Expanding Meniscus Repair
Indications –
Horizontal Cleavage Tears
and Root Tears

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Horizontal cleavage and Root Tears
HCT – Traditionally Taught by “Professors” to Resect or Leave Alone

• No good way to repair

• Techniques place sutures parallel to joint line
  • Great for vertical tears

• Horizontal tears typically degenerative & extend into avascular zone
Meniscus is Important to Preserve – Distributes the Load from Femur Over a Larger Area

• Loss of meniscus:
  ↓ Contact area by 75%
  ↑ Contact pressures by 235%¹

• Affecting both femoral & tibial cartilage

• Overloading the cartilage → failure ²

¹ Baratz, ME, et.al. AJSM 1986; 14: 270-4.
² McDermott, ID, et.al. JBJS(Br) 2006; 88B:1549-56.
Horizontal Cleavage Tears -----
The Tissue is There.
Same Biomechanics?
Biomechanics of HCTs

Tear & single leaflet resection → significant ↑ in tibiofemoral pressure

Repair with vertical loop suture configuration restores pressure to intact state

Beamer et. al. ORS 2015 Poster #2000
• HCT’s often not repaired
  • “Difficulty performing repair”
  • “Poor healing rates”
• PubMed and Embase databases searched
  • 9 studies met inclusion criteria
• 98 repairs with 78% success rate
• Repair of HCT’s → success rate comparable with other types of meniscus tears
Arthroscopic Repair of Horizontal Meniscal Cleavage Tears With Marrow-Stimulating Technique

Ji-Hyun Ahn, M.D., Ph.D., Oh-Jin Kwon, M.D., and Tae-Seok Nam, M.D., Ph.D.

• 32 consecutive meniscal repair of HCT’s with marrow-stimulation
• Mean f/u 4 years
• 29/32 (90%) healed (clinical assessment & 2nd look)
• Significant improvement in pain & functional scores
• Despite tears with degenerative tissue and extending into avascular zone
Original article

Analysis of short and long-term results of horizontal meniscal tears in young adults


• Overuse injuries not amenable to classic arthroscopic sutures
• Open meniscus repair allows lesion to be sutured vertically
• 18 patients – @ 2 yrs
• 9 patients – @ 10 yrs
• 26/27 successful – short term results maintained in long term
Horizontal Meniscus Tears & The STITCH Study

Horizontal Meniscus Tear

Typical Treatment: Partial Menisectomy

Alternative Treatment: Suture-based repair
The STITCH Study
A Prospective, Non-randomized, Multi-Center Investigation of All-suture-based Repair of Horizontal Meniscal Tears

- Patients: 30 patients age 18 - 60 with isolated HCTs
- Centers: 10 Investigational Centers
  Andrews (Anz)  
  Beth Israel (Ramappa, DeAngelis)  
  GWU (Faucett)  
  Long Beach Memorial (Kurzweil)  
  Mayo Clinic (Krych, Dahm, Levy, Stuart)  
  NYU (Jazrawi, Meislin, Strauss)  
  OrthoIndy (Farr, Lavery)  
  OSU (Flanigan, Kaeding, Magnussen)  
  Scripps/CORE Orthopaedic (Loren)  
  UVA (Gwathmey, Carson, Diduch, Miller)

- Endpoints:
  - Freedom from reoperation at 2 years
  - Improvements in knee pain and function 3m, 6m, 1y, 2y

- Imaging:
  - In office arthroscopy 6m
  - MRI 1y
  - X-ray 2y
Horizontal Cleavage Tears
Horizontal Cleavage Tears
Root Tears

- Age often >50
- Patients typically overweight
- Non-athletic
- Not usual “repair” indications
Abstract

Meniscal root tears are substantial injuries that usually require surgical management. If left untreated, meniscal root tears can lead to the rapid onset of osteoarthritis similar to that seen after a total meniscectomy. Meniscal root tears often go unnoticed on magnetic resonance imaging and arthroscopy, in large part because meniscal root anatomy and its biomechanical importance have been defined only recently. In a transtibial meniscal root repair, the current clinical standard of care, the root is reattached to its native attachment site on the tibial plateau, restoring tibiofemoral contact mechanics. While this video article shows a posterior medial root repair technique, the same anatomic, biomechanical, and surgical principles apply to a posterior lateral meniscal root attachment.
Biomechanical Consequences of a Complete Radial Tear Adjacent to the Medial Meniscus Posterior Root Attachment Site

In Situ Pull-out Repair Restores Derangement of Joint Mechanics

- Cadaver Study
- These tears lead to loading of medial compartment – same as complete root avulsion
- Repair restored joint mechanics to intact state

Padalecki, LaPrade AJSM 2014
Recent Root Repair Clinical Data

- 35% of meniscectomy patients advanced to TKA within 5 yrs. vs. 0% of repair patients\(^1\)
- Repair superior to meniscectomy at 4 years in a randomized study\(^2\)
- Multiple studies have shown improved clinical outcomes in patients age \(>50\)\(^{1,2,3}\)

\[ \begin{array}{ll}
\text{Joint Space}^1 \text{ (mm)} & \\
\text{Baseline} & \text{>5y FU} \\
\text{Meniscectomy} & * P < 0.001 \\
\text{Repair} & *
\end{array} \]

\(^1\) Chung et.al. \textit{Arthroscopy}. 2015 Jun 18. epub
\(^2\) Lee et.al. \textit{Arthroscopy}. 2009; 25(9):951-8.
\(^3\) Kim et.al. \textit{Arthroscopy}. 2011; 27(3):346-54.
Arthroscopic Transtibial Pullout Repair for Posterior Medial Meniscus Root Tears: A Systematic Review of Clinical, Radiographic, and Second-Look Arthroscopic Results

Matthias J. Feucht, M.D., Jan Kühle, M.D., Gerrit Bode, M.D., Julian Mehl, M.D., Hagen Schmal, M.D., Norbert P. Südkamp, M.D., and Philipp Niemeyer, M.D.

• 7 studies – 172 patients underwent root repair
• Mean age 55 years - 83% female
• No progression of cartilage degeneration in 84%
  • 3 year f/u
• Complete or near complete healing in 96%
  • 2nd look or MRI
• Outcome scores significantly improved
Recent Advances in Posterior Meniscal Root Repair Techniques

Abstract

Posterior root avulsions of the medial and lateral menisci result in decreased areas of tibiofemoral contact and increased tibiofemoral contact pressures. These avulsions may lead to the development of osteoarthritis. Therefore, two surgical techniques, the transtibial pullout repair and the suture anchor repair, have recently been developed to restore the native structure and function of the meniscal root attachment. Compared with the historical alternative of partial or total meniscectomy, these techniques allow for meniscal preservation and anatomic reduction of the meniscal roots, with the goal of preventing the development and progression of osteoarthritis. However, early biomechanical and clinical studies have reported conflicting results on the effectiveness of both techniques with regard to resisting displacement and facilitating healing. Although there is currently a lack of consensus on which is the superior technique, transtibial pullout and suture anchor repairs are increasingly used in clinical practice.
Root Repair
Root Repair
Root Repair
No Cannula
Posterior Root Lateral Meniscus

ipsi-lateral portal
≤ 3 mm from Popliteal artery in 43% specimens

All-inside suturing is safer

Miller (J Knee Surg. July 2007)
THANK YOU