OCCUPATIONAL CARTILAGE AND MENISCAL INJURIES OF THE KNEE

Lyndon B. Gross, MD, PhD
The Orthopedic Center of St. Louis
ANATOMY OF THE KNEE

- Bones
- Ligaments
- Meniscus
- Articular Cartilage
HISTORY

- Chief Complaint
- Age
- Mechanism of Injury
- Location
- Instability
- Mechanical Symptoms
- Prior Treatment
- Occupation
- Number of Years Working
- Changes in Work Environment
PHYSICAL EXAMINATION

• Inspection
• Range of Motion
• Special Testing
• Palpation
• Neurovascular Examination
RADIOGRAPHIC EVALUATION

• Plain X-Rays
  – Standing AP
  – 45° Flexion weight-bearing PA
  – Lateral
  – Merchant
MAGNETIC RESONANCE IMAGING

- MRI
  - Noninvasive
  - Sensitive
  - T1, T2, FSE, 3D
  - SPGR, MRA
MENISCAL INJURIES
MENISCUS

Anatomy

- Medial – Wider posteriorly
- Lateral – Semicircle, equal width anterior and posterior
- Red-White Zone – Peripheral blood supply only
- White Zone – Avascular
MENISCUS
Function

- Load Transmission
- Lubrication
- Nutrition
- Joint Stabilization
MENISCAL INJURIES

History

- Traumatic or Atraumatic
- Joint Line Pain
- Swelling
- Loss of Motion
- Locking or Catching
MENISCAL INJURIES

Physical Examination

- Palpable Joint Line Tenderness
- Effusion
- Limitation in Motion
- Provocative Test
MENISCAL INJURIES

Imaging

• Plain X-rays
  – Rule out loose bodies, fracture or osteoarthritis

• MRI
  – 89% to 98% Accuracy for meniscal tears
TYPES OF MENISCAL TEARS

- Vertical
- Longitudinal
- Oblique
- Radial
- Horizontal
- Complex
ACUTE MENISCAL TEAR
DEGENERATIVE MENISCAL TEAR
ACUTE MENISCAL TEAR

Treatment

- Non-Operative
  - RICE
  - Anti-inflammatory medications
  - Cortisone injection
  - Brace
  - Physical Therapy
Operative
- Partial Meniscectomy
- Meniscal Repair
- Meniscal Transplantation
PARTIAL MENISCECTOMY

- Tears not suitable for repair
- Removing only offending fragment or flap
- Obtain a smooth stable rim
- Short rehabilitation period
- 80% -90% Short-term satisfactory results
- Long-term results show degeneration
MENISCAL REPAIR

- Tears amenable to repair should be repaired
- Better long-term results than meniscectomy
- Longer rehabilitation than meniscectomy
- Delayed return to normal activities
- Failure rate associated with several factors
MENISCAL REPAIR

Predictive Factors

- Patient Age
- Rim Width
- Tear Length
- Age of Tear
- Tear Pattern
- Knee Stability
SURGICAL RECOVERY

• Meniscectomy
  – PT begins at 2 days post op
  – Full weight bearing
  – PT for 4-6 weeks for strength
  – Full activities at 8-12 weeks

• Meniscal Repairs
  – PT begins at 2 days post op
  – NWB for 2 weeks
  – Brace for 6 weeks
  – Functional activities at 3 months
  – Return to running, jumping, restraining at 6 months
CARTILAGE INJURIES
ARTICULAR CARTILAGE

• Articular Cartilage
  – Resilient
  – Wear resistant
  – Low-friction surface
  – High compressive stiffness
ARTICULAR CARTILAGE Injuries

- Difficult to diagnosis
- Non-specific symptoms
- Physical examination may show pain and swelling
- X-ray studies may be negative
- MRI may help confirm examination
  - MRI Arthrogram
- Arthrosocpy most accurate
ARTICULAR CARTILAGE INJURY CLASSIFICATION

Outerbridge System

- Grade I - softening
- Grade II - fibrillation
- Grade III - fissuring
- Grade IV - full thickness

Orthopedics 1997:20:525-538
ARTICULAR CARTILAGE

Acute Injuries
ARTICULAR CARTILAGE
Chronic Injuries
• Non-Operative
  – Lifestyle modification
  – Formal rehabilitation program
  – Orthotics/unloader bracing
  – NSAIDs
  – Chondroprotective Supplements
  – Corticosteroid injections
ARTICULAR CARTILAGE

Treatment

- Arthroscopic Debridement
- Microfracture
- Autologous Chondrocyte Implantation
- Matrix-Induced Autologous Chondrocyte Implantation (MACI)
- Osteoarticular Transplantation
MATRIX-INDUCED AUTOLOGOUS CHONDROCYTE IMPLANTATION (MACI)

- Biological Solution
- Arthroscopy is performed to assess lesion size, debride unstable flaps of cartilage, and to harvest (biopsy) chondrocytes
- Cells are cultured and multiplied in laboratory
- Cells are “seeded” onto collagen membrane
- a “hyaline like” reparative tissue
- Approved in patients 55 and younger

MATRIX-INDUCED AUTOLOGOUS CHONDROCYTE IMPLANTATION (MACI)

Cartilage Defect

MACI Implant
MATRIX-INDUCED AUTOLOGOUS CHONDROCYTE IMPLANTATION (MACI)
MACI Results-SUMMIT Study

- Comparing MACI vs microfracture in the knee, 2 year follow up
- 144 patients, mean lesion size 4.8cm²
- MACI KOOS pain and function scores improved more from baseline than microfracture
- Lower number of treatment failures in MACI

OSTEOARTICULAR TRANSPLANTATION

Autograft

• Round plugs of cartilage and underlying bone from non-weight bearing portion of joint used to fill defect
• Generally for isolated defects 2cm² diameter
• Technically demanding
• Repair tissue maintains hyaline properties
• Significant increase knee rating score
• Definite donor site morbidity
OSTEOARTICULAR TRANSPLANTATION
Autograft
OSTEOARTICULAR TRANSPLANTATION

Autograft

Cartilage Defect

Cartilage Implant
OSTEOARTICULAR TRANSPLANTATION

Allograft

- Transplantation of fresh osteoarticular allograft (cadaver) into defect
- Plug of tissue affixed with bioabsorbable screws, metal, or press fit
- Indicated for larger lesions or non-contained lesions larger than 2cm²
- Used when other methods fail
- Problems due to graft failure, chondrocyte death, or disease transmission
- Average time to obtain graft: 2-4 months
OSTEOARTICULAR TRANSPLANTATION

Allograft
OATS ALLOGRAFT

Results

• Long Term OATS Allograft
  – 180 patients with mean average age 32.7 years
  – Mean 5 year follow-up
  – 37% underwent reoperation (number of previous knee surgeries predictive of reoperations and failure)
  – 87% allograft survival rate at 5 years

SURGICAL RECOVERY

• Osteoarticular Transplantation
  – CPM machine 4 weeks
  – PT begins at 7 days post op
  – NWB for 6 weeks
  – Brace for 6 weeks
  – PT for 3-4 months

• MACI
  – CPM machine 4-6 weeks
  – PT begins at 7 days post op
  – NWB for 6-8 weeks
  – Brace for 6 weeks
  – PT for 4 months
# Rehabilitation and MMI

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<tr>
<th><strong>Rehabilitation</strong></th>
<th><strong>Estimated MMI</strong></th>
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<tr>
<td>MACI: 4-6 months</td>
<td>MACI: 6-9 months</td>
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<tr>
<td>OATS Autograft: 3-6 months</td>
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SMALL CHONDRAL LESIONS

Lesion <2 cm²

Primary Treatment
- Low Demand
  - Debridement
  - Marrow Stimulation Techniques (MST)

- High Demand
  - Debridement
  - MST
  - Osteoarticular Autograft (OATS)

Secondary Treatment
- Low / High Demand
  - Osteoarticular Autograft (OATS)
  - Autologous Chondrocyte Implantation (MACI)

LARGE CHONDRAL LESIONS

- Debridement
- Marrow Stimulation Techniques (MST)
- Osteoarticular Allograft (OATS)

Lesion >2 cm²

Primary Treatment
- Low Demand
  - Debridement
  - Marrow Stimulation Techniques (MST)
  - Osteoarticular Allograft (OATS)

High Demand
  - Osteoarticular Allograft (OATS)

Secondary Treatment
- Low / High Demand
  - Autologous Chondrocyte Implantation (MACI)
  - Osteoarticular Allograft (OATS)

Thank You!!