Current Management Options for the Unstable Focally Arthritic Middle-aged Knee
With focus on HTOs and UKAs +/- ACL reconstruction

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Aims of this Talk
• Discuss common and uncommon treatment paradigms for the active middle-aged patient with focal OA and an unstable knee

Main Variables to Consider
ACLR, UKA, HTO, Cartilage/Meniscal Surgery

Throw Out the Cookie Cutter
• Not all 50 year olds with an unstable knee are indicated for the same treatment paradigm
• One may need just an HTO, brace, or arthroscopic debridement
• Another may need an HTO and an ACLR
• Or even UKA and ACLR

DJD of the Knee in Active Patients
• Spectrum from focal chondral defects to established arthrosis
• Comprehensive history emphasizing symptom manifestation, activity level, and previous surgical treatment
• PE must include evaluation of alignment, gait patterns, and coexisting disorders of spine and adjacent joints
• Diagnostic testing should include the 45° flexion weight-bearing P-A Rosenberg


Disclosures
• Research support: Arthrex, MTF, Histogenics
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• Royalties: Arthrex, Inc.
DJD of the Knee in Active Patients

- Nonsurgical: rehabilitation, lifestyle modification, bracing, supportive devices (unloader brace), and medical management, including use of new chondroprotective oral and injectable agents
- Surgical options: arthroscopic debridement can provide a positive, but often short-lived, reduction in the severity of symptoms
- HTO/DFO may maintain patient’s active lifestyle and delay TKR
- UKR and TKR can each provide reliable relief of symptoms but may not permit a return to the activities that the patient values


Arthroscopic Treatment for Osteoarthritic Knee

Review of the available literature

- Localized symptoms < 6 months
- Mechanical symptoms (catching or locking)
- Clinical sign
  - Minimal effusion, localized tenderness, and positive meniscal stress test
- ROM: < 10° flexion contracture & > 120° flexion
- Weight bearing view
  - < 3mm joint space narrowing within physiologic valgus Age: < 70 years
- BMI: < 30


Arthroscopy of the Arthritic Knee: European Survey

- Improvement in cases of low-grade osteoarthritis, neutral leg axis, persistence of symptoms < 6 months, age < 60
- Partial meniscectomy and notchplasty with extension deficit were considered as successful treatment options
- Debridement was an accepted indication, with an outcome mainly rated as fair
- Unsatisfactory results if bone edema by MRI


Where Does HTO & UKR Fit in Treatment Plan?

- Malalignment/Joint Space Narrowing
- Degenerative Changes
- Loss of Function
- Conservative Treatment
- HTO vs UKR
- TKR
- Joint Preservation
- Joint Resurfacing
- Joint Replacement

HTO Indications

- < 60 y/o active patient
- Varus knee (5 - 15°)
- Medial compartment ≤ grade III
- Intact lateral & P-F compartments
- Flexion > 120°
- Stable joint

High Tibial Osteotomy (HTO)

- Common procedure for treatment of symptomatic medial compartment arthritis associated with varus malalignment
- Also common with
  - Medial MAT
  - MFC cartilage restoration surgery (ACI, OCA)
- Staged or concomitant
**HTO Indications Expanded**
- Posterolateral laxity
- Varus hyperextension thrust
- ACL deficiency & varus thrust or alignment
- Combined ligamentous laxity with varus or posterolateral thrust

**Standardized Radiographs**
- 4-view weight bearing anteroposterior (AP), lateral, notch, sunrise
- Bilateral weight bearing Rosenberg (450 PA)
- Bilateral weight bearing full-length hip-to-ankle radiographs

**Measurement Steps**
- Mechanical axis and desired axis measured drawn
- Desired mechanical axis drawn so weightbearing line drops between eminences
- Angle formed by lines from apex of planned osteotomy to current and desired mortise forms correction angle

**Features of New Wedge Implant**
- Guided+jigged instrumentation / Safe, accurate corrections
- PEEK implant/PEEK anchors/ less pain, similar modulus as bone, permanent, flush with bone
- Step by step technique / easy to learn, predictable

**Fence Around the Tibia**
Combined HTO and AISB ACLR

Approach

Technique Overview

• Determine correction
• Determine implant size
• Surgical approach
• Biplanar alignment guide places jig in correct position
• Hinge pin drill hole made
• Central drill holes made
• N-V Shield placed

• Osteotomy completed
• BVF placed if solid
• PEEK implant placed
• Fasteners placed
• BVF placed if injectable
• Bone graft from drill holes added

Biplanar Alignment Guide Placement with Hinge Pin

N-V Shield and Osteotomy Cut

PEEK Implant Placed, Secured & Quickset
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Final Closure

Does HTO with the iBalance fixation system correct alignment?

Operative Repair

• All patients undergo operative repair utilizing the iBalance fixation system with Osferion with porous β-TCP wedge and ACP

Outcome Measures

• 10 Outcome Measures
  • Time to FWB
  • Healing on Radiographs

• 20 Outcome Measures
  • WOMAC
  • Hematoma, Bleeding
  • Pain & Medication Use

Block Randomization: Two Treatment Arms

• Group I
  • TTWB 6 wk

• Group II
  • WBAT
    • Pain ≤ 3
    • Off narcotics

Standard HTO using the PEEK iBalance implant with Osferion and ACP ROM locked brace 6 wk.

Hypothesis

Time to full weight bearing will be significantly reduced in group allowed to bear weight as tolerated and healing will not be compromised
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**Data Points**

- **PRE OP**
  - WOMAC, Pain and Medication, Radiographs
- **1 WK**
  - Pain and Medication, Radiographs
- **8 WK**
  - WOMAC, Pain and Medication, Radiographs
- **12 WK**
  - WOMAC, Pain and Medication, Radiographs
- **6 MONTH**
  - WOMAC, Pain and Medication, Radiographs

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**MAIN QUESTION**

Will improved fixation strength allow patients to weight bear early?

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**Time to D/C of Crutches**

<table>
<thead>
<tr>
<th>Days Until Full Weight Bearing</th>
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<tr>
<td>Rapid WB</td>
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<tr>
<td>Average 12 days (9-21) post-op in the early group before no crutches needed</td>
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*significantly different, p < 0.05*

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**Pain by Group Assignment**

Both Groups Low Pain Levels at 1 week post-op

Early group: earlier and greater reduction in pain

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Will there be a difference in pain scores either as a result of the minimally invasive approach or as a result of weight bearing?
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Will weight bearing jeopardize the stability of the iBalance construct?

Pain Compared to Current Literature

Weeks Post-Op

0 10 20 30 40 50 60 70 80 90 100

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

Early vs. Delayed

Tomofix at 6 wks. 2010

Early vs. Delayed

UKA

TKA

Will weight bearing adversely affect the mechanical correction achieved with iBalance?

1 wk post-op Early vs. Delayed

No Difference - no collapse, fx.

6 wk post-op Early vs. Delayed

No Difference - no collapse, fx.

6 m post-op Early vs. Delayed

No Difference - no collapse, fx.
Summary: Key Highlights

- Growing need for knee realignment and joint preservation procedures
- HTO evolved from "freehand procedure" to guided, predictable/reproducible procedure

Conclusions: iBalance HTO Game Changer

- No increased complications
- Slope, correction maintained
- Early weight bearing appears safe and efficacious for HTO
- No difference +/- ACLR

UKR Benefits

- Preservation of kinematics and improved gait
- Preservation of uninvolved tissue and bone
- Lower perioperative morbidity
- Less blood loss
- Accelerated patient rehabilitation and recovery
- True outpatient surgery

Sports Activities after Medial UKA

- 78 of 131 participated in sports before surgery (mean age 64.4 years)
- 80.1% returned to their level of sports activity after UKA
- 6 took up sports after surgery while 15 stopped their sports
- Found a shift from high- towards low-impact sports
- Active patients had significantly higher scores for the OKS, KSS, WOMAC and UCLA score
- Complication rate was comparable in both groups.
Combined UKA with ACLR

- UKA is a viable option in a select group of patients to decrease pain and maintain an active lifestyle.
- Important to manage appropriate expectations for a successful outcome.


Combined ACLR and Oxford UKA

- 15 isolated medial UKA vs 15 UKA + ACLR.
- Mean outcome scores for both the ACLR and ACLI groups were high with no significant difference.
- 1 in ACLR group needed revision to TKR (infection).
- Short-term results of combined ACLR & UKA: excellent.
- Viable treatment option for young active patients with symptomatic arthritis with ACL deficiency.


Indications

- Ritter 2004
  - Analyzed 4021 knee arthroplasties.
  - 6.1% met anatomic qualification.
  - 4.3% met clinical standards.

Preoperative Assessment

- History
  - Localized pain.
  - Activity related.
  - Beware night pain.
- Exam
  - Malalignment of the limb should be passively correctable to neutral and not beyond.
  - Flexion contracture less than 15°.
  - Flexion to 110°.
  - One finger test vs. the knee grab.

Preoperative Assessment

- Radiographs
  - Radiographs.
    - WB AP, Flexion WB PA, Lateral, Sunrise / patellar view.
    - Evaluate other compartments.
    - Tibiofemoral subluxation.
- MRI
  - Ligamentous integrity.
  - Osteonecrosis.
  - Final decision made in OR.

Results

- Berger 2005 96% 10 year.
- Price 2005 93% 15 year.
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UKR Combined with ACLR

- 5-10 year f/u of 52 patients (mean age 51, 36 - 57)
- Mean Oxford knee score was 41 (sd 6.3; 17 to 48)
- 2 patients required conversion to TKR
- 93% implant survival at 5 years (95% CI 83 to 100)
- All but one patient reported being satisfied with the procedure
- Outcome not influenced by age, gender, tunnels, or staging
- ACL reconstruction and UKR gives good results in patients with end-stage MCOA secondary to ACL deficiency

My Analysis

- Previously two types of HTO:
  - Chondroprotective HTO: done to protect MAT, OCA, ligament grafts
  - Salvage: done to offload arthritic painful medial compartment
- UKR likely better for “salvage HTO” group

My Common Scenarios

1. Arthroscopy and UKA
2. Isolated UKA
3. ACLR with UKA (medial >> lateral)
4. UKA + Biocartilage/Microfracture
5. UKA after prior iBalance HTO
6. UKA + PFJ (bicompartamental)

My Practice, Past 12 Months

- 480 cases per year
- 40:40:20, Knee/Shoulder/Hip
- ~ 200 knees
- 60 UKAs, 10:1 ratio Medial to Lateral, since February 2013
- 12 UKAs with ACLRs (2 Lateral)
- 3 UKA after iBalance HTO
- All as true outpatient surgery, preop femoral block, interop IPACK block, no tourniquet
- 45 min UKA, 75 min UKA/ACLR

12-16-13 Case

- Left knee medial compartment pain and instability
- 45 year-old active male
- Initially seen by me in 2011: recommended Med MAT
- Sought multiple 2nd opinions: now back– MAT thought to be
- “Too little, too late”

Options

- Do nothing
- Injections: steroid, Synvisc, ACP
- Another arthroscopy
- Isolated ACLR
- HTO +/- ACLR
- Medial UKR +/- ACLR
Radiographic Workup

- Same as for HTO
- PA Rosenberg
- Mechanical Axis- Hip-Knee-Ankle if varus suspected
- Can accept up to 10-15°

Plan: Medial UKR with Allograft PL All-inside GraftLink ACLR

1. Arthroscopy...Graft preparation (no tourniquet for case)
2. Femoral and tibial retrosockets, park passing sutures out lateral portal
3. Open Medial iBalance UKR
4. Place GraftLink construct via arthrotomy prior to tibial Poly placement

Leave pad on bed, flexed for A'scope then straight, other leg in well leg holder, preplaced bump holds foot in high flexion for UKR

Surgical Flow for Lateral UKR and ACLR

- Only predrill Tibial retrosocket, place passing suture out lateral portal
- Lateral parapatellar arthrotomy
- After UKR femoral bony cuts...
- Make femoral retrosocket with flipcutter, so as to avoid blow out through condylar cut surface (angle akin to Pediatric ACL)
- Place UKR femoral and tibial components
- Pass graft
- Place poly

Graft Passage

- GraftLink ACLR
- Arthroscopy
- Femoral and tibial retrosockets, park passing sutures out lateral portal
- Open Medial iBalance UKR
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Graft Passage
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Poly Insertion

My Analysis
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  - Chondroprotective HTO—done to protect MAT, QCA, ligament grafts
  - Salvage—done to offload arthritic painful medial compartment
- UKA better than "salvage HTO"
- ACLR easy with both iBalance HTO & iBalance UKA
- UKA after HTO is viable option
- Move to Outpatient UKA

Postop Plan
- ACL-based rehab...
- Locked ROM brace, WBAT (crutches prn, 1-5 days)
- Straight leg raises, calf pumps, walking
- POVs #1 in 1-3 days: wound check, reinforce postop plan, PTx Rx
- Basically follow ACL rehab protocol
- POVs #2, 3, 4 @ 7-10 days, 6 and 12 weeks

Final UKA with Revision ACLR

UKA after iBalance HTO
Conclusions

• UKA is an excellent option for the 40-70 y/o adult knee
• Can do UKA after iBalance HTO, with ACLR
• True outpatient UKA is the wave of the future

Thank You

Questions?