Rehabilitation Following Meniscus Repair
Alone & Combined with ACL Reconstruction
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Meniscus Biomechanics
- 1968 – Jackson – no function, exact function still matter of conjecture
- Smiley = advocated complete removal
- 1948 Fairbank suggested load-transmission function, complete removal = flattening femoral condyles, osteophyte formation
- 1975 30-90% of load passes through meniscus

Loading of Meniscus
- Seedhom = 70-99% compressive load transmitted through menisci
- Flexion past 75 degrees = 100% of load goes through posterior horn
- 85% of tears in posterior horn
- Meniscus removal = 50-70% reduction of contact area
- ACL plus meniscus repair = aids healing, aggressive but extension ROM focus!

Function of Meniscus Joint Stability
- In the ACL deficient knee, removal of the medial meniscus = increased ATT
- Lateral meniscus = minor ATT
- Meniscus minor role in stability
- Distraction forces less harmful than shear forces

Meniscus Vascularity Arnoczky
- Meniscus repairs dependent on location
- Peripheral tears = increased vascularity
- Henning – pioneered meniscus repair = used fibrin clot to help heal repair
“I don’t want to have surgery just yet”

• Risks – ACL Deficient Knee Meniscus, Articular Cartilage
• Will your patient get stung?

ACL Deficient Rehabilitation Risks

• Increased articular cartilage loss long-term
• Murrell – AJSM ’01
  – 130 pts. ACL tears
  – ATS exam. – Reconstruction
  – Time = increased cartilage & meniscus loss
  – 9 x greater cartilage damage – 2 yrs. Vs. 1 mo. ACL rec.

Meniscus Repair
ACL Deficient Knee

• Hanks AJSM ’90
• Failure rate greater, but not contraindicated in ACL deficient knee

ACL Reconstruction & Meniscus Repair

• Meniscus Repair
Rehab. Guidelines
Over-ride ACL Guidelines
• Therefore: Meniscus Repair rehab follows same timeframe – with or without ACL
  Reconstruction
• ACL Reconstruction aids in healing response of meniscus repair
• Tenuta AJSM ’94
  90% healing w/rec.
  57% healing cruciate stable knees

Healing – How ACL Reconstruction Helps

• Meniscus – poor blood supply centrally
• ACL Rec. = Drilling of bone tunnels = bleeding
• Bleeding = increased healing response for meniscus repair

Early Days – Meniscus Repair
Charles Henning, M.D.

• Henning repaired all types of meniscus tears
  - Henning CORR 1990
• Used fibrin clot squeezed into knee
• Believed this promoted healing response – exact mech. never proven
• Reduction in their failure rate from 61% to 8%
Fibrin Clot

- Arnoczky et al, JBJS ’88 proposed fibrin clot appeared stimulus for reparative cells - provides scaffolding for reparative process.
- ACL Reconstruction simulates similar stimulation for meniscus healing.

Meniscus Repair Rehabilitation Progression

- Will always be variable due to location/extent of tear-stable, unstable (bucket handle into joint)
- Analogous to RCR in shoulder
- Barber – Accelerated Rehab. Arthroscopy ’94
- Grp. I – traditional program = 19% failure
- Grp. II – accelerated, no limits on ROM, WB, pivoting sports o.k. = 10% failure
- Physician Call not PT
- Middle of road rehab

Guidelines for Meniscus Repair Rehabilitation

1st Question: Weight Bearing?

- Wide Variance in Protocols
- Some believe that WB helps “squeeze” repair together
- Most believe NWB allows sutured meniscus to heal

Current Protocol WB

- Sutured Meniscus = WB 2-4 weeks = stable, unstable = 4-6 wks.
- Vascular Zone – RR, RW, WW location?
- WBAT = with crutches after 2-4 weeks – physician’s call
- Pt. Age may be factor – decreased cellularity >40 Mena AJSM ’07
- Intrinsic – within meniscus
- Must determine – sutured versus arrowed meniscus repair
- Arrows – versus debridement
- “Repair” has many faces – Communication - key

Non-Weight Bearing

- May reduce forces, but NWB promotes atrophy, malnutrition to articular cartilage
- NWB compliance – difficult to achieve
- Immobilization reduces GAG’s, cellular activity in meniscus Djurasovic AJSM ’98
- Must move knee – assess individual progression

Beginning WB Routine

- Wt. shifting
- Cone Ambulation
- Gait training – “bend knee” when lifting involved leg
- Total gym good transition
Meniscus Repair Rehab

- **2nd Question**: ROM?
- ROM guidelines are also varied
- Some – lock into extension
- Typical is 30 deg. Per week increase
- Current protocol – lock into ext. until adequate quad control ROM as tol.

Meniscus Repair ROM

- ROM limited to 90 degrees early passive ROM, but begin early even if locked!
- *No active* compressive flexion beyond 90 degrees
- Posterior horns are loaded
- 80% of all meniscus tears in posterior horn
- Smith AJSM '01
  - 99% MM, 87% LM
  - Posterior Horn

Peripheral Posterior Horn
MM Tears Most Common = 40%

Meniscus Repair ROM

- What is active compression >90 Deg?
- No squats
- Leg Press – limit ROM 0-90

Meniscus - ROM

- No limits to extension ROM
- Most frequent complication of meniscus repair (primarily medial) LOM extension
- Prevention: Immediate quad activation = biofeedback or muscle stim – “force your knee straight”
- If no quad = aspiration for swelling
- AJSM '01 Millet – Motion Loss

Meniscus ROM

- If protocol is cautious with ROM
- Must be willing to accept possible arthroscopic release of adhesions that may occur
- Stiff Knee worse than loss of meniscus

Treatment Techniques for Stiff Knee

- Flexionator, Extensionator ERMI
- Allows patient to control forces
- More forceful than CPM
Infrapatellar Fat Pad
- Source of pain post-op ACL/meniscus rep.
- ATS portals pass through fat pad
- Cause fibrotic hematoma in some patients
- May affect p. tracking with ATS
- Early intervention = US,Laser,manual soft tissue release,scar mobilization, normal quad function = no contracture

Muscle Re-education
- Question #3: How & when to begin strengthening
- Quad re-education begins immediately 10s
- Open chain 90-0 o.k.
- WB ex. Begins w/leg press 90-0

Closed Chain Progression
- Leg Press
  - MR Systems allows strength & position sense simultaneously
  - Control ROM below 90 early meniscus repair active compression control
  - Proprioceptors located in ACL & joint capsule

Closed Chain Progression
- Chair Stand-ups
  - 3x20 Place feet shoulder width apart
  - Toes out slightly
  - Knees behind toes
  - Maintain lumbar lordosis – power lifter positioning

Meniscus Repair Progression
- 4th Question: When to allow running, return to function?
- 50% of WB load transmitted to knee in full extension
- 85% of WB load transmitted in 90 d. flexion
- Provides 20% shock absorption
- Current protocol = 4 mos.

Gradual Loading
- Heel – Toe ambulation
- Step-up routine
- EFX
- Sports Cord
- Luxury rehab = underwater treadmill, alter G
Meniscus Healing Pujol AJSM ‘08

- Arnoczky AJSM ‘83 – dogs – 10 wks. healing complete
- Healing rate > 50% = good results
- Overall healing rate = 73%
- When is it healed? – no data–early stages of healing human meniscal repair most studies 6-7 mos. fu

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Return to function activities

- Running 4-6 mos.
- DL Plyos 4-6 mos.
- Functional training 5-6 mos.
- Return to full contact 6 mos.

Conclusion

- Most variable knee protocol
- Progression dependent on stable, non-stable, vascular zone location
- Close communication M.D./P.T. – critical
- Be patient with progression
- Recognize early signs of stiffness
- Gradual, steady loading & progression = fewer mistakes

Age Effects Us All

- Kevin Russ 1990
- Kevin Russ 2030