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Introduction

- 53 yo male, former competitive runner and soccer player
- S/P bilat. medial meniscectomy in 2001 and 2005 & left microfracture in 2005
- Confirmed grade 4 cartilage loss med comp
- Now increasing med knee pain L>R with exercise and at rest.
- On exam now, stable knee with complete ROM, minimal swelling.

Disclosures

- Conflict of interest related to this presentation:
- Arthrex
Unicompartmental OA in the Young Patient

- Medial > lateral
- Varus > valgus
- Post meniscectomy
- Post ACL injury
- Primary knee OA

Early Knee OA

- Operative Considerations:
  - Figure out the problem
  - Alignment, instability, meniscus, cartilage
  - Assess axial and sagittal plane alignment
  - Goals of surgery will affect decision
  - Decrease pain
  - Improve function for ADL's
  - Return to activity

Early Arthritic Knee

- Often meniscal deficient
- Meniscal transplant?

Early Arthritic Knee ≠ transplant

- Usually grade 4 changes
- Both on tibia and femur

Osteotomy: technical issues

- Techniques for osteotomy:
  - Proximal Tibial
    - Lateral closing
    - Medial opening
    - Acute vs gradual distraction
  - Distal Femoral
    - Medial closing
    - Lateral opening
Evidence for Osteotomy

**Authors' conclusions**

- Based on 13 studies, we conclude that there is 'silver' level evidence ([www.cochranemsk.org](http://www.cochranemsk.org)) that valgus HTO improves knee function and reduces pain.
- There is no evidence whether an osteotomy is more effective than conservative treatment and the results so far do not justify a conclusion about effectiveness of specific surgical techniques.
- No difference between techniques or vs UNI.

**Factors affecting results of HTO**

- Heterogeneous population
- Variable indications
- Severity of disease/knee condition
- Surgeon dependent
- Technical differences, ie fixation, techniques
- Patient expectations
- So review of the literature is imperfect!

**Overall results of HTO**

- Good or excellent short and midterm results in isolated medial OA
- Outcomes gradually deteriorate to a success rate between 60% and 70% at 10 years from surgery.

**From Bonasia, Amendola, Int Orthopaedics, Sept 2009**

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Evidence for Osteotomy

- 13 studies, 693 pts
- 6 studies comparing 2 techniques
- 1 study HTO alone vs HTO + mcfx
- 4 HTO different post op rehab
- 2 HTO vs UKA

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Factors affecting outcome from HTO

- **Negative effect**
  - severe articular destruction
  - Undercorrected / overcorrected knees
  - advanced age
  - patello-femoral arthritis
  - decreased range of motion
  - previous arthroscopic debridements
  - joint instability
  - loss of correction
  - lateral tibial thrust

- **Positive effect**
  - Valgus alignment post correction

Complications of HTO

- Accurate correction improves results.
- Valgus **overcorrection** yields poor results:
  - Insall et al., JBJS (A) 1974
  - Coventry et al., Or Clin NA, 1979
  - Tjornstrand et al., CORR, 1981
  - Aglietti et al., CORR, 1983
  - Hernigou et al., JBJS, 1987

Overcorrection

- 40 yo F pain, valgus and hyperextension deformity, 20 yrs post hto

Post revision Lateral CW Wedge HTO

- 1 yr post op

Other factors

- Body mass index
  - No evidence to conclude BMI has any effect on outcome

Evidence for Osteotomy

- Complications (10-41%)
  - Peroneal N injury
  - Anterior compartment syndrome
  - Overcorrection/undercorrection
  - Proximal tib fib joint
  - Patellar height
  - Non union / malunion
  - Revision to TKA
Peroneal N injury

- Related to proximal tib-fib joint management

Complications

- Intrarticular fractures
  - OW 11%, LCW 10-20%
- Non union
  - OW 1-4 %/ CWO 1-4%
- Infection
  - Internal fixation up to 4%
  - Ex-fix up to 54% (pin tract)

Open vs Closing Wedge HTO?

- Lateral Closing Wedge HTO
  - Results deteriorate with time.
    - ~ 80% good/excellent @ 5 yrs
    - ~ 50% good/excellent @ 10 yrs

Why opening wedge?

- Advantages
  - Leave the fibula alone
  - One osteotomy
  - Maintains/corrects bony anatomy
  - Less likely to overcorrect
  - Revision to TKA ? simpler

Why opening wedge?

- Disadvantages
  - Bone graft
  - Slope alteration
  - Patella height
  - Rehabilitation/WB
Concern with Opening wedge Osteotomy

The high tibial osteotomy, open versus closed wedge, a comparison of methods in 108 patients

Open vs closed wedge

Osteotomy fixation

- Stoffel et al. 52 (2004)
  - compared modified Puddu plate (Arthrex, Naples, Fla) vs the TomoFix plate (Synthes, Solothurn, Switzerland)
  - Both provide immediate stability
  - TomoFix has more torsional and axial stability with lateral cortex fracture
- Agneskirchner et al. 53 (2005)
  - compared four different plates - Long rigid plate the most stable (TomoFix)
  - in their biomechanical study tested three plate fixation devices; No difference in stability
- Spahn et al. 56 (2006)
  - Compared fixation techniques (conventional plate, angle stable plate with or without spacer) and concluded that spacer implants have superior biomechanical properties and that angle stable plates may prevent fractures of the lateral cortex.

HTO Complications: Is there a concern revising an HTO to TKA?

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Table 1. Results of TKA Following HTO

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Follow-up (Years)</th>
<th>TKA (No.)</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Katz</td>
<td>1987</td>
<td>2.9</td>
<td>21</td>
<td>Results worse than primary TKA</td>
</tr>
<tr>
<td>Staheli</td>
<td>1987</td>
<td>3.7</td>
<td>35</td>
<td>Results similar to primary TKA</td>
</tr>
<tr>
<td>Windsor</td>
<td>1988</td>
<td>4.6</td>
<td>49</td>
<td>80% had patella baja, results similar to revision TKA</td>
</tr>
<tr>
<td>Scuderi</td>
<td>1989</td>
<td>N/A</td>
<td>66</td>
<td>89% had patella baja</td>
</tr>
<tr>
<td>Amendola</td>
<td>1989</td>
<td>3.1</td>
<td>42</td>
<td>Knee scores similar, but less ROM in the HTO group</td>
</tr>
<tr>
<td>Jackson</td>
<td>1994</td>
<td>N/A</td>
<td>20</td>
<td>Worse results after HTO compared to UKA, because of complications</td>
</tr>
<tr>
<td>Mont</td>
<td>1994</td>
<td>6.1</td>
<td>73</td>
<td>Worse knee scores in HTO group</td>
</tr>
<tr>
<td>Bergmanhof</td>
<td>1997</td>
<td>4.9</td>
<td>14</td>
<td>No difference in knee scores, more complications in HTO group</td>
</tr>
<tr>
<td>Takken</td>
<td>1998</td>
<td>10</td>
<td>41</td>
<td>Knee scores same, RSA tibial movement same</td>
</tr>
<tr>
<td>Washburn</td>
<td>2000</td>
<td>10</td>
<td>25</td>
<td>Worse knee scores in HTO group</td>
</tr>
<tr>
<td>Naudie</td>
<td>2000</td>
<td>N/A</td>
<td>90</td>
<td>Worse knee scores in HTO group</td>
</tr>
</tbody>
</table>

Evidence for Osteotomy SURVIVORSHIP : Naudie et al, 1999
Naudie et al, 1999

- **Subset of patients**
  - Age < 50 yrs and Flexion > 120 degrees
- Increased probability of survival
  - 5 years: 95%
  - 10 years: 80%
  - 15 years: 65%

**HTO : Indications**

- HTO may be a more predictable procedure in carefully selected patients with OA
  - Active, heavy demand
  - Pre op activity level
  - ROM > 120
  - Mild to moderate deformity
  - Age ?

**Evidence for Osteotomy**

Repair of articular cartilage and clinical outcome after osteotomy with microfracture or abrasion arthroplasty for medial osteoarthritis

**Knee, 2007**

<table>
<thead>
<tr>
<th></th>
<th>HTO group</th>
<th>FP group</th>
<th>AK group</th>
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<tbody>
<tr>
<td>Total number</td>
<td>37 knees</td>
<td>25 knees</td>
<td>51 knees</td>
</tr>
<tr>
<td>Age (years)</td>
<td>64.9±5.5</td>
<td>65.0±5.8</td>
<td>64.6±5.9</td>
</tr>
<tr>
<td>Postoperative KOA score</td>
<td>40.8±6.8</td>
<td>32.5±8.7</td>
<td>32.6±6.8</td>
</tr>
<tr>
<td>One year after surgery</td>
<td>56.1±9.9</td>
<td>54.0±5.9</td>
<td>56.4±7.2</td>
</tr>
<tr>
<td>Three years after surgery</td>
<td>56.0±6.6</td>
<td>56.0±6.6</td>
<td>56.9±7.8</td>
</tr>
<tr>
<td>Five years after surgery</td>
<td>55.9±6.8</td>
<td>55.6±7.4</td>
<td>57.8±7.8</td>
</tr>
</tbody>
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- No difference at 5 years

**Case: 55 yo avid runner**

- Case: 55 yo avid runner

**50 yo avid runner**

- 50 yo avid runner
2 years after HTO

- Gave up running
- 320 km bike race

Summary

- Osteotomy is a good option in the right patient
- Assess the patient expectations and knee condition
- Accurate correction and performance of the surgery is essential
- my choice: Opening wedge HTO

Thank you