Osteoarthritis Update - What Can We Do?  
The Impact of New Techniques and Technology

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Overview

- General overview of arthritis
- Clinical evaluation of the Arthritic Hip and Knee
- Treatment Options
- Total Joint Replacement
- Impact of New Techniques and Technologies

Arthritis—Background

- Arthritis is the second most common chronic condition in the US
  - Most common among elderly
    - 20-30% of people over age 70 suffer from osteoarthritis (OA) of the hip
  - Seeing increased demand in patients 40-60 yo
    - Technology and Delivery Improvements
    - Patient Demand and Lifestyle
    - DTCA
  - 80% of patients with OA have some limitation of movement
  - 25% cannot perform major daily activities

Causes of Degenerative Arthritis

- **Primary**  
  - “Idiopathic” (Unknown)—80%
- **Secondary**  
  - Post-traumatic
  - Developmental dysplasia
  - Inflammatory arthritis
  - Osteonecrosis
  - Infection
  - Metabolic Disorders
  - Hemoglobinopathies and other blood disorders
  - Autoimmune disorders

Diagnosis—History

- **Location:**  
  - Hip
    - Grain with Thigh Radiation
    - Buttock
    - Overlying Greater Trochanter
    - Radicular symptoms/paresthesias
  - Knee
    - Anterior vs. Posterior
    - Diffuse vs. Isolated joint line pain
  - Intensity
  - Duration of symptoms
  - Precipitating factors:
    - Activity-related pain
    - Position related?
Diagnosis—History (cont.)

- Stiffness/swelling
- Mechanical symptoms/giving way
- Limitation in function
  - ADL’s
  - Walking tolerance (confounded by co-morbid conditions)
  - Use of assistive devices (cane, walker, wheelchair)
  - Threaten Recreational and Social Activities

Impact on Quality of Life!!!

- Helps tailor treatment recommendations
- Improved outcomes and patient satisfaction

Physical Exam: Hip

- Gait
- Active straight leg raise (Stinchfield test)
- Range of motion/joint contractures
- Leg lengths (true and apparent)
- Neurovascular exam

Physical Exam: Hip

- Antalgic vs. Trendelenburg vs. Coxalgic Gait
  - Antalgic
    - Shortened stance phase affected side
  - Trendelenburg
    - Weak abductor power affected side
  - Coxalgic
    - Pain affected side normal abductor power

Physical Exam: Hip

- True LLD
  - Osseous abnormality in femur, tibia or hindfoot
  - Hip or Knee Soft Tissue contracture
- Apparent (Functional) LLD
  - Fixed or Dynamic Pelvic Inequality

Physical Exam: Hip

- Thomas test
Physical Exam: Knee

- Inspection:
  - Gait
  - Mechanical alignment (varus/valgus)
  - Effusion
  - Skin changes
- Palpation
  - Crepitus
  - Warmth
  - Tenderness
- Range of motion
- Ligamentous exam
  - Varus and Valgus Stability
  - AP Stability
- Provocative tests (McMurray, Apley, Steinmann, Patellar Grind)

Provocative Maneuvers

Diagnosis: Radiographic Evaluation

- Hip Osteoarthritis
  - AP Pelvis
  - Dedicated AP and Lateral of the Affected Hip
- Knee Osteoarthritis
  - Standing Bilateral AP Knee
  - Standing Bilateral PA Bent View
  - Lateral View
  - Merchant View

Diagnosis: Advanced Imaging Studies

- MRI
  - Soft Tissue Pathology
  - Ossicle or Stress Fracture
  - Aseptic Necrosis
  - Limited usefulness in OA
- Bone scan
  - Identify supra-physiological skeletal process such as neoplasm, infection, accrue
  - Limited usefulness in OA
- CT
  - Helpful to assess osseous definition
  - Rarely required in OA
- Ultrasound
  - Diagnosis of fluid collection/aspiration
  - Functional studies
  - Limited usefulness in OA
Differential Diagnosis: Hip

- **Intrinsic**
  - Primary or Secondary Osteoarthritis
  - Bursitis (greater trochanteric, iliopsoas)
  - Labral tear/intra-articular loose body
  - Femoral Head/Neck Pathology
    - Aseptic Necrosis
    - Neoplasm
    - Occult or Stress Fracture

- **Extrinsic**
  - Lumbosacral spine disease
  - Spondyloarthropathy

Differential Diagnosis (cont.)

- **Intrinsic**
  - Primary or Secondary Osteoarthritis
  - Tendonitis/bursitis
  - Meniscal/chondral injury
  - Ligamentous injury
  - Symptomatic Popliteal Cyst
  - Occult or Stress Fracture

- **Extrinsic**
  - Lumbosacral spine disease
  - Spondyloarthropathy
  - Referred Pain from Hip Osteoarthritis (Medial Knee)
  - Peripheral vascular disease/Vascular Claudication
  - Nerve injury/irritation (sciatic, femoral, meralgia paresthetica)
  - Metabolic disease (Paget's disease, osteomalacia)
  - Malignancy/metastases
  - Hernia (femoral, inguinal, obturator)
  - Causalgia/Complex Regional Pain Syndrome
  - Other Referred pain

Diagnosis: Provocative Tests

- Anesthetic arthrogram (hip)
- Epidural steroid injection

Differential Diagnosis (cont.)

- **Extrinsic**
  - Lumbosacral spine disease
  - Spondyloarthropathy
  - Referred Pain from Hip Osteoarthritis (Medial Knee)
  - Peripheral vascular disease/Vascular Claudication
  - Nerve injury/irritation (saphenous)
  - Primary tumor or Malignancy/metastases (RARE)
  - Causalgia/Complex Regional Pain Syndrome
  - Other Referred pain

- **Activity Modification**
- **Weight Loss**
- **Bracing**
- **Cane/walker**
- **Physical Therapy**
Treatment Options—Medications

- **Anti-inflammatories**
  - Ibuprofen, Advil, Naprosyn
- **COX-2 Inhibitors**
  - Bextra, Vioxx, Celebrex
- **Nutritional supplements**
  - Glucosamine/Chondroitin Sulfate

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Treatment Options—Injections

- **Corticosteroid**

- **Viscosupplementation**
  - (proposed anti-inflammatory, anabolic, local analgesic, and chondroprotective effects)

  
  Conclusion:
  - Support exist for VS and CS injections for the temporary management of symptoms of OA
  - AAOS Clinical practice guidelines

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Surgical Treatment Options

- Joint preserving operations
  - Arthroscopy
  - Osteotomy
  - Autologous chondrocyte transplantation

- **Arthroplasty Options:**
  - Hemi/uni-compartmental arthroplasty
  - Resurfacing arthroplasty
  - Total joint arthroplasty

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Goals of Osteoarthritis Treatment

- **Relieve pain!!**
- Preserve function, mobility
Nonoperative or Operative?

- All therapeutic modalities have a common goal:
  - To control a patient’s symptoms to permit them an acceptable Quality of Life
  - When pain or dysfunction is unable to be controlled by nonoperative measures and a patient’s quality of life is threatened, TJR becomes a predictable and safe alternative

When to Refer?

Anytime a patient wishes to further their education on their options, both nonoperative and operative

The Future of Total Joint Replacement

- Value = Quality/Cost
- Standardized Delivery Pathways
- National Joint Registry
- Treatment Efficacy
- Patient Safety
- Physician Accountability
- Patient Education

Results following Hip and Knee Replacement

- About 90% of total hip and knee replacements are successful in terms of pain relief up to ten years following surgery.
  - The average hip or knee replacement lasts 15-20 years, depending on:
    - Age
    - Weight
    - Activity level

Complications

- Early (<10%)
  - Dislocation/instability
  - Nerve palsy
  - Infection
- Late (> 5 yrs post op)
  - Wear of articular bearing surface
  - Osteolysis
  - Mechanical loosening
  - Peri-prosthetic fracture
  - Implant failure

TJR Volume Estimates

- Primary and Revision TJA Procedures Performed in the US
- Projections
TJR Background

- Total hip replacement is one of the most cost-effective health care interventions in all of medicine

Health-Related Quality of Life in Total Hip and Total Knee Arthroplasty: A Qualitative and Systematic Review of the Literature

- Health Improvements
  - Substantial improvements in the scores for physical health – pain and physical function
  - Population normative values
    - Poorer preoperative SF-36 scores vs normal population
    - Improvement seen postoperatively
    - THA scores equaled scores of normal population
- Age Effect
  - Postoperative improvement similar despite age
- Gender Effect
  - Data difficult to interpret

Predictors of Health-Related Quality-Of-Life improvements

- High baseline preoperative psychosocial scores
  - Socioeconomic demographics, educational level, functional level, emotional state
- High volume facilities
- Fewer medical comorbidities

Weight Effect

- Literature suggests obesity alone does not influence outcomes

Cost Effectiveness

- Cost per QALY decreases as a function of time

TJR – Improvements in the last 10-15 years

- Technology
  - Implant Design
  - The Concept of MIS
  - Computer Assisted Surgery
- Delivery
  - ANESTHESIA, ANESTHESIA, ANESTHESIA
  - Operating Room and Hospital Efficiencies
- Patient Safety
  - Clinical Care Pathways

Prosthesis Design

- Cementless Implants
  - Biologic Ingrowth/Ongrowth
- Improved Revision Components
  - Improved Modularity
  - Design address complex technical factors like bone loss and instability
- Bearing Surface Improvements
  - Highly Cross-Linked UHMWPE
  - Ceramics
  - Metal

Alternate Bearing Surfaces

- Traditional bearing surfaces in TJA involve metal and high-density polyethylene
- Wear of bearing surface/osteolysis is primary cause of late failure in TJA
Alternate Bearing Surfaces – HCL Polyethylene, Metal and Ceramic

**Advantages:**
- Lower wear rates
- Improved longevity of prosthesis

**Potential drawbacks:**
- Fracture (ceramics)
- Metal ion toxicity (metal-metal)

What is Minimally Invasive Surgery

- A Direct Anterior THA? NO
- A Shorter Hospital Stay? NO
- Using a robot or computer? NO
- A Smaller Incision? NO
- A Smaller Implant? NO
- Unique to Total Joint Replacement? NO

A CONCEPT OF WELL-PLANNED, WELL-DESIGNED DELIVERY OF CARE

Goals of “Minimally Invasive” TJA

- Limit Biologic Footprint
- Minimize blood loss
  - Lower transfusion rates
- Better postoperative pain control
- Decreased Infection Rates
- Shorter inpatient stay (≤ 3 days)
- Earlier return to function
- Lower overall cost of care
  - Value = Quality/Cost
- Improve Patient Education
- Higher Patient Satisfaction

Computer Assisted Surgery

Multimodal Approach to Perioperative Pain Control

- Intraoperative anesthesia techniques
- Opioids, oral vs. parenteral
- Non-opioid Analgesics
- Membrane-Stabilizing Pain Medications
- Supportive or minimally invasive effects of pain management

Clinical Pathways

- Operating Room
  - Dedicated Orthopaedic Team: Surgeon, Anesthesiologist, Nursing Staff and Implant Rep.
  - Decreased OR time
  - Decreased turnover
  - Committed Ancillary Staff: Preop and PACU Nurses, Central Processing
  - WHO protocol = Enhanced Patient Safety
- Multi-disciplinary approach:
  - Physicians
  - RN’s
  - Case managers
  - Physical therapists
  - Pharmacist
  - Pain Management
- Goal: Maximize benefits to patient, health-care system
Post-Operative Protocol

- ≤ 3 day LOS
- Multi-Modal Pain Management
- Aggressive PT
- DVT Prophylaxis
- Earlier MD Follow-up

St. Charles Hospital Bend

- JCAHO Disease Specific Certification for Total Joint Replacement
- Outcomes Analysis
- Multidisciplinary Care Delivery Pathways
  - Orthopaedics, Internal Medicine, Nursing, Therapy, Pharmacy, Case Management
- Multidisciplinary Rounds
- Pilot Site for AJRR

OUTCOMES – The Center (2009)

- Medicare Surgical Complications
  - Acute Myocardial Infarction
  - Acute Renal Failure
  - Respiratory Failure
  - Major Bleeding
  - Septicemia
- OR Specific Measures
  - Joint Surgery
  - Catheter Use
  - Sepsis

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Robotics, Custom Patient Blocks and Other Hot Topics

- Marketing driven
- Evidence limited
- Possible future improvements

Summary

- Osteoarthritis of the hip and knee are common and often severely disabling conditions that affects millions of Americans
Summary

- Total hip and knee arthroplasty using conventional techniques, instrumentation, and implants have provided excellent clinical results in terms of pain relief and improvement in QoL.

- New techniques and technologies such as MIS TJR, well designed clinical pathways, computer-assisted surgery, and alternate bearing surfaces have the potential to shorten recovery time, improve implant longevity, and improve clinical outcomes associated with TJA.

- Long-term data is needed before we can adequately judge the impact of these new techniques and technologies on patient outcomes and quality of life.

Thank You!!!