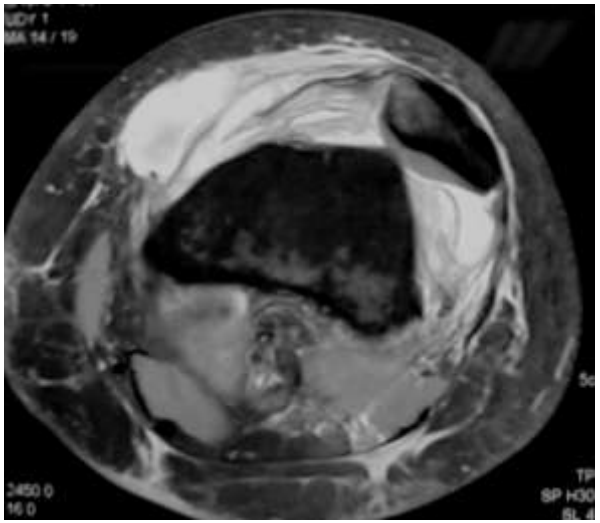
MPFL RECONSTRUCTION FOR TRAUMATIC RECURRENT PATELLAR DISLOCATION



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Natural history - prognosis

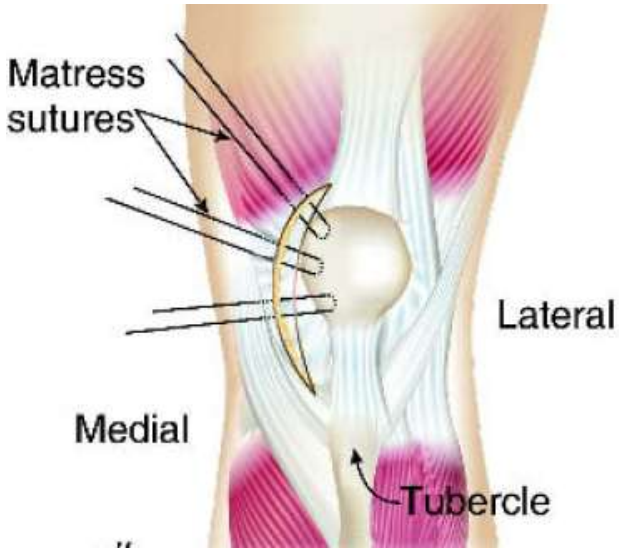
- **15%** re-dislocation rate and **33%** symptomatic following 1st dislocation[1]
- Recurrence rates up to **44%** in 100 conservative treated patients[2]
- **40% to 70%** have chronic retropatellar pain and instability[3]
- **Young-active patients** more prone to recurrence[4]

1. MacNab I. JBJS Br, 1952
2. Maenpaa H & Lehto MUK. Am J Sports Med, 1997
3. Hawkins RJ et al. Am J Sports Med, 1986
4. Cofield RH & Bryan RS. J Trauma, 1977

Surgical treatment

> 150 surgical methods have been described for the treatment of patellar instability

- proximal realignment
- distal realignment
- proximal and distal realignment
- lateral retinacular release
- medial retinacular plication
- combinations of procedures
- **MPFL reconstruction (last decade)**



Mini-Open Medial Reefing and Arthroscopic Lateral Release for the Treatment of Recurrent Patellar Dislocation

A Medium-Term Follow-up

Ellis K. Nam,*† MD, and Ronald P. Karzel‡

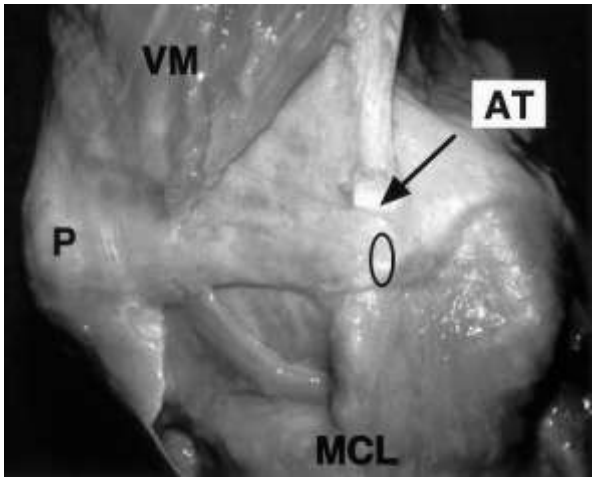
Complications

Procedures that don’ t address
the site of pathology

- recurrence of dislocation
- persistent patellofemoral instability
- patellofemoral osteoarthritis
- loss of flexion
- medial subluxation

Aichroth PM and Al-Duri Z. Knee surgery, 1992
Insall JN. Surgery of the knee, 1984
Dandy DJ. JBJS Br, 1996
Hughston JC. Am J Sports Med, 1988
Shellock FG et al. Arthroscopy, 1990

Medial patellofemoral ligament (MPFL)

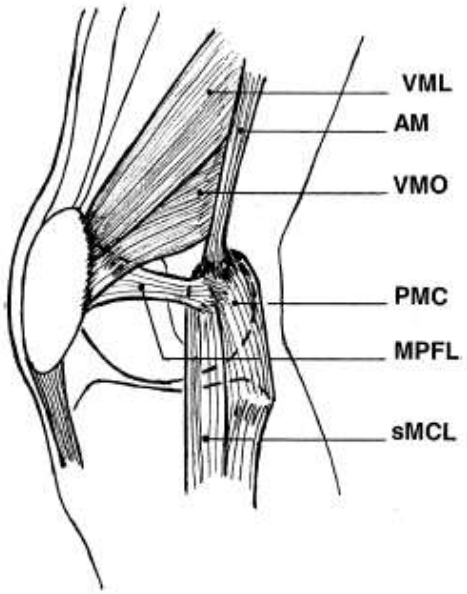


- Kaplan[1] first discussed the transverse retinacular ligament (1957)
- Its clinical importance gradually recognized the last decade
- Is comprised **53-60%** of the total medial restraining force[2,3]
- Very high rate of tearing during acute patellar dislocation (80-90%)[4,5]

1. Kaplan EB. Bull Hosp Joint Dis, 1957
2. Conlan T et al. JBJS Am, 1993
3. Desio DS et al. Am J Sports Med,1998
4. Nomura E. Int Orthop, 1999
5. Sallay PI et al. Am J Sports Med, 1996

Anatomic considerations

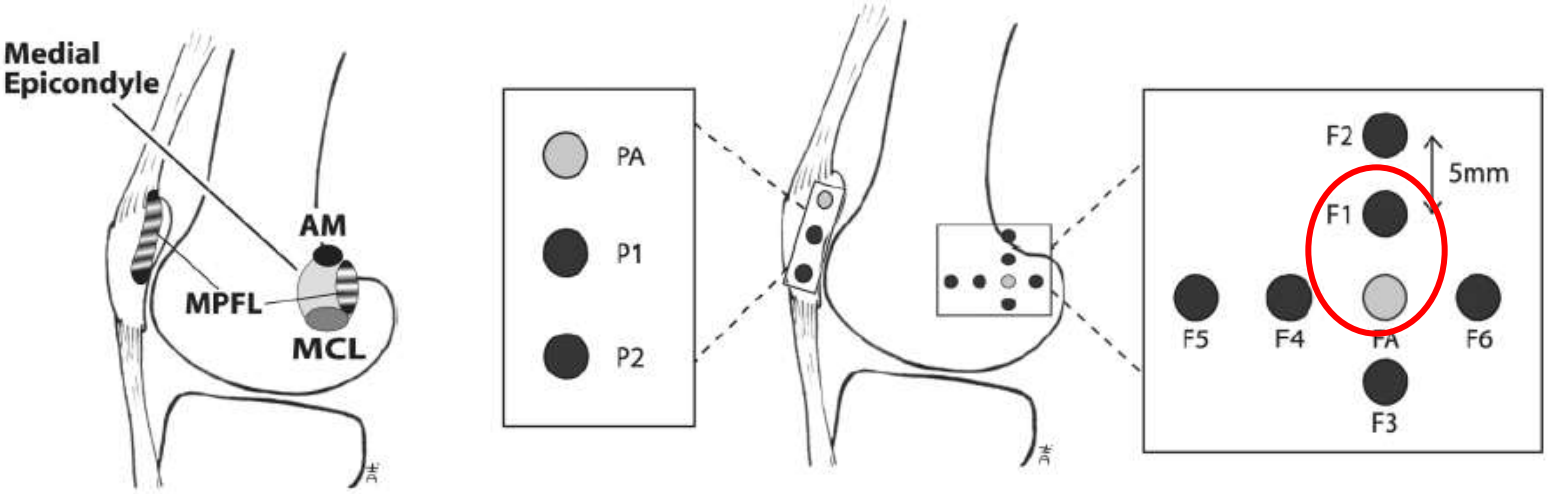
- Thin fascial band ~ **53 mm long** (range 45–64)[1]
- Constant structure in anatomic dissections[2,3]
  (Reider[4] et al identified MPFL only in 35% of specimens)
- Patellar attachment in the supero-medial border
- Controversial femoral attachment
  - adductor tubercle[5]
  - medial collateral ligament[5]
  - medial epicondyle (anterior part)[3]
  - medial epicondyle (posterior part)[6]



1. Tuxoe JI et al. KSSTA, 2002
2. Hautamaa et al. Clin Orthops Related Res,1998
3. Nomura E et al. Knee, 2000
4. Reider B et al. JBSJ Am, 1981
5. Desio SM et al. Am J Sports Med 1998
6. Feller JA et al. KSSTA, 2002

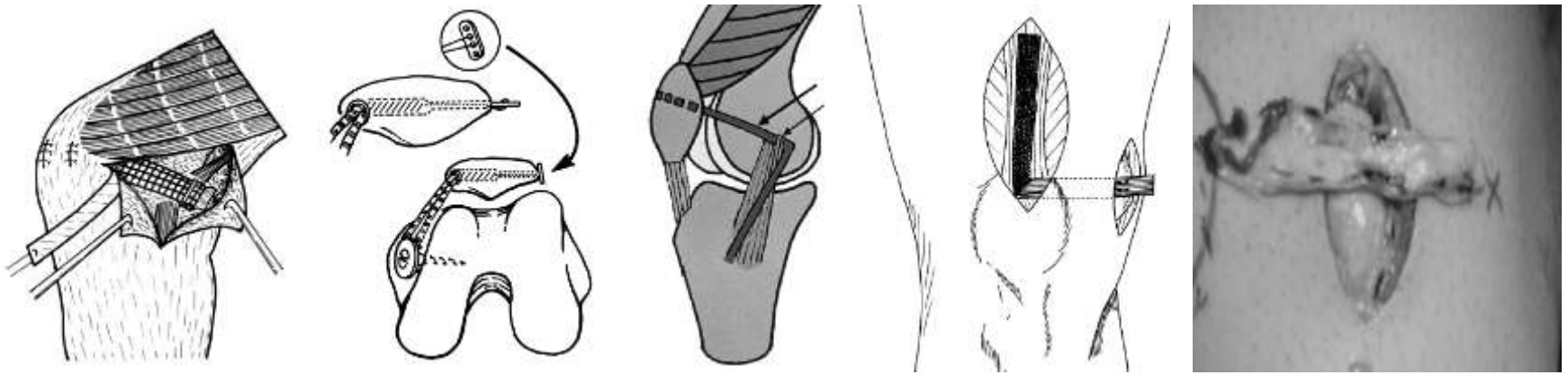
Anatomic considerations

25 cadaveric knees: optimal attachment points for an MPFL graft were the superior patella and the femoral attachment points of the MPFL (**just distal to the adductor tubercle**)



Smirc C & Morris H. Knee, 2003

MPFL reconstruction techniques



- Artificial ligament (Nomura)
- Hamstrings graft (Schock, Deie, Drez, Letts)
- Quadriceps graft (Steensen)
- Medial retinaculum strip (Cossey)

1. Nomura et al. Arthroscopy, 2003
2. Drez et al. Arthroscopy, 2001
3. Steensen et al. Arthroscopy, 2005
4. Cossey et al. Knee, 2005

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Isometric behavior of the reconstructed medial patellofemoral ligament using two different femoral pulleys: A cadaveric study

Authors' Contribution:
A Study Design
B Data Collection
C Statistical Analysis
D Data Interpretation
E Manuscript Preparation
F Literature Search
G Funds Collection

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Source of support: Departmental sources

Summary

Background: Several techniques have been described for reconstructing the medial patellofemoral ligament (MPFL). However, the anatomy of the medial patellar retinaculum and the isometry of both intact and reconstructed MPFL remain controversial. The purpose of this study was to investigate the isometric behavior of the reconstructed MPFL when two different pulleys are used for the reconstruction.

Purpose of the study

- Clarification of the anatomy of medial patella retinaculum (MPR)
- Isometry of the medial patellofemoral ligament (MPFL)
- Two different pulleys for ST reconstruction: medial intermuscular septum (MIS) and medial collateral ligament (MCL)

Methods

Eight fresh-frozen elderly cadaver knees (4 cadavers, 2 male & 2 female) were dissected. No knee had prior surgery that would have disrupted the medial patellar retinaculum

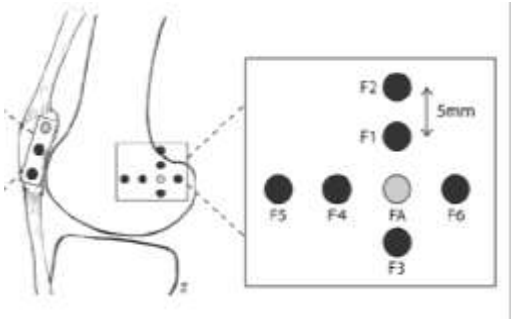
Methods

- Anatomic correlations of MPFL (patella, AT, MFE, VMO and MCL)
- Transfer of ST through the posterior one-third of MCL (Deie[1] et al.) and through the distal part of MIS (van Niekerk et al)
- Fixation to the inferior pole of the patella (Steensen[2] et al.) with the knee flexed at 50^{o} to 60^{o}

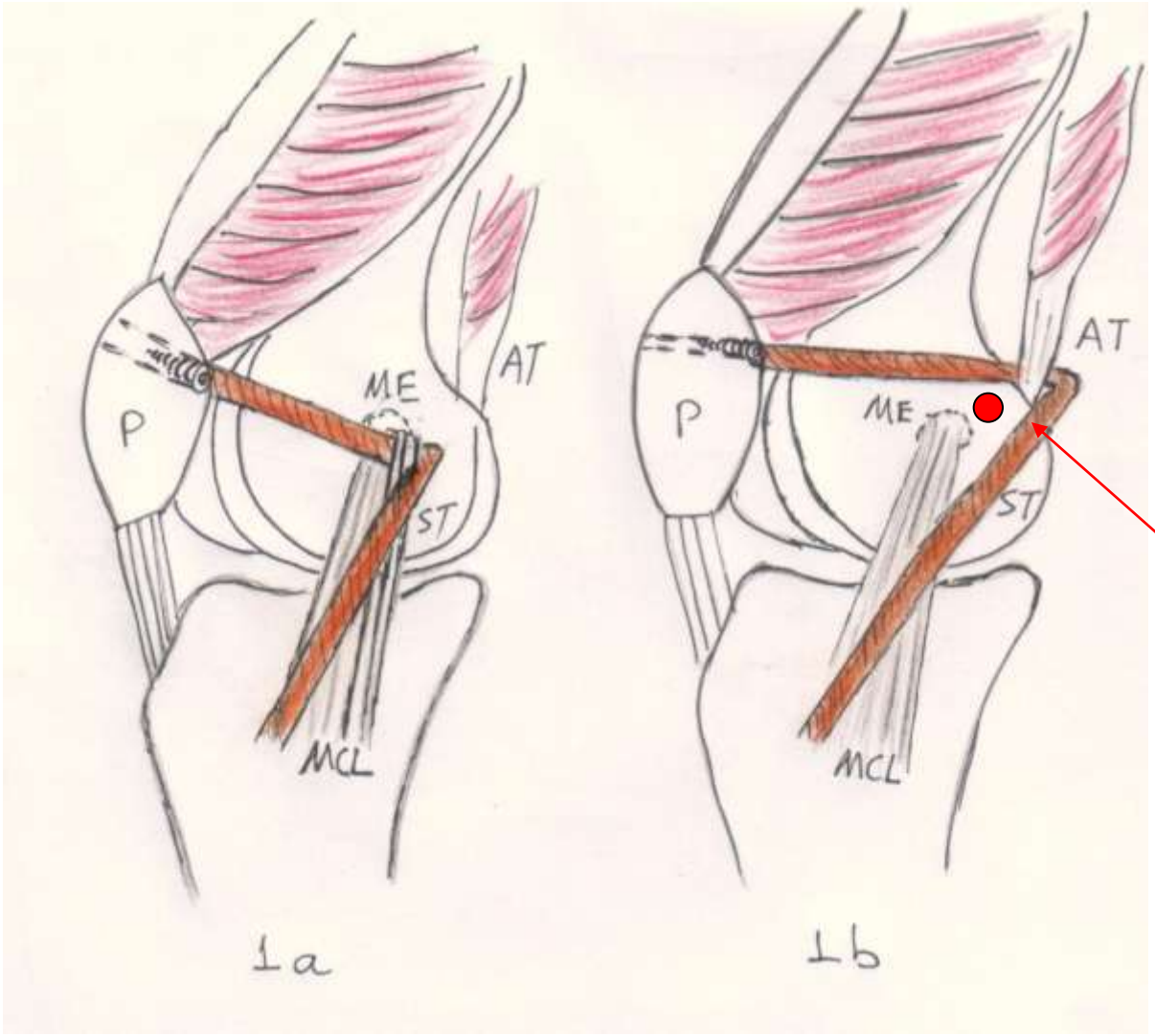
1. Deie M, et al. JBJS Br, 2003

2. Steensen RN et al. Am J Sports Med, 2004

Methods

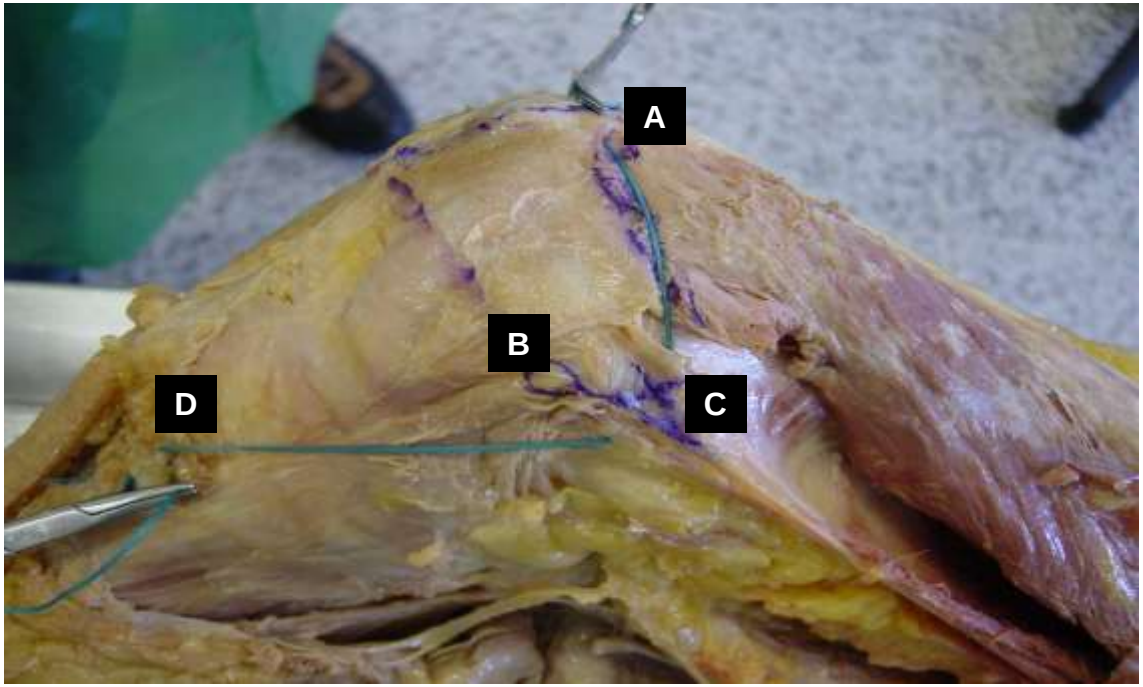


Smirc C & Morris H. Knee, 2003



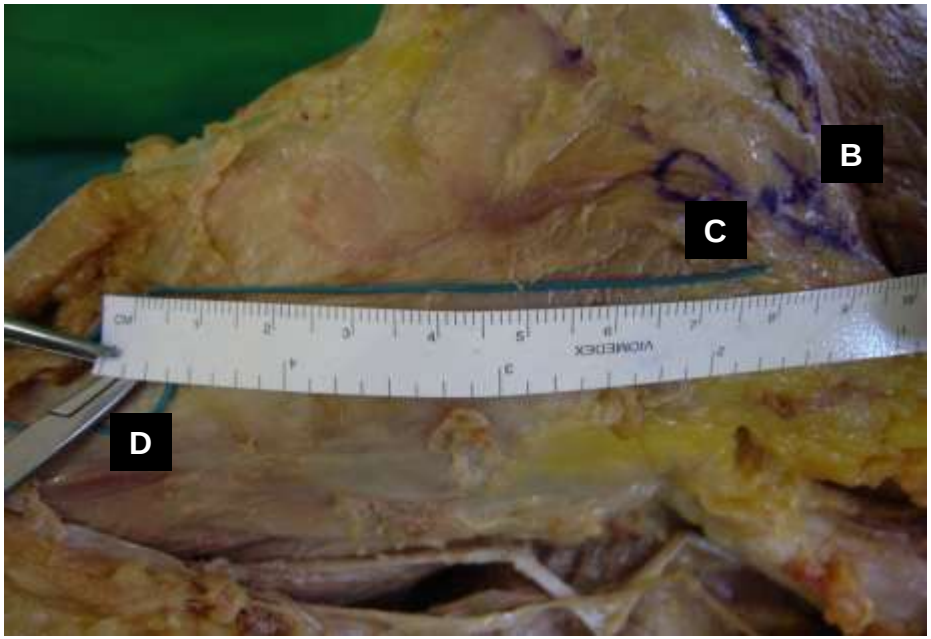
Isometricity of the re-routed ST

We marked 4 points on (A) the insertion of ST to the patella, (B) the MCL pulley, (C) the MIS pulley, and (D) the tibial insertion of ST. The distance between points at various fixed angles of knee flexion (0^o, 30^o, 60^o, and 90^o) was measured using a standard goniometer



Stability of MIS and MFE pulleys

Before and after 100 repeated flexion-extension passive knee circles (0º-120º), the D-B and D-C distances were measured Measurements were taken with the knee at 90º. Same values at repeated measurements were indicative of a fixed pulley whereas different values defined a loose pulley.



Results – MPR anatomy

The medial retinaculum has two constituent parts:

(a) the *superficial layer :* aponeurosis of the VMO

(b) The *deep layer* is a Y-shaped structure: the combined limb attaches to the medial border of the patella. The superior limb **(MPFL)** attaches to the MFE and superior part of MCL and consistently received a contribution from the vastus intermedius muscle & fascia

The inferior limp **(MPTL)** attaches to the MIS and medial meniscus

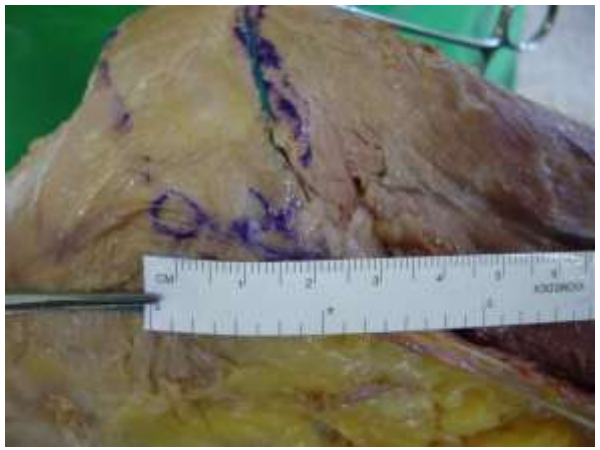


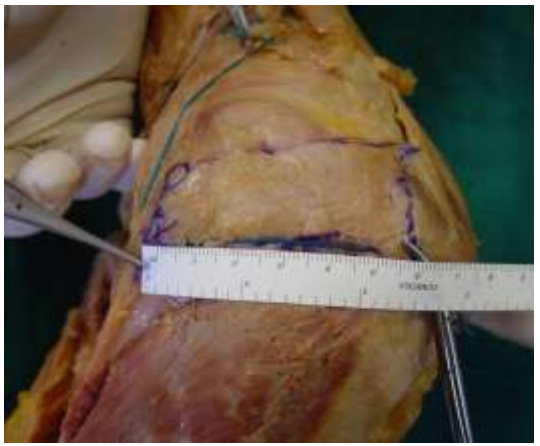
Results – MPFL anatomy

- The MPFL is a bandlike condensation of the deep MPR layer. Average width of femoral origin: 15.5 mm (12-19 mm) and of the patellar insertion 17.5 mm (14-21 mm)

- Vertical distance from patella to the **superior edge** of MPFL is 7.5 mm (1-16 mm) and to the **inferior edge** 20 mm (15-28 mm)

- The MIS fibres just before their insertion to the adductors tubercle (AT) demonstrate an oblique to vertical orientation to the longitudinal axis of the limb.





Results – isometricity of the graft

Most isometric behaviour when MCL was used as a pulley

Knee flexion	0º	30º	60º	90º
D-C	70	72	72	72
A-C	57	56	56	56
Total length through MCL	127	128	128	128
D-B	84	85	85	85
A-B	57	60	60	60
Total length through MIS	141	145	145	145

Average changes in graft length during knee flexion from 0º to 90º were **1 mm** with MCL pulley and **4 mm** with MIS

The distance A-B (MCL) was more isometric than the distance A-C (MIS). No differences were showed in both groups at 30º, 60º, and 90º when total graft length was measured

Results - isometricity

After 100 repetitive flexion-extension cycles of the knee (0º-120º), the graft length from its tibia insertion to MCL pulley (D-B) was reduced to 2mm on average when measured at 90º.

The graft length from its tibia insertion to the MIS pulley (D-C) remained always the same when measured at 90º

At 90º of knee flexion	Before cycling	After cycling
D-B	85	85
D-C	72	70

Conclusions

We prefer the MIS as pulley for three reasons:

1. the oblique orientation of MIS fibres keeps the ST tendon in the initial position through the pulley

2. The adductor tubercle was identified as the anatomic origin of the superficial MPR

3. Isometricity of the graft is not disrupted above 30º of knee flexion

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MPFL Reconstruction for Recurrent Patella Dislocation: A New Surgical Technique and Review of the Literature

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Key words
- traumatic patella dislocation
- patella instability
- MPFL reconstruction

Abstract

Recurrent dislocation, subluxation and functional instability due to patellofemoral pain might be present in 30% to 60% of patients managed non-operatively for posttraumatic patella instability. Disruption of the capsule, medial patella retinaculum and/or vastus medialis obliquus have been associated with recurrent patella instability but recently the medial patellofemoral ligament (MPFL) has been recognised as the most important including the release of tight lateral ligaments, tensioning of loose medial structures and distal realignment of the extensor mechanism or a combination of these. Very few address the principle site of pathology in patella dislocation, i.e., the torn MPFL. The outcomes are inconsistent and many studies have reported recurrent dislocations and patellofemoral pain and arthritis in up to 40%. We describe a simple technique of MPFL reconstruction using a single hamstring tendon graft which is passed through the medial

MPFL protocol (2006-)

- History
- Clinical & radiological evaluation
- Evaluation under anesthesia
- Arthroscopic confirmation & treatment
- MPFL reconstruction with ST-rerouting

Patients (2005-2011)

- 45 patients (21 men, 24 women)
- Average age 26.9 years-old
- Mean post-injury interval 22.3 months
- Mean recurrent dislocations 2.7 times
- Average follow up 36 months (range, 24-80 months)

Clinical evaluation

Tegner activity level scale

ICRS score

IKDC score

Lysholm score

Kuzala’s score

History – clinical examination

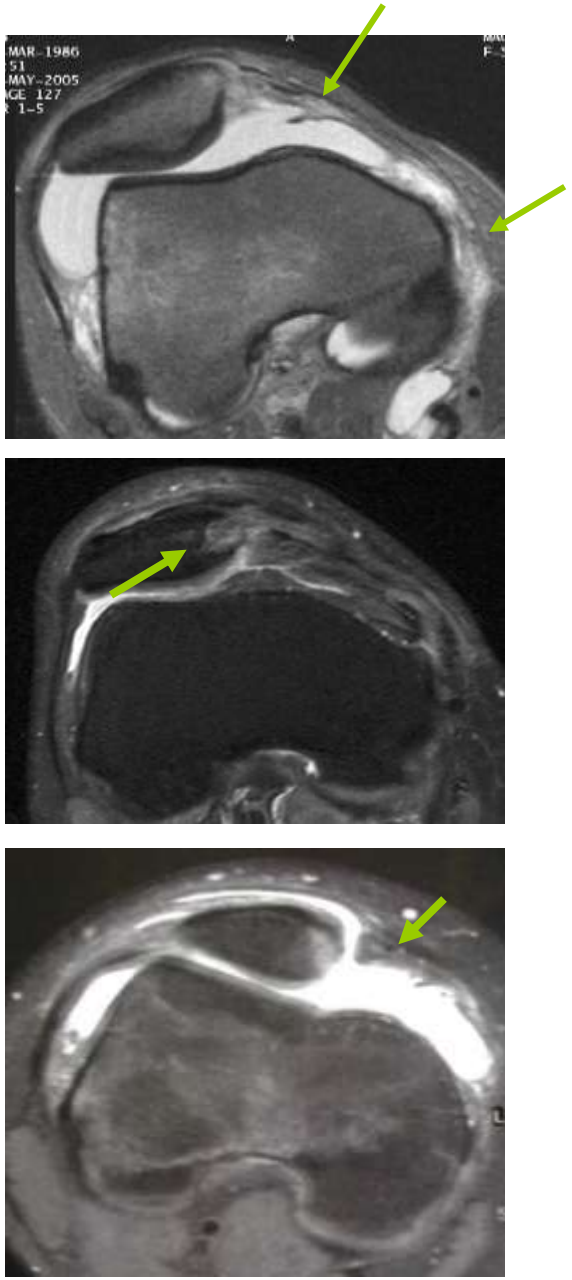
- Apprehension test
- Lateral tilt test
- Effusion
- Patellofemoral symptoms-crepitus
- Evidence of generalized laxity
- Associated pathology

X-rays

- Insall-Salvati ratio
- Patellar morphology
- Sulcus angle
- Congruence angle
- Lateral patella displacement
- Lateral patellofemoral angle

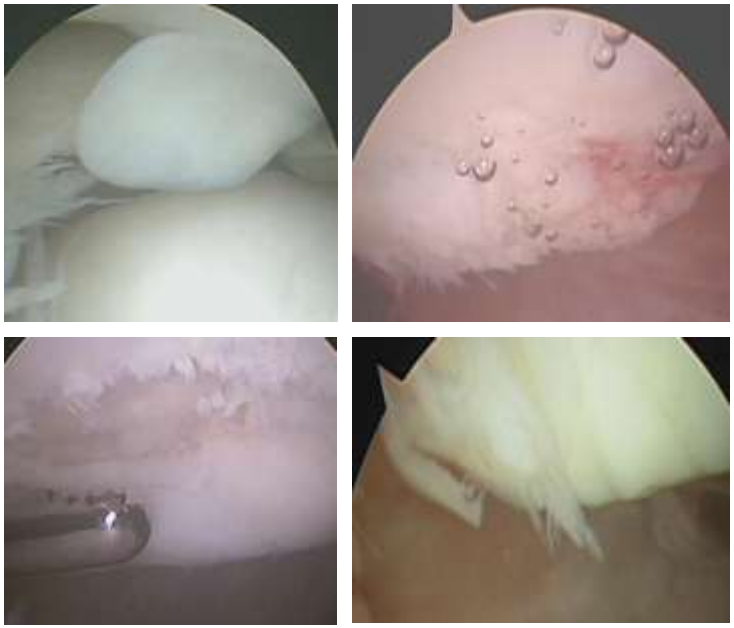
MRI scan

- Patella lateralization
- Cartilage injuries
- MPFL rupture
- Trochlear dysplasia
- Associated knee pathology

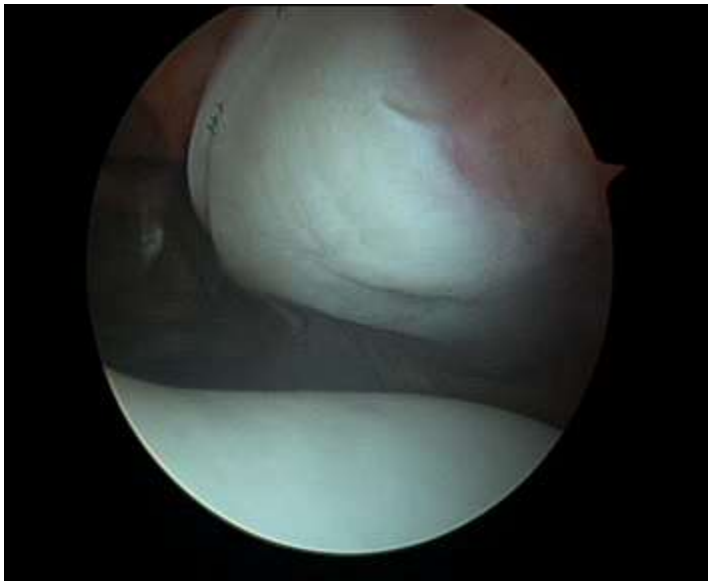


EUA + Arthroscopy

- Cartilage status
- Patellofemoral incongruity
- Trochlear morphology



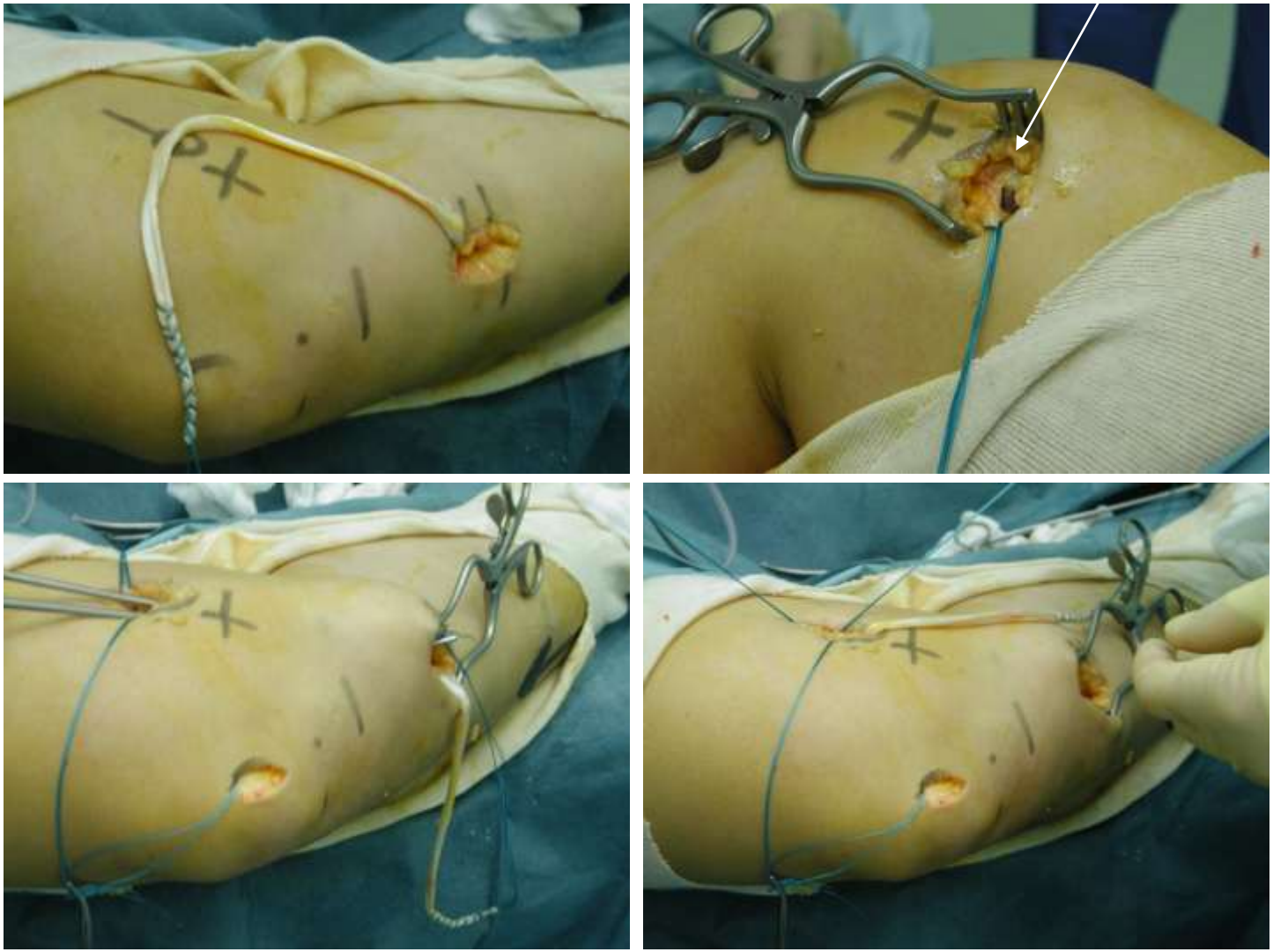
- Types of cartilage damage



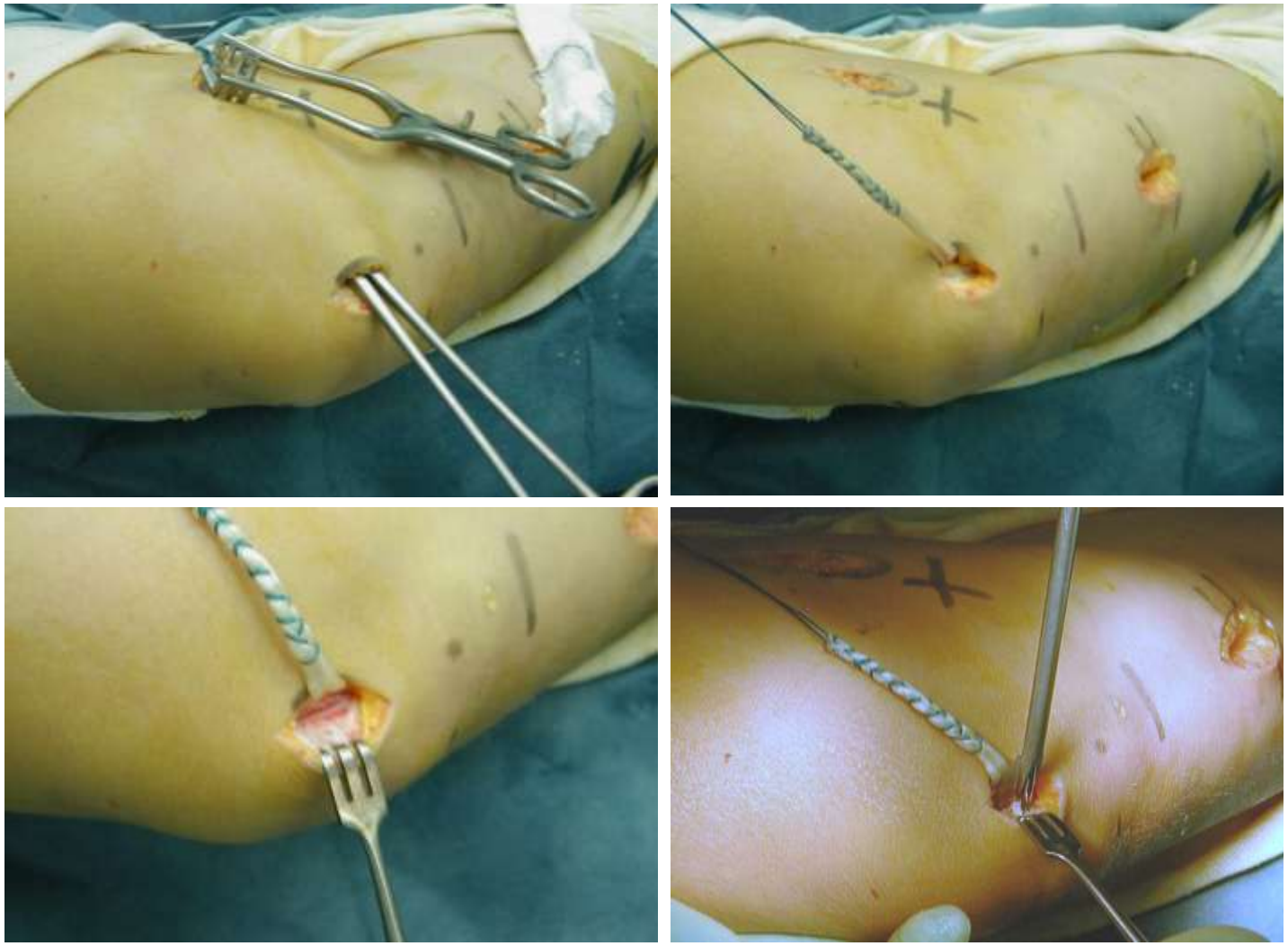
- Lateralization during passive ROM

Surgical technique

MIS (AT)



Surgical technique



Surgical technique

- First 7 cases : 7 mm transverse blind ended tunnel, double tendon loop & fixation with 7 mm Biotenodesis screw

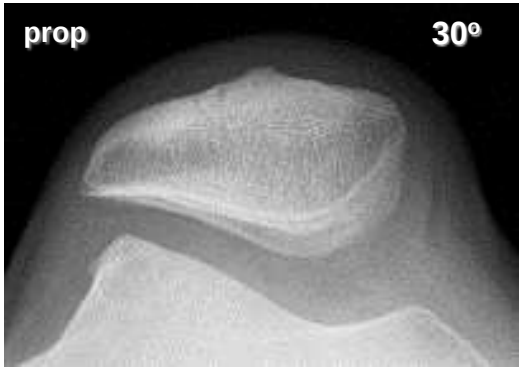
Fixation in 60 degrees of flexion

- Next 38 cases : 5 mm oblique tunnel through the patella in the direction of VMO & fixation with 5.5 mm Biotenodesis screw

Substantiation of reconstruction

Reconstructed MPFL

Patella centralization



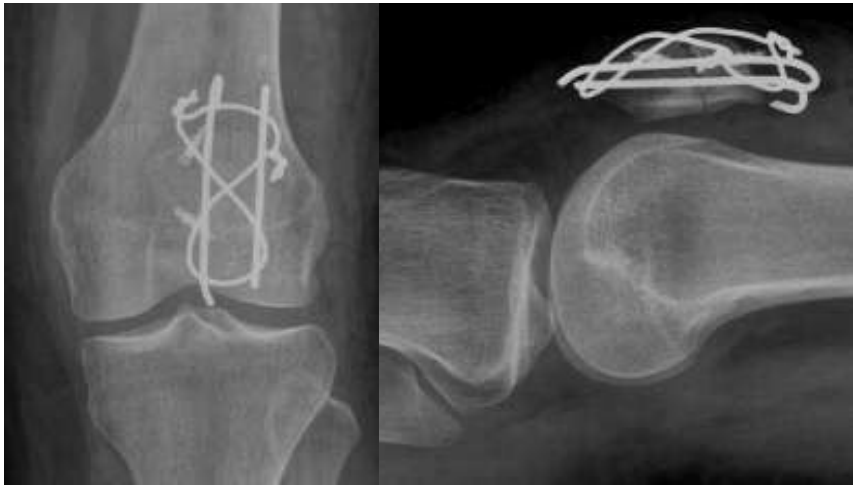
Clinical results (mean follow up 36 months)

- No incidence of re-dislocation (except one after new trauma)
- Negative apprehension-lateral tilt test
- No skin complications-infections
- No tendon harvest associated pathology

FUNCTIONAL SCORES	Pre-op	Last fup
ICRS	III / IV	I / II
IKCD score	46.9	86.5
KUJALAS score	60	87
LYSHOLM knee scale	54	85
TEGNER activity scale	4.2	6.4

Complications

- Two patients with patella fracture (7 mm blind ended tunnel) (ORIF with tension band, stabilization of the tendon with Twin-fix anchors)



Conclusions

- Surgical reconstruction of the MPFL provide a favorable early outcome for the treatment of post-traumatic patellofemoral instability
- Centralization of the patella can be achieved without any disturbance in the alignment of the knee or the intact lateral retinaculum
- The oblique **5 mm tunnel** seems to carry less risks for patella fracture and the ST tendon acts to the direction of VMO
- Associated cartilage lesions of the patella and cases with generalized laxity or trochlear dysplasia might influence the clinical outcome in the future