture and Redislocation

Study	No. of Patients (Technique)	No. of Reported Patellar Fractures	Fracture Incidence	No. of Redislocation Events	Redislocation Incidence
Alm et al.,[23] 2017	30 (F)	0	0%	4	13%
Bitar et al.,[9] 2012	21 (F)	0	0%	0	0%
Calapodopulos et al.,[25] 2016	22 (F)	0	0%	Undisclosed	—
Deie et al.,[15] 2011	31 (F)	0	0%	0	0%
Fink et al.,[28] 2014	17 (F)	0	0%	0	0%
Goyal,[30] 2013	32 (F)	0	0%	0	0%
Kang et al.,[32] 2014	45 (F)	0	0%	0	0%
Niu et al.,[40] 2017 (*Knee Sports Surg Traumatol Arthrosc*)	32 (F)	0	0%	0	0%
Valkering et al.,[44] 2017	31 (F)	0	0%	1	3%
Wagner et al.,[46] 2013	50 (F)	0	0%	1	2%
Witonski et al.,[47] 2013	10 (F)	0	0%	0	0%
Csintalan et al.,[26] 2014	56 (S)	0	0%	0	0%
Ellera Gomes,[11] 1992	30 (S)	1	3%	1	3%
Feller et al.,[27] 2014	26 (S)	0	0%	0	0%
Goncaives et al.,[29] 2011	22 (S)	Undisclosed	—	0	0
Hohn and Pandya,[31] 2017	25 (S)	1	4%	2	8%
Kita et al.,[33] 2012	25 (S)	1	4%	0	0%
Kita et al.,[34] 2015	44 (S)	3	7%	2	5%
Krishna Kumar et al.,[35] 2014	30 (S)	0	0%	0	0%
Lee et al.,[36] 2018	50 (S)	0	0%	0	0%
Lind et al.,[37] 2016	24 (S)	0	0%	5	21%
Matthews and Schranz,[38] 2010	25 (S)	0	0%	0	0%
Mulliez et al.,[39] 2017	91 (S)	1	1%	0	0%
Niu et al.,[41] 2017 (*Med Sci Monit*)	30 (S)	0	0%	0	0%
Panagopoulos et al.,[42] 2008	25 (S)	1	4%	0	0%
Panni et al.,[43] 2011	45 (S)	1	2%	0	0%
von Engelhardt et al.,[45] 2018	30 (S)	0	0%	0	0%
Astur et al.,[24] 2015	28 F and 30 S	0 F and 1 S	0% F and 3% S	0 F and 0 S	0% F and 0% S
Mikashima et al.,[13] 2006	12 F and 12 S	0 F and 2 S	0% F and 17% S	0 F and 0 S	0% F and 0% S

F, cortical fixation; S, patellar bone socket.

PFJ Preservation Surgery

Summary

- Figure out the problem
  - Alignment, instability, dysplasia
- MPFL reconstruction should be considered, along with additional correction of underlying factors
- Complications can be avoided with careful preoperative evaluation and technical performance of the surgery


Thank you