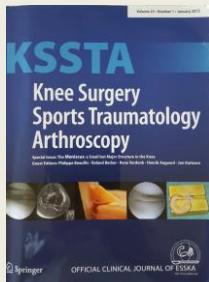


MENISCUS UPDATE



Dr. Nicos Papaloucas

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MENISCUS UPDATE

- 1. Meniscectomy
- 2. Meniscal Repair
- 3. Meniscal Root Repair
- 4. Meniscal Transplantation

2

Clinical and radiographic results of arthroscopic **partial lateral menisectomies** in stable knees with a minimum **follow up of 20 years**

Many publications found that lateral menisectomies were associated with worse prognosis compared to medial ones with respect to OA

1. A group of **excellent clinical and radiological Results (30-40%)** (mean 28 years old, No chondral damage, Meniscectomy less than 50%) And normal or slight varus alignment
2. Group of **asymptomatic but radiological OA (20-30%)** (Mean age: 37 years old, some chondral damage, and normal or slight varus alignment)
3. Group of **symptomatic OA (20-30%)** (Mean age 44 years old, presence of chondral damage and slight **VALGUS** alignment)

Guide Lines :

1. **Patients with high risk** → Age over 40, BMI over 30, Valgus alignment (chondral damage)
2. **Patients with good prognosis** ->Age <40, BMI <25and normal or slight varus alignment

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MENISCECTOMY

Influence of partial meniscectomy on attachment forces, superficial strain and contact mechanics in porcine knee joints

Conclusion: Partial meniscectomy significantly alters the **loading situation** of the meniscus and its attachments. Specifically, the attachment forces decreased with increasing amount of **meniscal tissue loss**, which reflects the **impaired ability of the meniscus** to transform axial joint load into meniscal hoop stress.

Clinically concluding, it is recommended to preserve as much meniscal tissue as possible during resection [16].

Cartilage degeneration and not age influences the health-related quality of life outcome after partial meniscectomy

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MENISCAL REPAIR

Meta-analysis on biomechanical properties of meniscus repairs: are devices better than sutures?

Suture repairs remain the **gold standard** in terms of biomechanical characteristics. A **vertically oriented repair** seems to be superior to the horizontal orientation based on higher LTF and stiffness values. Meniscal repair devices are

Why menisci show higher healing rate when repaired during ACL reconstruction? Growth factors release can be the explanation

Conclusions: A significant growth factors release was detected in the knee joint during arthroscopic surgery. **PDGF concentration** was significantly higher in anterior cruciate ligament reconstructed knee than in the meniscectomy group. PDGF can play an important role enhancing the healing response of meniscus suture and can be one of the biological reasons of the higher meniscal healing rate in anterior cruciate ligament reconstructed knee.

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MENISCAL REPAIR

The magnetic resonance imaging of the postoperative repaired meniscus is difficult to interpret [46]. A **persisting hypersignal** is frequent (>60 % of cases), even 10 years after open [28] or arthroscopic meniscal repair [34], even in the vascularised zones.

Platelet-rich plasma for open meniscal repair in young patients: Any benefit?

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Conclusion

Open meniscus repair of horizontal tears extending into the avascular zone was effective at midterm follow-up in young patients. Clinical outcomes were slightly improved by the addition of PRP in this case-control study. Although encouraging, **no recommendation can be made**.

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ANATOMY OF THE MENISCUS

Anterior root

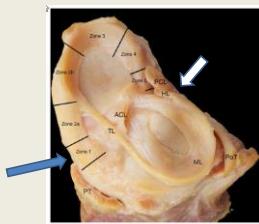


Fig. 2 Anatomical dissection showing five anatomical zones within medial meniscus. *ACL*, anterior cruciate ligament; *PCL*, posterior cruciate ligament; *PT*, popliteus tendon; *PL*, Humphrey ligament; *ML*, lateral meniscus.

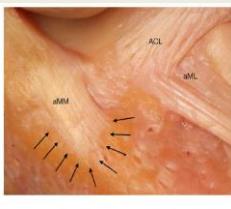


Fig. 3 Zone 1 of medial meniscus. Anatomical dissection showing type I of anterior fibular attachment of medial meniscus (marked with black arrows). *ACL*, anterior cruciate ligament; *aMM*, anterior medial meniscus; *AOL*, anterior oblique ligament.

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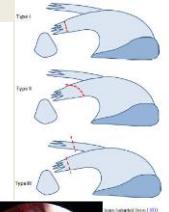
MENISCAL ROOT TEARS

- Meniscal root tears are defined as **avulsion injuries** of the meniscotibial lig (root lig), or **radial tear** of the meniscus within 1cm apart of its insertion site
- In human cadaveric model, demonstrated that a **root tear** of medial meniscus had the same detrimental consequences on medial compartment as **total medial meniscectomy**. Meniscus root tear might therefore promote the **onset and progression of osteoarthritis**.
- Posterior root tears of MM are mainly the result of **degenerative meniscal disease** and are frequently found in middle aged patient
- Posterior root tears of LM are usually **traumatic** in nature and have been reported in **10-15%** of patients with **tear of ACL**
- Repair of meniscal root tears is **strongly recommended** to preserve meniscal functions

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CLASSIFICATION OF PLMR-TEARS

- **Type 1 Avulsion injury** of the posterior lateral meniscus root with stable fixation of the meniscal posterior horn to the femur via the MFL (Figs. 1, 3a)
- **Type 2 A radial tear** of the lateral meniscus posterior horn close to the root (between the root and the meniscal origin of the MFL) (Figs. 1, 3b)
- **Type 3 Complete detachment** of the lateral meniscus posterior horn from its tibial and femoral attachments (root tear and **rupture of the MFL**, functional loss of the meniscal ring) (Figs. 1, 3c) [11]



Avulsion injury



Radial tear



Complete detachment

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MMR-TEARS

Diagnostic accuracy of 3.0 T magnetic resonance imaging for the detection of meniscus posterior root pathology

Conclusions This study demonstrated **moderate sensitivity and specificity** of 3 T MRI to detect posterior meniscus root tears. The negative predictive value of 3 T MRI to



Meniscal Extrusion

Tear

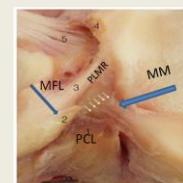
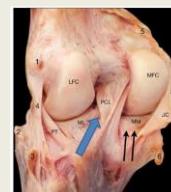
"ghost" sign

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MENISCAL ROOT OF LATERAL MENISCUS

→ An important difference between the medial and lateral meniscus is the additional attachment of the posterior lateral meniscal horn to the medial femoral condyle via the **meniscofemoral lig**. The MFLs **secure the lateral meniscus** and attach the posterior horn to the femur.

→ The MFLs consist of lig of Humphrey and the lig of Wrisberg

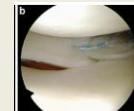


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TREATMENT OF PLMR-TEARS

In cases with **type 1 and 3** lesions, a transosseous pullout repair was performed using the tibial ACL tunnel (Fig. 5a),

b) [11]. In cases with **type 2** lesions, a side-to-side repair using an all-inside suture was performed.



In cases with complete detachments of the lateral meniscus (type 3), fixation is strongly recommended [11].



Fig. 5 Posterior lateral meniscus root tear (PLMR) repair using a pulley technique: a 2.0 mm wire is used to fix the meniscal tissue; b resection of the root to the tibial insertion

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Avulsion of the anterior medial meniscus root: case report and surgical technique

Fig. 1 Magnetic resonance imaging demonstrating an **avulsion of the anterior medial meniscus root**. **a** Axial avulsion of the anterior horn of the medial meniscus root. **b** Coronal images. **c** Axial images. **d** Coronal images. **e** On axial images. **f** Removal of the medial meniscus (arrow) greater than 3 mm on coronal images. **g** On sagittal images, the anterior horn of the medial meniscus could not be visualized near the center of the tibial plateau (arrow), whereas more peripherally, the anterior horn was displaced for meniscus suture.

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3. Graft Extrusion: -> A very common phenomenon.
-> more frequent in lateral compared to medial MAT
-> does not correlate with clinical and functional outcomes
-> occurs most frequently in the anterior horn or mid-body
-> The practical implications of meniscal extrusion are not well understood.

4. Graft sizing: -> Both plain radiographs and MRI can be used for graft sizing.
-> No definitive evidence that MRI is better than plain radiograph for graft sizing
-> Meniscal size is influenced by gender, height, and weight

5. Graft horns fixation: -> Bone fixation of the medial meniscus horn attachments better restores knee contact mechanics compared to suture fixation.
-> The use of suture fixation has more risk of graft extrusion compared to bone fixation

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MENISCAL TRANSPLANTATION

Meniscal allograft transplantation. Part 1: systematic review of graft biology, graft shrinkage, graft extrusion, graft sizing, and graft fixation

CONCLUSIONS :

- 1. Graft biology:**
 - > Allografts do not create a significant inflammatory or rejection reaction
 - > Allografts are repopulated with host cells, similar to fibrochondrocytes.
 - > The synovium may play an important role in graft cellular repopulation.
- 2. Graft Shrinkage:**
 - > Meniscal allograft shrinkage is a relatively common phenomenon, with an average 7% in cryopreserved allografts
 - > Meniscal allograft shrinkage tends to appear in the first months after MAT and stabilizes thereafter

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Meniscal Transplantation

3. MAT and associated procedures: -> The association of cartilage procedures or ACL reconstruction with MAT does not worsen the results.

4. Osteoarthritis: -> It seems that MAT may prevent progression of cartilage degeneration in the long-term follow-up
-> For the prevention effect of MAT on the development of knee osteoarthritis no definitive conclusions can be drawn

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Meniscal transplantation

Meniscal allograft transplantation. Part 2: systematic review of transplant timing, outcomes, return to competition, associated procedures, and prevention of osteoarthritis

1. Outcomes: -> MAT is a successful surgical procedure to improve symptoms, function, and quality of life at 7 to 14 years of follow-up (level IV evidence)
-> The overall failure rate (need for knee arthroplasty) ranges from 10 to 29% in the long-term follow-up
-> no differences in the clinical and functional outcomes between the medial and lateral MAT

2. Return to sports: -> MAT allows return to the same level of competition in 75–85% of patients in the short- to mid-term follow-up

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SUMMARY

The era of meniscus preservation began and was based on three pillars

1. Repair of the torn meniscus whenever reasonable
2. Conservative/non-surgical treatment of asymptomatic meniscal pathologies despite a meniscal tear according to MRI
3. Partial meniscectomy and resection of as much as necessary and as little as possible.

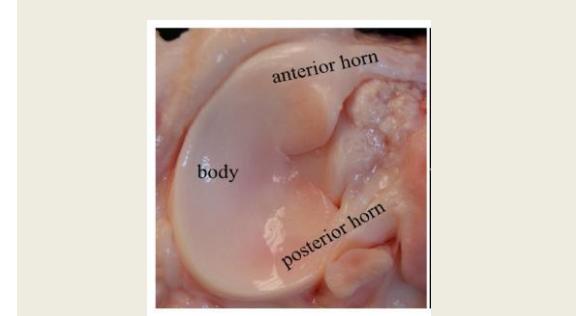
Meniscal repair in Germany: 6.5% of all meniscal procedures. It still remains low and under the 15–25% of meniscus lesions, which appears to be appropriate for repair.

Currently, meniscal reconstruction using an allograft or substitute should be considered as a salvage procedure after meniscectomy, especially when the lateral meniscus of a young patient is involved.

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SUMMARY

Be ware : Middle-aged patient suffering from a symptomatic degenerative meniscus lesion. The question of whether a meniscectomy in degenerative lesions should be routinely performed is still controversial and has generated an intensive worldwide debate



THANK YOU

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ANATOMY OF THE MENISCUS Posterior root

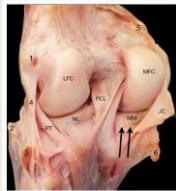


Fig 9 Anatomical dissection of posterior aspect of the left knee joint. Posterior femoral roots is marked with blue arrows. Nodular fine superior slips of posterior horns of medial meniscus. LFC lateral femoro-tibial ligament, PCL posterior cruciate ligament, HFL anterior cruciate ligament, MM medial meniscus, JC joint capsule, MFC medial femoral condyle, LFC lateral femoral condyle, AMF anterior cruciate ligament, 2-dual attachment of its-labral band, 3-dual attachment of medial head of patagonemus muscle, 4-dual attachment of medial head of patagonemus muscle, 5-dual attachment of medial collateral ligament.

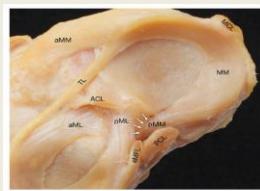


Fig 10 Anatomical dissection of proximal tibial articular surface (plant view, femur removed). Tibial attachment of posterior root of medial meniscus is marked with white arrows. PCL posterior cruciate ligament, aMFL anterior menisco-femoral ligament (Humphry ligament), aML anterior root of lateral meniscus, aMM anterior root of medial meniscus, pMM posterior root of medial meniscus, TL transverse ligament (anterior menisco-metacarpal ligament), MCL medial collateral ligament.

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MENISCAL ROOT TEARS

Meniscus root tears profoundly compromise the load distribution and stability of the knee and result in an almost complete loss of the biomechanical function of the meniscus, leading to meniscus extrusion and early onset of femoro-tibial osteoarthritis [2-7]. In a recent biomechanical study evaluating peak local contact stress in the femorotibial joint, root tears equalled a total meniscectomy and lead to an increase up to 235 % in peak local contact stress [2]. Thus, repair of root tears should strongly be considered in order to preserve the function of the meniscus. Refix-

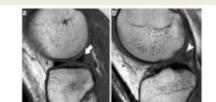


Fig 3 (left) normal sign. The normal central signal seen as peripheral white in series is replaced by high signal as a side bright sign.

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MENISCUS AFTER HTO

Accelerated degeneration of the discoid lateral meniscus after medial opening wedge high tibial osteotomy

Conclusion The results of this study suggest that increased load on the lateral compartment after HTO can accelerate discoid lateral meniscus degeneration by MRI and caution that when a discoid lateral meniscus is found by preoperative MRI, progressive degeneration may occur after HTO and clinical outcome may be adversely affected.
Level of evidence Therapeutic study, Level IV.

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