Unicompartmental Knee Arthroplasty - Principles and Practice

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Today’s Goals
- Describe Unicompartmental Knee Replacement
- Indications
- Principles
- Management
- Results
- Pitfalls

History
- JBJS McIntosh 1958
- St Georg 1969
- Marmor 1972
- Ahlback Unicompartmental disease does not “spread to total involvement”
- Surgeon’s General impression “UKA harder than TKA”

Early Design
- Curved metal femur on flat plastic tibia
  Marmor 1972

Disclosure
- None relevant to this topic
- Consultant:
  Stryker Trauma
  Nuvasive

Editorial Board:
- JBJS, CORR, Journal of Trauma,
  Journal Orthopaedic Research
There is the General Opinion... UKA is harder than TKA and thus, less successful for the average surgeon.

Causes of knee deformity:
- Congenital
- Constitutional
- Physeal arrest
- Metabolic
- Osteopathy
- Postrauma
- Joint destruction
- Cartilage loss

Post-traumatic:
- Facture malalignment
- Leads to uneven load

Post-traumatic:
- Intraarticular damage
- Leads to poor chondral repair

OCD / Avascular Necrosis:
- Microcirculation damage
  - Dysplasias
  - Steroids
  - Alcohol
  - unknown
**Aging**
- Leads to meniscal and hyaline wear
- Uneven load

**Indications for Uni**
- Monocompartment osteoarthritis
- Active
- Minimal contracture
- Pain localization

**Symptoms of Unicompartmental Arthritis**
- Pain localized
- Pain present standing
- Pain severe walking
- Pain absent sitting
- Extended knee in varus

**Anatomic Features**
- Cruciates normal
- Anterior tibial cartilage eroded
- Anterior femoral cartilage eroded
- Opposite cartilage full thickness
- Collaterals normal length
- Posterior capsule short

**Incidence Medial to Lateral**
10:1

**X-ray Assessment**
**Why partial knee?**

Patients report a more "normal feel"
- Better motion
- Better kinematics
- Less recovery pain than TKA
- Faster recovery
- Less blood loss

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**Patient Selection for UKA**

- Isolated medial or lateral end stage disease
- Preserved ligaments
- Preserved ROM
- Adequate bone stock

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**Contraindications**

- Inflammatory arthritis
- Global pain
- Knee stiffness
- Ligament damage
- Osteoporosis
- Extreme deformity
- Extreme obesity

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**Deciding on Uni vs Osteotomy**

- AT least two office visits
- LISTEN to expectations
- Get MRI
- Review prior scope images
- Nuanced discussion

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**Osteotomy Expectations**

- Impose No restrictions
- 90% Pain relief
- Improved function
- Delay / Avoid TKA
  - 10 years

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**HTO over UKA**

Younger and more active
HTO prevention
High tibial osteotomy versus unicompartmental joint replacement: 7–10-year follow-up prospective randomised study
Stukenborg-Colsman, Wirth, Lazovic, Wefer

UNI > HTO
70 vs 60 % survival at 10 years
Lower complications in UNI
Age and activity expectations

UNI Recovery
- In-hospital Recovery: 1-2 days
- Significant Functional Improvement: 6 weeks – 3 months
- Maximal Improvement: 6 – 12 months

Rehabilitation
- Physical Therapist day of surgery
- Ambulate day of surgery
- Regain muscle strength
- Increase range of motion
- No CPM

Outpatient Unicompartmental Knee Arthroplasty Is Safe to Perform at an Ambulatory Surgery Center
A Comparative Study of Early Post-Operative Complications
John P. Cody, Kiel J. Pfefferle, Deborah J. Ammeen, Kevin B. Fricka
- Equivalent results
- Lower cost for outpatient

Practice Patterns 2014
Unicompartmental Knee Arthroplasty Versus High Tibial Osteotomy:
Benedict U. Nwachukwu MD, MBA
Frank M. McCormick MD
William W. Schairer MD
Rachel M. Frank MD
Matthew T. Provencher MD
Martin W. Roche MD

2007-2011
UKA up 5%
HTO down 4%

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TRIA 2016-2017
- 10 surgeons
- 105 UNI
- 200 TKA
- 0 infections
- 2 hospital admissions
- Anxiety
- Feather allergy
Limitations After Uni Surgery

- Avoid
  - Construction work
  - Certain types of heavy labor
  - Occupations that involve repeated climbing
  - Contact sports

Limitations After Surgery

- Athletics that place excessive stress should be avoided.
- Contact sports
  - Long distance Running
  - Frequent jumping

Eight Hundred Twenty-Five Medial Unicompartmental Knee Arthroplasties: The First 10-Year US Multi-Center Survival Analysis

48 yo male

90%

Manages arboretum
RTW 5 weeks

60 yo with lateral pain
Exposure with lateral more difficult

Osteonecrosis

56 yo female

Controversies
- Sports
- Youth
- Obesity
- ACL

Long distance walker
Combined UNI + ACL
Dodd, Murray JBJS

- 3 year follow suggests good durability
- I don’t advise

52 yo elite runner
- Medial joint line pain
- Multiple scopes
- Difficulty walking
- Desires to continue running
- HTO !!!

Still Running
50 m / week
12 years after bilateral HTO

At 14 years, hurts too much to run
Right medial joint line pain
States: “Doc, I will run…no matter what”

UNI after HTO ?
Now 6 years of running
50 miles / week
- Not recommended by Oxford group
- Yet, I perform if alignment neutral, and all other criteria met

55 year old
9 years s/p UKA
- Runs 5 miles per day
- Pain for past 6 months
Osteolysis, Aspirate and labs normal. Can I still run?
Revision with impaction graft
Agreed to quit running

Obesity and UKA?
- Literature mixed
- I have no set BMI
- But extensive discussion

Youth and UKA
- 22 yo medical student familial osteonecrosis
  - s/p scopes, OCD pinning, osteochondral allograft, distal femoral osteotomy
Custom tantalum support noncompliant & Pain free at 5 years

The difficulty with partial knees

- Selection
- Inaccurate placement
- Difficult to consistently restore:
  - Tibial slope
  - Coronal alignment
  - Femoral rotation
  - Limb alignment
  - Implant congruency

Causes of Failure
Australian registry  n=4362

- Loosening 45 %
- Disease progression 27
- Pain 10
- Infection 4
- Fracture 2
- Malalignment 1
- Poly wear 1
- Unstable 1

Causes of Failure
Dahl  n=13/753

- Loosening 3
- Disease progression 3
- Pain 4
- Bearing dislocation 4
- Infection 2
- Fracture 0
- Malalignment 0
- Poly wear 0
- Unstable 0

Mobile bearing dislocation

- Requires TKA
- Results from MCL injury
- Swedish registry 2.3 %
- Dahl 4 / 213

Technical failures with manual partial knees

- Subjective “feel” for balance
- Pin stress risers
- No mid-flexion knowledge
- Difficult to reference “slope”
Is robotics the solution?

Positioning
Surgeon-controlled intra-operative adjustments can be made to optimize implant placement.12

CT Planning
Patient-specific pre-operative plan enables more accurate implant positioning.9,10,11

Robotic UKA, Rhodes et al
Proves nothing

• 1135 knees at minimum 2-year follow up
• 909 knees 2-year follow up
• 46 knees 5-year follow up

Too early to say

Conclusions

 Patients are extraordinarily Happy
 Poor Patient Selection is the biggest Factor in the need for revision
 Osteoporosis
 Disease progression
 Mobile bearing dislocation 2 %
 Pain rare
 Malposition rare

Clinical Audit

• 33 years
• 1,257 HTO
• 3,512 TKA
• 753 UKA
Conclusions: Unicompartmental Knee Arthroplasty

- Careful patient selection
- Ideal indications
- Ideal expectations
- Ideal surgery
- Excellent, lasting results

Thank You