ANESTHESIA FOR TOTAL JOINT REPLACEMENT SURGERY

Olivia Romano, MD
Assistant Professor
UCH Acute Pain Service Director
University of Colorado School of Medicine

DISCLOSURES
- No financial disclosures or conflicts of interest
- Will discuss several off-label uses of medications

OBJECTIVES
- Discuss clinical pathways for joint surgery
- Discuss evidence for choice of anesthesia
- Discuss multimodal analgesia and regional anesthesia options for joint replacement surgery
- Discuss elements of Early Recovery After Surgery (ERAS) programs for joint replacement surgery.

TOTAL JOINT REPLACEMENT
- Over 700,000 TKA and THA procedures annually in the US
- Demand expected to quadruple by 2030

GOALS OF A CLINICAL PATHWAY
- Pain
- Morbidity
- Cost
- Length of Stay
- Falls
- Blood transfusion
- Use of Resources
- Surgical Site Infection
- Functional Outcomes

DESIGNING A CLINICAL PATHWAY
- RCTs
- Database Studies
- Metaanalyses
- Anesthesia Care
- Hospital Support
- Surgeon Preference
MANY DECISION POINTS

Management Plan

CHOICE OF ANESTHESIA

SYSTEMATIC REVIEW: TKA & THA PTS

LARGE DATABASE TKA STUDY: SA VS. GA

LARGE DATABASE THA STUDY: RA VS. GA
LARGE DATABASE THA STUDY: RA VS. GA

Results (after matching with controls): RA vs GA

- **Deep infection:** 0.22% vs 0.57%; OR 0.38 (p < 0.01)
  - Independently assoc. factors: Revision THA, age > 70y & IDDM

- **CV complications:** 0.9% vs 1.4%; OR 0.61 (p < 0.01)

- **Pulm. complications:** 0.5% vs 0.9%; OR 0.51 (p < 0.01)

- **Average hospital LOS:** 3.2 vs 3.4 days (p < 0.01)

- **Prolonged hospital LOS:** 5% vs 6.6%; OR 0.75 (p < 0.01)

- **30-day mortality:** 0.29% vs 0.37% - NOT statistically significant
  - Independently assoc. factors: Revision THA, age > 70y, ASA class 3 or 4, IDDM

RCT OF TKA PROTOCOL: TIVA VS SAB

- **RCT comparing GA (target-controlled infusion of propofol plus remifentanil) vs SA (intrathecal bupivacaine) for TKA in a fast-track setting.**

  - **Design:**
    - N = 120 pts
    - ASA class 1-3
    - Age 45-85y
    - Exclusions: revision TKA, BMI > 35, rheumatoid arthritis, immunodepression, allergy to study drugs, preop opioids or steroids, hx of stroke or psych disease that could affect the perception of pain
    - Measures:
      - Primary = hospital length of stay
      - Secondary = Actual discharge time, postoperative pain, intraop blood loss, PACU LOS, diaphoresis, POV, need for urinary catheterization, patient satisfaction

  - **Preop:**
    - Celecoxib 400mg PO,
    - APAP 1g PO

  - **Intraop:**
    - No tourniquet or drains
    - Tranexamic acid 1g IV; abx prophylaxis; 2L LR over first 24h
    - High-volume LIA: Ropiv 0.2% 150mL w epi 10mcg/mL
      - Posterior capsule, periarticular, and anterior peri-incisional subcutaneous tissues

  - **Postop:**
    - Celecoxib 400mg PO q 12h, APAP 1g PO q6h
    - IV PCA morphine for 24h at 20mcg/kg 10 min lockout
      - After 24h, oxySR 10mg q12h and oxyIR 10mg prn
      - Q3h bladder scans with bladder catheterization protocol

- **Results:** (p < 0.05)
  - No difference in subject characteristics or surgical data
  - Hospital LOS: GA vs SA
    - 46h vs 52h
  - Lower initial pain scores in SA group, but after 6h lower pain scores were seen in GA group
  - 24h morphine consumption: GA vs SA
    - 1mg vs 5mg
  - Rates of dizziness, ability to walk 5m at 6h & 10h, and need for bladder catheterization showed benefit in the GA group.
  - No difference in PE, blood loss or patient satisfaction
RCT OF THA PROTOCOL: TIVA VS SAB

- Similar RCT comparing GA (target-controlled infusion of propofol plus remifentanil) vs SA (intrathecal bupivacaine) for THA in a fast-track setting in Sweden.
- Nearly identical protocol as TKA (but no LIA)
- Results:
  - LOS: GA 26h vs SA 30h
  - No difference in actual day of discharge
  - Lower initial pain scores in SA group, but after 6h higher pain scores were seen vs GA group
  - GA group had less dizziness & nausea, better ability to walk at 6h, & shorter PACU LOS
  - No difference was seen in blood loss, morphine consumption, need for bladder catheterization.

SYSTEMATIC REVIEW: COGNITIVE DYSFUNCTION

- Systematic review looking postoperative cognitive dysfunction in elective joint replacement
- RA showed benefit for first 7 days postoperatively
- Optimize depth of anesthesia with GA – mixed evidence
- Other techniques that may improve PCD:
  - Non-opioid pain management techniques
  - Oral opioid preparations only
  - Avoid all morphine

SUMMARY: CHOICE OF ANESTHESIA

- Overall complication rates are low
- Neuraxial anesthesia probably underutilized
- Patients with multiple comorbidities had significantly less complications
- Good outcomes with general anesthesia at some centers
- Specialized fast-track or enhanced recovery after surgery (ERAS) protocols may play a large role in outcomes differences

CHOICE OF ANALGESIA

- Multimodal analgesia
  - NSAIDs
  - APAP
  - Ketamine
  - Gabapentinoids
  - Local anesthetics
  - Opioids

LOCAL INFILTRATION ANALGESIA (LIA)

- THA infiltration sites
  1. Acetabular capsule, adductor mm, gluteus medius m
  2. External rotators
- TKA infiltration sites
  1. Posterior capsule structures
  2. Periprosthetic structures
  3. Fascia and subcutaneous tissues

UCH PROTOCOLS: TKA

- Pain management strategies include:
  1. Opioid escalation
  2. Non-opioid analgesics
  3. Adjunctive therapies

- Consider more aggressive modalities when indicated:
  - IV PCA for >48 hours
  - Catheter techniques when available

REGIONAL ANALGESIA

- Epidural
- Peripheral Nerve Block
- Intrathecal Morphine
- LIA (Local Infiltration Analgesia)

UCH PROTOCOLS: THA

- Pain management strategies include:
  1. Opioid escalation
  2. Non-opioid analgesics
  3. Adjunctive therapies

- Consider more aggressive modalities when indicated:
  - IV PCA for >48 hours
  - Catheter techniques when available
ENHANCED RECOVERY PATHWAYS FOR TOTAL JOINT SURGERY

CHANGES IN PRACTICE
- Shorter stays – “Fast Track”
- More aggressive rehabilitation programs
- Emphasis on function over “no pain”
- Decreased use of opioids
- Partnerships between Acute Pain Medicine specialists and Orthopedic surgeons

INTERDISCIPLINARY TEAM
- Orthopedic surgeon
- Clinic & hospital coordinators
- Nursing
- Inpatient PT/OT
- Anesthesia
- Pharmacy
- Hospitalist
- Case Manager/Social Worker
- Outpatient PT
- Respiratory therapy
- Dietary
- Pastoral care
- Organizational quality

JOINT COMMISSION: THKR CERTIFICATION

AMERICAN ACADEMY OF ORTHOPAEDIC SURGEONS
Guidelines to assist with the following:
- Antimicrobial prophylaxis in surgery
- Surgical site infections: Prevention and treatment of surgical site infection
- VTE prophylaxis
OTHER ELEMENTS OF ERAS

- Decrease number of drains
- Temperature management
- Active warming
- Glucose control
- PONV prophylaxis
- Urinary tract infections
- Decrease bladder catheterization
- Urinary retention protocols
- Blood transfusions
- TXA administration

BLADDER SCAN PROTOCOL

1. Bladder volume, <300ml, repeat bladder scan within 3h
2. 300–399 ml, repeat bladder scan within 2 h
3. 400 – 499 ml, repeat bladder scan within 1 h
4. ≥500 ml, do intermittent catheterization
   - This can be repeated twice after which an indwelling urinary bladder catheter is used.

SUMMARY

- Changes in practice toward early recovery programs has shifted priorities in care
- Improved function over “zero pain”
- Decreased reliance on opioids
- Evidence-based choices for anesthesia, especially in high risk populations
- Neuraxial anesthesia
- Multimodal analgesics
- Regional anesthesia for pain control that works for your institution & practice model