Disclosure
Objectives

- Keep the audience awake
- Review available Arthroplasty procedures for hip and knee arthritis
- Discuss New procedures and practices
- Provide general understanding of Joint Replacement Surgery for the PCP
Overview

• Most of what is new does not occur in OR
• Change in Health Care System focusing on cost reductions, outcomes and prevention of complications
• Some New toys!!
AAOS Evidence Based Guidelines, 2nd Edition
Non-Arthroplasty Treatment of Knee Arthritis

• List of evidence-based treatment recommendations
• Full Guideline
  – 1196 pages
  – 20 member workgroup
  – Over 10,000 separate pieces of literature reviewed
  – 16 peer reviewer representing multiple specialty societies
Goals and Rationale

• Improve treatment based on current best evidence
• Systematic review of available literature regarding treatment of Knee OA
• Demonstrates:
  – Good evidence
  – Where evidence is lacking
  – Topics that future research must target
Intended Users

• Orthopedic Surgeons
• All qualified Physicians managing patients with Knee OA
• Insurance carriers
• Governmental bodies
• Health-Policy decision-makers
Knee OA Guidelines

- **Strong Recommendation**
  - Quality of supporting evidence is high

- **Moderate Recommendation**
  - Benefits exceed the potential harm
    - Or opposite in case of negative recommendation
  - Quality of supporting evidence not as strong

- **Consensus Recommendation**
  - Expert opinion supports the guideline recommendation even though there is no evidence that meets inclusion criteria of literature review

- **Inconclusive Recommendation**
  - Lack of compelling evidence, benefits vs harm unclear
Article Inclusion

- Evaluated a treatment for Knee OA
- Enrolled a patient population of at least 80% patients had Knee OA
- Reported quantified results
- Full article published in Peer reviewed Journal
- Was not Cadaveric, animal or in vitro study
- Enrolled > 30 patients in each study arm
- Follow up at least 4 weeks
- >80% patients were 19 years or older
- English language article
- Published after 1980
- Not retrospective chart review
- Was prospective
- Measured patient oriented outcomes
Recommendation 1

- Patients with symptomatic OA of knee participate in self management programs, strengthening, low-impact aerobic exercise and neuromuscular education
  - Strong
Recommendation 2 (my #1)

Patients with BMI > 25 should be encouraged to lose weight
  • Minimum 5% of body weight
  – Maintain weight at lower level with appropriate diet and exercise
  – Moderate
Obesity

- Patients with BMI > 40 show 70% increase in surgical complications
  - Wound healing problems
  - Infection
  - Failure of components
  - Poor functional outcome
  - Nonsurgical morbidity
Obesity

Prevalence of Obesity in Adult Women (%)
Obesity

1991

2010

Legend:
- No data
- <10%
- 10%–14%
- 15%–19%
- 20%–24%
- 25%–29%
- ≥30%
Recommendation 3 (a,b,c)

• 3a
  – Cannot recommend use of acupuncture (Strong)

• 3b
  – Unable to recommend physical agents including electrotherapeutic modalities (Inconclusive)

• 3c
  – Cannot recommend for or against manual therapy (Inconclusive)
Recommendation 4

- Unable to recommend for or against valgus directing force brace
  - Inconclusive
Recommendation 5

• Cannot suggest lateral wedge insoles
  – Moderate
Recommendation 6

• Cannot recommend Glucosamine and/or Chondroitin sulfate
  • Strong
Recommendation 7

7a
- Recommend NSAIDS or Tramadol
  - Strong

7b
- Unable to recommend for or against use of acetaminophen, opioids or pain patches
  - Inconclusive
Recommendation 8

- Unable to recommend for or against the use of intra-articular corticosteroids
  - Inconclusive
Recommendation 9

• **Cannot** recommend intra-articular hyaluronic acid injections for patients with symptomatic knee OA
  - Strong
Recommendation 10

- Unable to recommend for or against growth factor injections and/or Platelet rich plasma
  - Inconclusive
Recommendation 11

- Cannot suggest the use of needle lavage
  - Moderate
Recommendation 12

• Cannot recommend arthroscopy with lavage and/or debridement
  – Strong
Recommendation 13

• Unable to recommend for or against arthroscopic partial menisectomy
  – Inconclusive
Recommendation 14

- A valgus producing tibial osteotomy may be performed in patients with symptomatic medial OA
  - Limited
Recommendation 15

• It is opinion of work group not to use free-floating interpositional device
  – Consensus
CMS

- THA/TKA account for the largest procedural cost to the CMS budget each year
  - Prime focus for identification of quality measures
- 2 hospital level quality measures
  - Complication rate
  - 30 day all cause readmission rate
• Complications (4.23%)
  – Acute MI, pneumonia, sepsis, surgical bleeding requiring reoperation, pulmonary embolism, death in 30 days, mechanical complications, joint infection, wound infection within 90 days
CMS Criteria for Total Joint Replacement

- Must have failed all of the following treatment options
  - NSAIDs, joint injection, use of assisted ambulatory device/brace, physical therapy
- Must have documentation of
  - Swelling
  - Pain preventing activities of daily living
  - Radiographic findings of osteoarthritis
CMS

• Mandates on patient outcome measures have driven the following initiatives
  – Pain management
  – Accelerated rehabilitation protocols
  – Blood management strategies
What’s New, What’s Not

- Perceived as New
  - Minimally invasive surgery
  - Unicompartmental Knee Replacement
  - Alternative Bearings
  - Trabecular Metal
  - Bone Grafting Techniques for Revision Surgery
  - Computer Assisted Surgery
  - Hip resurfacing
  - Get Around Knee
  - Patient Matched Blocks

- Sort of New
  - Alternate Bearings
  - Trabecular Metal
  - +/- Hip Resurfacing
  - Direct Anterior Approach
  - Patient Matched Blocks
  - Multimodal Pain Protocols
  - Accelerated Rehab
  - Blood Management
Direct to Consumer Marketing

- Much like Pharmaceutical Companies, Orthopedic Implant Companies have begun direct to consumer marketing.
- Companies make claims without good clinical data
- Patients perceive something recently advertised as new and improved
  - This is often not the case
- Patients are demanding “new” technology
- Many Physicians are taking advantage of this to increase market share
An Evaluation of Information Available on the Internet Regarding Minimally Invasive Hip Arthroplasty
Labovitch et al, JOA 1/06

• Evaluated 150 Web sites (3 search engines)
  – Hospital/University – 45%
  – News Stories – 26%
  – Private Medical Groups – 25%
  – Orthopedic Industry Sites – 6%
• 9% of sites referenced peer-reviewed publications
• 41% described the surgical technique
An Evaluation of Information Available on the Internet Regarding Minimally Invasive Hip Arthroplasty
Labovich et al, JOA 1/06

• 15% explained eligibility
• 45 sites offered the opportunity to make an appointment
• 13% explained the risks of the procedure
• More than 91% of the sites made specific claims regarding the **advantages** of MIS surgery
• Conclusion: “the information on the Internet regarding minimally invasive total hip replacement is misleading and of poor quality.”
Minimally Invasive Surgery

- Companies and Surgeons began to advertise prior to any randomized controlled studies.
- Patient saw it advertised and demanded it.
- All benefits were perceived.
- Now randomized prospective studies published showing no benefit.
Minimally Invasive Surgery

• The hope was that less damage to the soft tissues would provide
  – Decreased blood loss
  – Less pain
  – Faster recovery
• Original series however combined the change in surgical procedure with a change in pre and post op pain protocols
Total Hip Arthroplasty
Is Small Incision Better?
Rothman et al, JOA 6/06

- Matched pairs comparing regular to small incision THA
- No difference in: blood loss, analgesia requirement, functional recovery, LOS or disposition at discharge.
- One patient in small incision group required revision at 8 months
- “unable to detect any difference in outcome parameters”
- “recent extensive interest for MIS THA has been attributed to market-driven and patient driven demand for the procedure”
What’s New
Pain management

• Goals
  – Reduced narcotic use
  – Facilitate early rehabilitation
  – Facilitate early hospital discharge
  – Enhance patient’s satisfaction
  – Accelerated return to function
Pain management

• Multimodal protocols
  – NSAIDs (Celebrex/Mobic)
  – Long-acting oral narcotic (OxyContin)
  – Lyrica
  – Peripheral nerve blocks
  – Intra-articular injections with “cocktails”
  • Bupivacaine, Depo-Medrol, morphine, Toradol
Accelerated rehabilitation

- Patient’s begin rehabilitation protocols preoperatively
- Out of bed on postop day 0
- Surgical approaches
  - Direct anterior approach to the hip
  - Quadriceps sparing approach to the knee
Direct Anterior Approach Hip

- Patient supine during procedure
  - Better evaluation of the leg lengths
  - Preferred by anesthesia
- Single anterior incision
- Only tensor fascia lata muscle split
  - Posterior approach
Direct Anterior Approach Hip

- Matta Table
  - Expensive
  - Ankle fracture
  - Unable to stability test
- Keggi Approach
  - standard OR table used
Blood management

- Tranexamic acid
  - Antifibrinolytic
  - Inexpensive ($5)
  - IV or intra-articular
  - TKA
    - Decreased transfusion from 13.1% to 2%
  - THA
    - Decreased transfusion from 13.5% to 3.6%
  - Savings $ 65,000 per 1000 TJR
Blood Management

• Aquamantis
  – Bipolar sealer which delivers her frequency energy and saline simultaneously
  – process heats tissues to around 100 degrees centigrade, much less than for standard electrocautery, shrinking the collagen in the walls of the tissue vessels
  – Expensive
    • $500 per case
Arthroplasty for Treatment of Knee OA

- Standard TKA
  - Cruciate substituting
  - Cruciate retaining
  - Bicruciate substituting
  - Rotating platform
- Unicompartmental
  - Femoro-tibial
  - Patello-femoral
Unicompartmental Knee Replacement

- One Compartment involved
  - Medial
  - Lateral
  - Patella-femoral
- Less invasive surgery
- bone preserving
- More natural feel
- Quicker recovery
- Last approximately 10 years
- Revision surgery easier
Patello-Femoral Replacement

- Resurfaces patello-femoral joint
- Versions have been used over past 20 years
- Poor instrumentation
- Newer designs and instruments now available
- Easier revision
Total Knee Replacement

• Highly successful
  – Provide excellent pain relief
  – Restores joint function (not bionic)

• Survivorship
  – 10 years-98%, 15 years-92%, 20 years- 85%

• Complications
  – Infrequent but devastating
  – PE, MI, infection
Standard TKA

- Replaces all 3 compartments
- Highly successful procedure
- Pain relief
- Increase function
- Longevity ???
Rotating Platform Knee

- Perceived as new
- Actually has been in use since 1977
- Theory is that ROM will increase and will generate less wear debris
- No studies have shown any difference between this and a fixed bearing knee
Get Around Knee

- Marketed as new design
- Actually was released prior to 1996 by different company under another name
- No studies showing any advantage
Journey TKA

- Substitutes for ACL and PCL
  - Other systems either retain PCL or substitute for it, none address ACL
- Made of Oxinium
- Designed for high demand patient
- 30 year knee
Oxinium

- Is a metal that is treated with heat and oxygen
- Transforms the outer layer into a ceramic
- Decreased wear debris
- Scratch resistant
- Can not break
- Available in Knee and Hip Components
- Lubricious
Lubricious

- Having a slippery or smooth quality
- Joint fluid forms film on Oxinium, reducing wear debris even more
TKA
CAS

- Computer assisted surgery
- Available for THA and TKA
- Average alignment does not change
- Reduces outliers
- May be beneficial in Obese patients with difficult landmarks
CAS

- Adds time to procedure
- Must drill pins into bone at distant sites
- Equipment is costly
- Not reimbursable
- Will probably not change revision rate
CAS
Patient Matched Cutting Blocks

- X-ray, MRI/CT
- Computer generated cutting blocks manufactured
- Enhanced alignment
- Decreased surgical time
- Decreased exposure
- Canals not violated
- Increased Cost
Total Hip Replacement

- First performed in 1960
- Ball and socket of hip joint resurfaced with metal and plastic (traditionally)
  - Ceramic-plastic
  - Ceramic-ceramic
  - Metal-metal
  - Oxinium-plastic
- Fixation
  - cemented
  - Hybrid
  - Cementless
- Has evolved into the preferred surgical technique over the past 3 decades
Alternate Bearings in THA

- Ceramic-Ceramic
  - Excellent wear properties
  - Reduces 3rd body wear
  - Limited sizes
    - Neck lengths
  - Potential for ceramic fracture
    - Rare
    - Decreased with newer generation of ceramics
Alternate Bearings in THA

- **XLPE**
  - Cross linked Polyethylene
    - Radiation
  - Current industry standard
  - Articulates with metal or ceramic

- **Engh et al**
  - Min 10 year F/U
  - 114 conventional PE
  - 116 XLPE
  - Revisions
    - 8 CPE
    - 0 XLPE
  - Linear wear
    - CPE 0.21 mm/yr
    - XLPE 0.03 mm/yr
Hip Bearings

titanium hip socket with plastic liner

Oxinium™

ceramic

cobalt chrome

titanium hip stem
THA
Oxinium
Metal – Metal THA

• Seemed to be attractive alternative
  – Large heads (stability)
  – Low wear debris
• 2x greater failure rate
• Failure Causes
  – Corrosion
  – ALTR (pseudotumors)
  – Systemic Metal ions
Hip Resurfacing

- Ideal candidate is active male < 60 with OA
- Represents 4% of hip replacement surgeries (2009)
- 1.4 to 3.6 higher revision rate than standard THA
  - Femoral neck fracture
  - Surgical experience decreases revision rate
  - Not all resurfacings created equal
Resurfacing Consensus Group

- Surgeon should not do resurfacing until completing 200 conventional total hip arthroplasties
- Best candidate is male patient with OA
- Female should **not** be excluded
- Women of childbearing years should be excluded
- Patients with metal allergies should be excluded
- Patients with abnormal anatomy should be excluded
Birmingham Hip Resurfacing

- Swedish registry shows inferior results in males < 60 with conventional THA compared to general population
- Higher demand
- Current data shows little detectable clinical outcome differences between resurfacing and total hip
Birmingham Hip Resurfacing

- Women can still be candidate
- Must assure no osteoporosis or osteopenia
  - Bone Density test
Birmingham Hip Resurfacing

- Decrease chance of dislocation
  - Large head size
- No activity restrictions
- May run
  - Prohibited with conventional THA

Polar Radial Clearance = R₂ - R₁
Birmingham Hip Resurfacing

- Metalurgy is the key
- Metal on metal articulation
- Cobalt – chrome with a high carbide content
  - Increases the wear resistance
Birmingham Hip Resurfacing

- The procedure is bone sparing
- The femoral canal is not violated
- This conserves bone and makes a later revision surgery easier
- This makes it ideal for younger high demand patients
Birmingham Hip Resurfacing
Revision Surgery
Bone Grafting Techniques
Revision Surgery
Bone Grafting Techniques
Revision Surgery
Bone Grafting Techniques
Revision Surgery
Bone Grafting Techniques
Trabecular Metal

- Porus tantalum metal
- Highly biocompatible
- Low stiffness
- High friction
- Structural stability
- High strength to weight ratio
- Osteoconductive
- Tissue ingrowth occurs
Trabecular Metal

Bone Ingrowth
This micrograph shows the majority of Trabecular Metal solid space filled with bone of 12 weeks after surgery. ([The Trabecular Metal appears white on the image.]

Soft Tissue Ingrowth
The high-volume porosity and interconnected cellular structure of Trabecular Metal support rapid, vascularized tissue ingrowth. ([The Trabecular Metal appear black on the image.])
Trabecular Metal
Trabecular Metal
Trabecular Metal
Questions
AAOS Clinical Practice Guidelines
Venous Thrombo-embolism

• Work Group evaluated available English Literature concerning
  – Patient Screening
  – Risk Factor Assessment
  – Prophylactic Treatment
AAOS Clinical Practice Guidelines
Venous Thrombo-embolism

• Purpose
  – Help improve treatment based on current best evidence
  – Provide practice recommendations
  – Highlight gaps in Literature
  • Require further research
AAOS Clinical Practice Guidelines
Venous Thrombo-embolism

• Review English Literature after 1970
• 10 Recommendations
  – 1 Graded Strong
  – 4 Consensus
  – 1 Weak
  – 3 Moderate
  – 1 Inconclusive
AAOS Clinical Practice Guidelines
Venous Thrombo-embolism

• Recommendation 1 (Strong)
  – Recommend against routine Duplex US screening

• Recommendation 2 (weak)
  – Current evidence is not clear whether other factors increase the risk of VTE in THK/TKA patients
  – Previous VTE is the only risk factor that may place patient at a higher risk
• Recommendation 3 (consensus)
  – Patients are at risk for bleeding complications
  – Patients should be assessed for known bleeding disorders (hemophilia/liver disease)
AAOS Clinical Practice Guidelines
Venous Thrombo-embolism

• Recommendation 4 (moderate)
  – Antiplatelet agents should be discontinued before surgery (aspirin/Plavix)
• **Recommendation 5** (moderate)
  - Pharmacological agents and/or mechanical compression devices should be used in patients who are not at elevated risk for VTE
  - Unable to recommend for or against specific chemotherapy prophylactic agents
  - Current evidence unclear about which prophylactic strategy is optimal/suboptimal
• Recommendation 6 (consensus)
  – Patients with bleeding disorders should use mechanical compression devices only
• Recommendation 7 (consensus)
  – Patients with previous VTE should receive pharmacologic and mechanical prophylaxis
AAOS Clinical Practice Guidelines
Venous Thrombo-embolism

• Recommendations 8 (consensus)
  – Early mobilization is encouraged
• Recommendation #9 (moderate)
  – Neuraxial anesthesia suggested
    • Limits blood loss
    • Evidence suggests that it does not affect VTE
• Recommendations 10 (inconclusive)
  – Current evidence does not provide clear guidelines about whether IVC filter prevents PE in patients with contraindications to chemoprophylaxis
  – Unable to recommend for or against
Thank You