Perioperative Pain Modalities for Enhanced Recovery

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Goals

• PreOp, IntraOp, PostOp aspects of Enhanced Recovery
• Evidence for neuraxial, ketamine, adductor canal
• Chronic Post Surgical Knee Pain
  • Contributing Factors
  • Prevention Ideas
  • Treatment
TKA Pathway Goals

• Decrease Pain
• Decrease hospital length of stay
• Decrease cost
• Decrease morbidity/mortality
• Decrease use of resources
• Improve long-term outcomes

• Decrease incidence of falls
• Decrease surgical site infection
• Decrease rate of blood transfusion
• Decrease incidence of chronic pain
• Improve patient satisfaction
Enhanced Recovery - A team approach

• Multi-disciplinary approach to patient care

• Starts well before surgery

• Continues well after surgery

• Buy in from all team members including patients and families is crucial
Enhanced Recovery

Preoperative Interventions

• Education of patients and family
  • Surgery, anesthesia, expectations

• Nutrition
  • Carbohydrate drink
  • Liberal fasting (6-8hrs)

• Medical Optimization
  • Anemia
  • Prehabilitation

• Prewarming in preop

Intraoperative Interventions

• Preemptive oral analgesia
  • APAP, NSAID/COX-2, gabapentinoid

• Regional Anesthesia
  • Adductor canal single shot vs. catheter

Postoperative Interventions
Enhanced Recovery

Preoperative Interventions

Intraoperative Interventions

Postoperative Interventions

- Neuraxial anesthesia
  - Spinal or combined spinal epidural
- Short acting sedatives/hypnotics
- Local infiltration/posterior capsule
- Normothermia
- Normovolemia
- Appropriate antibiotic prophylaxis
- Blood conservation
  - Tranexamic acid
- Antiemetic administration
  - Ondansetron, dexamethasone
Enhanced Recovery

Preoperative Interventions

- Multimodal analgesia
- Minimization of opioids (no PCAs)
- Early mobilization/PT
- IV/PO fluid intake
- VTE Prophylaxis
  - LMW heparin
  - DOACs
  - ASA

Intraoperative Interventions

Postoperative Interventions
Evidence for Neuraxial Anesthesia

• Provides sympathetic block, no hemodynamic response to surgery
• Inhibits stress hormone release
• Decreased pulmonary complications
• Decreased incidence of PE, transfusion, renal injury, infection
• Decreased length of stay
• Reduced 30-day mortality rate
• 8.5 fold decrease in postoperative pain
• 2.5 fold decrease in persistent pain
Evidence for antiemetics

• Dexamethasone at the beginning of surgery
  • Risk/benefit PONV vs. hyperglycemia
  • Can cause hyperglycemia in diabetics and non-diabetic patients
  • No link to increased complication rates
  • Can skip in low PONV risk patients or brittle diabetics
  • Some surgeons worry about wound healing, infectious complications
    • Analgesic property

• Serotonin receptor antagonist
  • Ondansetron
  • Inexpensive, low risk
Dexamethasone effect on spinal analgesia

- Meta-analysis of 17 studies, 1133 patients
- 2 studies in arthroplasty, 1 hip fracture study
- Doses of dexamethasone 4-40mg

Results
- Decrease in 1st 24hr opioid consumption (12mg OME)
- No significant complication differences (wound healing/infection)

Intraoperative Ketamine in TKA/THA

• Meta-analysis of 10 studies, 577 patients

Results
• Improved pain scores in 0-8hr post operative period but not beyond
• Morphine consumption:
  • 18 mg decrease in 0-24 hrs
  • 22mg decrease in 0-48 hrs
• Adverse effects:
  • No difference in occurrence of psychomimetic/GI adverse effect
  • Looked for drowsiness, hallucinations, delirium, Nausea/vomiting
• No data provided for long term effect, chronic pain incidence

Xu et al. BMJ Open 2019,9,e028337.
Adductor canal/Posterior capsule injection

Multimodal periarticular injection (MPI)

vs.

Adductor canal block (ACB) and Posterior capsule injection (PCI)
Adductor Canal Block (ACB) and Posterior Capsule Injection (PCI) is superior

• Double blinded, prospective RCT
• ACB + PCI vs. Multimodal periarticular injection
• Lower VAS scores at rest and with movement at 8 and 24 hrs
• Less opioid consumption
• No difference in functional recovery/LOS/adverse events

Preoperative Radiofrequency ablation of genicular nerves

- Mixed data, both positive and negative studies
- Recent RCT, 70 pts, RF ablation performed 2-6 week prior to surgery
- Superior lateral and medial and inferomedial genicular nerves targeted
- Multimodal analgesia in the perioperative period
- No measurable effect on postoperative pain, opioid consumption
- No long term effects at 1, 3, 6 months after TKA

Walega et al. Reg Anesth Pain Med. 2019
Chronic Knee Pain after TKA

- How can we treat it?
- Can we prevent it?
- Can we predict who will have it?
- What are risk factors for developing chronic pain after TKA?
- Are there modifiable risk factors?
Prediction of Chronic Post Surgical Knee Pain

- Study out of Rush University Medical Center, Incidence 14%
- Two cohorts with and without chronic knee pain
- Having a higher **Acute** post surgical pain was a **predictor** of chronic post surgical pain (p=0.005)
- Group with NO Chronic Pain had acute pain score **2.8**
- Group with Chronic Pain had acute pain score of **4.2**
- Adjusted for confounders (pain catastrophizing, anxiety, depression, functional status)

Buvanendran et al. Reg Anesth Pain Med. 2019
Preoperative Gene Expression

• Pilot study of 16 patients
  • 4 developed chronic pain
• RNA analysis of blood
• Before surgery, 48 hrs and 6 months after
• Different preoperative gene expression
• Preoperative upregulated pain pathways
• May or may not be modifiable

• Central sensitization?

Buvanendran et al. Reg Anesth Pain Med. 2019
Central Sensitization Theory

• Persistent noxious stimulus/genetic/environmental factor
• CNS becomes hyperexcitable
• Hypersensitivity to both noxious and non-noxious stimuli
• More susceptible to chronic pain
• Allodynia: Pain experienced from stimuli that usually don’t cause pain (Thermal, mechanical, tactile)
• Hyperalgesia: Pain out of proportion to a painful stimulus (papercut, flu shot)
Can we predict/treat Central Sensitization?

• Duloxetine (selective norepinephrine serotonin reuptake inhibitor)
• Used to treat depression, some pain syndromes with central sensitization
• Negative results in a large, well designed RCT in TKA in general population
  (YaDeau et al.)

• What if we use it for a targeted population?

YaDeau et al. Anesthesiology. 2016
Duloxetine and TKA: Centrally Sensitized Patient Population

• Patients screened for central sensitization (Central Sensitization Inventory), 25 question survey, 17% tested positive

• If positive, randomized to duloxetine or control

• Duloxetine group had better performance (2-12 weeks) with:
  • Brief Pain Inventory
  • Short Form-36
  • Measure of Intermittent and Constant Osteoarthritis Pain
  • Hamilton Depression Scale

• Improved quality of recovery indicated by emotional/physical functioning

If all preventions fail......

- Genicular nerve blocks
  - No great evidence for prevention but helpful in treatment of chronic pain

- Can be done with ultrasound guidance or fluoroscopic
- Often a diagnostic block is done using local anesthetics
- If satisfactory analgesia is obtained **Cooled Radiofrequency Ablation**
- RFA without the cooling creates a smaller ablated zone/less effective
- Variable outcome, 6 months or more of relief is considered a good outcome.
- Many patients need it performed only once, a small percent come back for repeat ablations
Take Home Points

• Team Approach
• Patient Education ahead of time
• Multimodal Analgesia
• Don’t ignore the acute pain
  (1 point increase in VAS, increases OR of developing chronic pain to 1.5)
• Patients are different (central sensitization, chronic pain)
• Refer to pain management specialist for chronic pain
Thank you....