Meniscus Repair: Update

MICHELLE WOLCOTT, MD

ASSOCIATE PROFESSOR
CU SPORTS MEDICINE
DEPT. OF ORTHOPAEDICS
UNIVERSITY OF COLORADO
TEAM PHYSICIAN, UNIVERSITY OF COLORADO
TEAM PHYSICIAN, UNIVERSITY OF DENVER
Meniscus Repair: Update

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Knee Anatomy and Biomechanics: Meniscus

- **Function:**
  - Load Distribution
  - Deepens tibial surface
  - $2\degree$ stabilizer

- Medial = C-shaped
- Lateral = Semicircular
Meniscal Tears

- Medial tears 3X more common than lateral tears
- Lateral meniscus motion 2X greater
- Young patients have more acute tears, often associated with ligamentous injuries
- Older patients tend to have degenerative tears associated with cartilage wear/arthritis
Types of Meniscus Tears

Complete longitudinal  Bucket handle  Displaced bucket handle

Parrot beak  Flap  Displaced flap

Radial  Double flap  Incomplete longitudinal

Severity of Articular Cartilage Wear
Medial Meniscus Tear Morphology and Chondral Degeneration of the Knee: Is There a Relationship?


- 103 patients prospectively evaluated at the time of meniscal surgery
- Chondral degeneration, tear morphology/location
- Root/radial flap tears more strongly associated with medial compartment degeneration
- Meniscus tears with increasing disruption of circumferential hoop fibers were significantly associated with cartilage lesions of increasing severity in both medial and lateral compartments
Knee Anatomy and Biomechanics: Meniscus

- Perimeniscal capillary plexus provides blood supply to the peripheral 1/3
- Blood supply regresses with age
- “Red-Red” zone and “Red-white” zone

Meniscus Microanatomy
Meniscus Biomechanics

Hoop stress

Radial tensile stress

Shear stress
Biomechanics: Hoop Stress
Vertical/Bucket Handle Tears

- Complete longitudinal
- Bucket handle
- Displaced bucket handle

- Vertical tear
- Peripheral tear
Bucket Handle Tear
Meniscus Repair
Meniscus Repair

- Inside-Out Repair
- Gold Standard
- Strongest Repair
- Vertical Mattress
Meniscal Repair

- Configuration
  - Best results with simple or single tears
  - Peripheral vertical tears best candidates
  - Deformed bucket-handle fragment not amenable to repair
Meniscal Repair

Advances in Biologics: Trephination, Fibrin clots, PRP growth factors, Stem cells

All Inside Techniques - Risks: Breakage, Migration, Synovitis, Chondral Injury, Decreased strength
Meniscal Root Tears/Radial Tears
Meniscal Root Tears/Radial Tears
Radial Tears
Radial Tears

Radial Tear (small)

Radial Tear (large)
Radial Tears
Meniscus Root Tears
Meniscal Root Tears

- Acute tears associated with ligamentous injury
  - Most common is lateral root tear + ACL

- Chronic tears associated with osteoarthritis
  - Risk factors
    - Female gender
    - Higher BMI
    - Relatively lower activity level
    - 40s-50s
    - Varus alignment (for medial tears)
Chronic Tears

- Medial more common
  - Relative immobility of medial meniscus
  - Most stress in axial loading
  - Secondary stabilizers
Meniscal Root Anatomy
Meniscofemoral Ligament
Biomechanics of Radial Tears/Root Tears

- Root tears increase medial compartment loads by 25% in cadaveric studies.
- Increases external rotation and lateral stabilization of the femur on the tibia.
- Repairing meniscus root tears restores kinematics.
Diagnosis

- Symptoms may be similar to other types of meniscus tears
  - Joint line tenderness
  - Pain with McMurrays
  - Swelling
- Can also be nonspecific
  - Vague pain symptoms (posterior)
- MRI
- Arthroscopic Assessment
MRI

- truncated triangle, cleft, marching cleft and ghost meniscus signs
- the use of all four signs increased the detection rate for radial tears to 89%
Meniscal Repair

- Radial Repair
Radial Repair
Meniscus Root Repair
Meniscus Root Repair
Meniscus Root Repair
Meniscus Root Repair
Results of Meniscus Repair

- Cadaveric studies
  - Universally demonstrate that biomechanics can be restored with repair

Biomechanical Consequences of a Complete Radial Tear Adjacent to the Medial Meniscus Posterior Root Attachment Site

Padalecki, et. al. JBJS 2013
Results of Meniscus Repair

- Meniscus Suture Repair: Minimum 10 yr Outcomes in Patients Younger than 40 yrs Compared With Patients 40 and Older

  Steadman, et al. AJSM 2015

  - No significant difference based on age (5.5% vs 5.3%)
  - 82% vs 93% followup
  - No significant difference based on which meniscus (med vs lat), concomitant ACL injury, microfracture
Results of Meniscus Repair

- Arthroscopic Transtibial Pullout Repair for Posterior Medial Meniscal Root Tears: A Systematic Review of Clinical, Radiographic, and Second-Look Arthroscopic Results

  Feucht, et al, Arthroscopy 2015

- 30 mos followup
  - Lysholm scores improved from 52.4 to 85.9
  - Radiographs – 84% showed no progression
  - MRI – 82% showed no progression of cartilage degeneration, 56% showed reduced meniscal extrusion
  - 2nd look arthroscopy – healing status complete in 62%, partial in 34%, failed in 3%
Postoperative Rehab

- No consensus
- Limited data
- Use sound principles and biomechanical information
- Biology? Timing
Postop Rehab – Meniscal Repair

- Protect the repair in first 4-6 weeks
- Restricted WB in first 4-6 weeks
  - WBAT in full ext
  - NWB for root and radial tears
- Restrict ROM 0-90 deg x 6 wks
Conclusions

- Meniscus function is critical to a well-performing knee
- Protect and restore function when possible
- Repair can restore biomechanics in the lab/short-term
Conclusions

- Future directions
  - Biologics
  - Improved instrumentation/technique
  - Long-term outcome
    - Acute vs Chronic tears
- Diagnosis
  - Can we identify tears earlier
References


- Bhatia S, LaPrade CM, Ellman MB et.al. Meniscal Root Tears: Significance, Diagnosis, and Treatment. AJSM 42: 3016-3030
References


Thank You