Meniscus Injuries:
When to operate?  When not to?
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and Restoration

DISCLOSURES

Industry:
- Sanofi/Genzyme: Consultant (payments to KMSF, non-profit)
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- AJSM, CORR, JRS, O&O, Orthopaedics, Tissue Engineering

Patents:
- 08/051,524, PCT/EP98/00349

ARTHROSCOPIC MENISECTOMY

> 450,000 / yr in the U.S.
Most common procedure performed

National Center for Health Statistics, 1998
Meniscus Injuries: When not to operate?

- Dx: Osteoarthritis
- Complaint: Pain
- MRI findings:
  - Synovitis/Effusion
  - Meniscus tear
  - ACL: tear/ cyst/ thickening
  - Chondral defects
  - Chondromalacia
  - Baker’s cyst

These are typical signs of Osteoarthritis that you will not change by operating on it!!!!!

WHY DO I SAY THAT:

- Moseley et al NEJM 2002:
  - 165 patients randomized trial
  - Sham (needle) versus meniscectomy in OA patients
  - No difference between groups at 2 years

- Kirkeley et al NEJM 2008:
  - 160 patients randomized trial
  - PT and meniscal debridement vs. PT alone in OA patients
  - PT and debridment had better results for first 3 months, not thereafter

- Katz et al NEJM 2013:
  - 356 patients randomized trial
  - Meniscectomy and standard rehab versus PT alone
  - No differences at any time point but a 30% cross-over on non-op group

Epidemiology

- Review of 6,039 meniscal tears from 17 medical centers
  - Classification of tear types:
    - Complex 30%
    - Peripheral 26%
    - Flap 21%
    - Horizontal cleavage 12%
    - Radial 9.3%
    - Discoid <1%

CASE STUDY #1

HPI:
- 19y old college football running back
- NCAA Div 1AA
- Hit during game, able to continue on with pain "walked it off"

Exam Findings:
- Effusion
- Lateral joint line tenderness, pain with valgus stress
- Ligaments: Lachman, V/V Posterior drawer normal
- Minimal mechanical clicking during ROM
- ROM: 0/0/120

Case study and images courtesy of Christian Lattermann, MD University of Kentucky, Lexington KY.
MENISCUS REPAIR

The “soft shell taco” repair:

Lateral Meniscectomy

Generally worse prognosis

Fairbanks changes (%)

Bonneux et al. 8 yr f/u in athletes
Scheller et al. 12 yr f/u

Watch out for rapid progression of chondral damage following lateral meniscectomy

Alford et al. Arthroscopy 2005
**Center for Cartilage Repair and Restoration**

**Medial Meniscus**
- large tibial plateau
- concave

**Lateral Meniscus**
- shorter tibial plateau
- convex

**Functions of the meniscus?**
- Decrease in contact pressures (shock absorber)
- Stability (chock block)
- Lubrication

**Contact Pressure:**

<table>
<thead>
<tr>
<th>Meniscectomy</th>
<th>Area</th>
<th>Stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partial (inner 1/3)</td>
<td>10%</td>
<td>65%</td>
</tr>
<tr>
<td>Total</td>
<td>75%</td>
<td>235%</td>
</tr>
</tbody>
</table>
• Segmental meniscectomy (loss of hoop tension) equivalent to total meniscectomy
• Peripheral meniscus provides greater contribution to decreasing mean contact stresses than central portion

Levy, JBJS 1982
TREATMENT

- Non-OP treatment
  - First line treatment for degenerative tears without mechanical symptoms
  - Stable LMT / ACL tear
  - Stable horizontal tears

- Meniscectomy vs repair
  - Repair if possible
  - Don’t repair degenerative tissue in older pts

LONG-TERM EVALUATION OF LATERAL MENISCUS TEARS LEFT IN SITU AT THE TIME OF ACL RECONSTRUCTION

- Of 332 patients, only 8 (2.4%) required subsequent surgery for the lateral meniscus.

Shelbourne, Arthroscopy 2004
CASE STUDY #2

HPI:
- 55 year old male,
- Sudden onset of medial sided knee pain
- Some swelling but predominantly clicking, feeling of instability

Exam Findings:
- Small Effusion
- Medial joint line tenderness, palpable click
- Ligaments: Lachman, VV Posterior drawer normal
- ROM: 0/2/130

X-RAY:
MRI:

Case study and images courtesy of Christian Lattermann, MD University of Kentucky, Lexington KY.

MENISCECTOMY:

Case study and images courtesy of Christian Lattermann, MD University of Kentucky, Lexington KY.

GOALS OF ARTHROSCOPIC MENISECTOMY:

- Remove unstable torn portion
- Contour
- Preserve capsular rim
- Leave stable cleavage tears?
- Protect surrounding cartilage
RESECTION OF UNSTABLE FLAP TEAR

LOOK FOR THE MISSING FLAP

ARTHROSCOPIC PARTIAL AND TOTAL MENISCETOMY:

<table>
<thead>
<tr>
<th>Fairbanks Changes</th>
<th>Partial</th>
<th>33%</th>
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<tbody>
<tr>
<td>Total</td>
<td>72%*</td>
<td></td>
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<tr>
<td>(p&lt;0.05)</td>
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* 14% symptomatic with ADL’s

Andersson-Molina.
Arthroscopy 2002
LONG-TERM RESULTS OF MENISCUS REPAIR AND MENISCECTOMY:
13 YEARS F/U
○ At 7 yrs joint space reduction more common after meniscectomy
○ By 13 yrs No difference (only successful repairs compared to mx)

Evid:4

MENISCAL REPAIR COMPARED WITH MENISCECTOMY FOR BUCKET-HANDLE MEDIAL MENISCAL TEARS IN ANTERIOR CRUCIATE LIGAMENT-RECONSTRUCTED KNEES.
○ 6-8 yr / f/u
○ Outcomes of repair were not superior to partial removal.
○ Repaired degenerative tears had significantly lower subjective scores than those with non-degenerative tears.

Evid:3

PARTIAL (RIM PRESERVATION) VS. SUBTOTAL MENISCECTOMY
Outcome of Arthroscopic Meniscectomy:
Pt’s under 23 years of age
- 13 yr f/u

Radiographic Changes
Subtotal 87%
Partial 48%


RIM PRESERVATION IN DEGENERATIVE TEARS

Subtotal meniscectomy (rim resection) for a degenerative tear scored significantly worse on the knee-specific outcomes than individuals who had rim preservation for the same type of tear.

Englund et al. Rheumatology. 2001 Jun;40(6)

MENISCAL RIM PRESERVATION IS HIGHLY RECOMMENDED

**COMPARATIVE STUDY OF MEDIAL VS LATERAL MENISCECTOMY ON STABLE KNEES: 10-YEAR MINIMUM F/U**

<table>
<thead>
<tr>
<th>IKDC (Gr 1 or 2)</th>
<th>Degenerative changes with normal other side</th>
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<tbody>
<tr>
<td>Med</td>
<td>86% 22%</td>
</tr>
<tr>
<td>Lat</td>
<td>79% 38%</td>
</tr>
</tbody>
</table>

- Better prognosis: intact rim, vertical tears, no chondrosis

Chatain et al. Arthroscopy 2003

Evid: 4

**LONG-TERM RESULTS OF A-SCOPIC PARTIAL MEDIAL MENISECTOMY IN AN OTHERWISE NORMAL KNEE**

- 72 knees, age > 40, Minimum 15 yr f/u
- All posterior horn, stable rim preserved

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<tr>
<th>Chondrosis (Outerbridge)</th>
<th>Post-op G/E</th>
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<tr>
<td>0-2</td>
<td>95%</td>
</tr>
<tr>
<td>3-4</td>
<td>44%</td>
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</table>

Patel DV. AAOS 2006

**CARTILAGE STATUS PROGNOSTIC OF OUTCOMES**

- Katz et al.; Osteoarthritis Cartilage. 2006 May;14(5)
- Asik et al.; Knee Surg Sports Traumatol Arthrosc. 2003 Mar;11(2)
- Patel DV et al. AAOS 2006

Very Poor prognosis
DOES AGE EFFECT OUTCOME?
ARTHROSCOPIC PARTIAL
MENISCCTOMY IN PATIENTS OVER 70
YEARS OF AGE

Outerbridge | Satisfactory Outcome
---|---
0-2 | 80%
3-4 | 69%

55% increase with OA

Degenerative changes effect outcome more than age

Crevoisier et al. Arthroscopy. 2001

DOES GENDER EFFECT OUTCOME?

LATE RESULTS AFTER ARTHROSCOPIC
PARTIAL MEDIAL MENISCCTOMY.

- Maximum chondral damage
  - Outerbridge Gr II < 1cm, 7 yr fu
- Excellent clinical results in 96%
- Still had degenerative progression in 33%

Worse in women (p<0.05)

ACL TEAR WITH PARTIAL MENISCECTOMY

Factors predicting functional & radiographic outcomes after arthroscopic partial meniscectomy:

- Increased chondral damage (OA)
- Greater size of meniscal resection
- Degenerative type tear
- Lateral tears
- Valgus alignment
- Female gender
- Higher BMI
- Worse pre-op functional status (SF-36)
- Workman’s compensation

Meredith et al, Arthroscopy 2005

Lohmander et al. AJSM 2007: