“Navigating the Waters of Acute Postoperative Pain”

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Conflict of Interest Disclosure

Author/Speaker: Susan Pendergrass, no conflict of interest

Objectives

At the conclusion of this activity participants should be able to:

1. Identify populations at high risk for managing acute postoperative pain.
2. Discuss latest guidelines, protocols and consensus statement related to acute postoperative pain.
3. Review various multimodal approaches.
4. Discuss future directions for acute postoperative pain management.
Potential High Risk Populations

- Polypharmacy - Opioid status
- Comorbidities - COPD, Sleep Apnea, Morbidly Obese, Renal/Hepatic disease, CV, SUD
- Age - very young/advanced elderly
- History inadequately managed surgical pain
- History persistent postoperative pain
- Prolonged anesthesia time
- Type of surgery
- Socioeconomic factors


- ASA
- ASRA
- Pain Medicine
- Adults and Children
- Targets all clinicians managing postoperative pain
- Multimodal analgesia regimens


ASRA: 2018 Four New Quality Pain Measures

- Use of Neuromuscular Techniques and/or PNBs for Total Knee Arthroplasty
- Safe Opioid Prescribing Practices
- Infection Control Practices for Open Interventional Pain Procedures
- Multimodal Pain Management

Enhanced Recovery After Surgery (ERAS)

- Multimodal, opioid-sparing specialty protocols
- Evidence based intraoperative care
- Multidisciplinary, including nutritionists
- Entire surgical spectrum: preadmission, preoperative, intraoperative, postoperative, post discharge
- Education, active pt. involvement throughout
  - www.mycme/postoperativepainmanagement
  - www.erassociety.org

Preoperative Considerations

- Patient Education
- Surgeon
- Type of anesthesia
- Type of procedure
- Anticipated analgesia needs
- Nursing
- Discharge

Chronic pain - opioids

Taper?

- LAO, Methadone, Buprenorphine

Pharmacological Options

Non-opioids
- NSAIDs
- celecoxib (Celebrex), ketorolac (Toradol)
- acetaminophen
- IV Ketamine, IV Lidocaine, Local Anesthetics
- Neurontin (Gabapentin), pregabalin (Lyrica)
- dexmedetomidine (Precedex)
- propofol (Diprivan)
- midazolam (Versed)
- Steroids

Opioids - opioid sparing approach
IV PCA  Epidural
Appropriate Patient Selection

IV PCA - Loading dose, no basal, no proxy

Epidural - preservative free solutions
  - "Balanced Analgesia" - opioid/local anesthetic differ
  - Site, catheter patency/migration, sensory/motor, etc.

Smart pump technology
  - Don’t rely solely on equipment; do assess “hands on”

Peripheral Regional Anesthesia
Neuraxial Therapies

  - May be opioid sparing
  - For whom opioids may not be preferred
  - Multimodal regimen
  - Surgical procedure
  - Clinician aware of side effect profile of each medication & technique with appropriate monitoring & management


Nerve Blocks
Nerve Blocks

Continuous paravertebral
- Chest wall
- Thoracic
- Abdominal
- Iliac crest bone graft

Single paravertebral
- Inguinal hernia
- Prostatectomy
- Hysterectomy

www.frca.co.uk/images/upperlimbs

<table>
<thead>
<tr>
<th>Approach</th>
<th>Level</th>
<th>Sensory block</th>
<th>Complications</th>
<th>Remarks</th>
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</thead>
<tbody>
<tr>
<td>Intercostal</td>
<td>Intercostal roots</td>
<td>Shoulder, upper arm, elbow</td>
<td>Pneumothorax, phrenic nerve palsy, Horner’s syndrome</td>
<td>Not technically difficult, many side effects,</td>
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<tr>
<td>Supraventricular</td>
<td>Trunks and peripheral divisions</td>
<td>Entire arm</td>
<td></td>
<td>sparing the thoracic territory, phrenic nerve</td>
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<tr>
<td>Clavicular</td>
<td>Cords</td>
<td>Forearm, wrist, hand</td>
<td>Intravascular injection, pneumothorax</td>
<td>Painful in the awake patient, landmarks are sometimes easy to identify</td>
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<tr>
<td>Intercostal</td>
<td>Cords</td>
<td>Forearm, wrist, hand</td>
<td>Pneumothorax, intravascular injection</td>
<td>Lateral incisonal landmark must be identified correctly</td>
</tr>
<tr>
<td>Terminal branches</td>
<td>Nerves</td>
<td>Forearm, wrist, hand</td>
<td>Herniated nerves, intravascular injection</td>
<td>Easy, low complication rate, but often spoils the motor/sensory nerve</td>
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</tbody>
</table>

Local Anesthetics

Upper Extremity Nerve Block

<table>
<thead>
<tr>
<th>Local Anesthetic</th>
<th>Onset</th>
<th>Anesthesia</th>
<th>Analgesia</th>
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</thead>
<tbody>
<tr>
<td>Lidocaine 2%</td>
<td>10-20 min</td>
<td>2 ½-3 hours</td>
<td>2-6 hours</td>
</tr>
<tr>
<td>Lidocaine 2%+epi</td>
<td>5-15</td>
<td>3-6</td>
<td>5-8</td>
</tr>
<tr>
<td>Bupivacaine 0.5%</td>
<td>15-20</td>
<td>6-8</td>
<td>6-12</td>
</tr>
<tr>
<td>Bupivacaine 0.5%+epi</td>
<td>20-30</td>
<td>8-10</td>
<td>16-18</td>
</tr>
<tr>
<td>Mepivacaine 1.5%</td>
<td>10-20</td>
<td>2-3</td>
<td>2-4</td>
</tr>
<tr>
<td>Mepivacaine 1.5%+epi</td>
<td>5-15</td>
<td>2 ½-4</td>
<td>3-6</td>
</tr>
</tbody>
</table>
Sciatic Nerve Block

<table>
<thead>
<tr>
<th>medication</th>
<th>onset</th>
<th>anesthesia</th>
<th>analgesia</th>
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</thead>
<tbody>
<tr>
<td>Mepivacaine 1.5%</td>
<td>10-15 min</td>
<td>4-5 hours</td>
<td>5-8 hours</td>
</tr>
<tr>
<td>Lidocaine 2%</td>
<td>10-20</td>
<td>5-6</td>
<td>5-8</td>
</tr>
<tr>
<td>Ropivacaine 0.5%</td>
<td>15-20</td>
<td>6-12</td>
<td>6-24</td>
</tr>
<tr>
<td>Bupivacaine 0.5%</td>
<td>15-30</td>
<td>8-16</td>
<td>10-48</td>
</tr>
</tbody>
</table>

www.nysora.com

Liposomal bupivacaine (Exparel)

- FDA approval – interscalene brachial plexus nerve block for shoulder surgeries (post surgical analgesia 48-72 hrs), ie. rotator cuff repair, total shoulder arthroplasty
- May delay time for requiring first rescue medication dose
- Caution with hepatic dysfunction
- PI: Do not administer within 96 hrs any other amide local anesthetic due to risk of elevated plasma levels
- Higher cost than other Bupivacaine HCL - evaluate pain outcomes and overall cost of care within setting


Transversus Abdominis Plane - TAP

- Local anesthetic between internal oblique and transversus abdominis muscles
- Indications - abdominal surgeries, bowel, prostate, ob/gyn, C-section, open laparotomy
- Duration of block 12-36 hrs
- Observe “flank bulge” — relaxation of abdominal muscles, more pronounced with low BMI, assess for internal bleeding

Continuous local anesthetic infusion: Elastomeric Pain Pumps

- Infusion @ slow rate 2-5 days post op
- Models: fixed rate - with or without on demand
- After completion (container shrinks) tubing/catheter removed
- Some patients may require oral BTP analgesics
- Patient education - home care instructions

Lidocaine Infusion

- Opioid sparing
- Optimal dose not well defined (per body wt.)
- Pre-existing chronic pain, opioid experienced, history SUD, MAT, methadone maintenance
- Open colorectal surgeries
- Contraindications, or refuses regional anesthetic.

    Less N/V, sedation
    Pain control at rest and with movement
    Enhanced return bowel function
    May reduce hospitalization stay

Systemic IV Lidocaine

- Inhibits spontaneous impulses arising from injured nerve fibers and dorsal root ganglion neurons proximal to injured nerve segments.
- Mediation occurs via variety of mechanisms, including sodium channel blockade, inhibition of NMDA receptors and others.
- Blocking systemic inflammatory responses to surgical stressors may aid in preservation of bowel motility.

Contraindications

- Unstable coronary disease; cardiac arrhythmias
- Recent MI
- CHF
- Heart block
- Hepatic and/or renal (depending upon severity)
- Seizure disorders
- Electrolyte disturbances
- Known or suspected allergy

General Monitoring

- VS’s and pain score q 15 min x3, then q 1 hr x 12, then q 2 hr x 12, then q 4 hr and prn duration of infusion
- O2 Sat, respiratory rate, sedation, ae’s - q 1 hr
- Telemetry may or may not be continuous, protocols vary
- If infusion must be stopped
  - Always obtain STAT blood sample for serum lidocaine level
  - Goal is to maintain serum lidocaine level < 4 mcg/ml

Lidocaine Infusion: Toxicity

Levels of toxicity - possible adverse effects

- MILD - think peripheral
- MODERATE - think central
- SEVERE - think systemic
Lidocaine AE’s: Mild

Serum levels 3-8 mcg/ml
- Numbness/tingling fingers and toes
- Circumoral numbness
- Metallic taste
- Tinnitus
- Lightheadedness, dizziness
- Visual changes
- Confusion


Lidocaine AE’s: MODERATE

Serum levels 8-12 mcg/ml
- Nausea, vomiting
- Severe dizziness
- < hearing
- Tremors
- Fluctuations BP and pulse
- Confusion


Lidocaine AE’s: SEVERE

Serum levels greater than 12 mcg/ml
- Drowsiness
- Confusion
- Muscle twitching, convulsions
- Loss of consciousness
- Cardiac arrhythmias, cardiac arrest

LAST: Local Anesthetic Systemic Toxicity

- IV infusion 20% lipid emulsion - reverse cardiac and neurological effects of toxicity (bolus & infusion)
- Initial focus - airway, cardiac, seizure - AVOID propofol in pts with cardiovascular instability (cardiac depressant effect of lipid content)
- Modify ACLS: cardiac arrhythmias - AVOID vasopressin, calcium channel blockers, beta blockers, local anesthetics, reduce epinephrine dose to < 1 mcg/kg
- Monitoring > 12 hrs if systemic toxicity occurs
- Post LAST events www.lipidrescue.org and report use of lipid www.lipidregistry.org

Ketamine: Sub-anesthetic

- NMDA receptor antagonist - analgesic properties
- Exerts some activity on other receptors
- Dose dependent effects
- Sub-anesthetic dosing - renewed interest as stand-alone or component of multimodal analgesia

Consensus Guidelines on Use of IV Ketamine Infusions for Acute Pain Management: 2018

- Assist practitioners, institutions, 3rd party payers, regulatory with decision making, protocols, safety and outcomes, 6 key questions:
  1. Which patients and acute pain conditions be considered?
  2. What dose range is sub-anesthetic & does evidence support?
  3. What evidence to support as adjunct to opioids and other analgesic therapies for perioperative analgesia?
  4. What are the contraindications in setting of acute pain management and do they differ from chronic pain settings?
  5. What evidence supports non-parenteral for acute pain mgt?
  6. Does evidence support pt. controlled IV Ketamine-acute pain?

1. Which patients and acute pain conditions?
   - Type of surgery and expected severity postop pain
   - Opioid tolerant or dependent undergoing surgery
   - > risk opioid related resp. depression, including OSA

2. What dose range is sub-anesthetic and does evidence support dosing in this range for acute pain?
   - Variability exists, recommendation is: bolus doses do not exceed 0.35 mg/kg and infusions not exceed 1.0 mg/kg/hr outside intensive care settings – assess individual needs

3. What evidence supports Ketamine infusions as adjunct to opioids & other analgesic therapies for periop analgesia?
   - Lack of convincing evidence for specific sub-anesthetic IV loading dose or infusion * refer to #2 dose range

4. What are contraindications to Ketamine infusions in settings of acute pain mgmt., and do they differ from chronic pain settings?
   - Exclude or limit Ketamine use with commonly considered contraindications, ie. severe hepatic dysfunction, high risk coronary disease, poorly controlled psych conditions involving psychosis (schiz.), elevated ICP, elevated intraocular pressure
   - Always consider risk vs. benefit, pt. monitoring (ACLS, Ketamine and moderate sedation training)

5. What evidence supports non-parenteral Ketamine for acute pain management?
   - FDA approval only parenteral route as anesthetic agent
   - Off label - lesser bioavailability. Some studies IN route, and lesser evidence for oral use in acute pain

6. Does any evidence support patient controlled IV Ketamine analgesia for acute pain?
   - Moderate evidence supports as adjunct to opioid IV PCA
   - Limited evidence as sole analgesic acute/perioperative pain management
Ketamine

Precautions
- CVD, MI or CVA
- Hepatic
- Pulmonary
- Recent psych hospitalization
- PTSD

Contraindications
- Head Trauma
- Post intracranial surgery
- Increased ICP
- Intracranial bleed/mass
- Seizure Disorder


Ketamine: AE Profile

- Hypertension/Hypotension
- Excessive Sedation
- Increased cardiac output
- Tonic-clonic movement, tremors
- Hypotension/Hypertension
- Impaired memory
- Nyctagmus
- Increased ICP, Headache
- Hyper-salivation
- Hepatotoxicity
- Respiratory depression and/or apnea with rapid IV admin.
- Psychomimetic effects - hallucinations, dreams, nightmares, dissociation, emergent reaction

* Partial listings. See product information for complete profile.

General Monitoring Guidelines

- Monitoring: VS, cardiac, respiratory, neuro, psychomimetic effects, pain
- Continue q 15 min x4, q 1 hr x3, may > if stable thereafter
- Minimize external stimuli
- Verification “double check” protocol
- Dedicated infusion device, labeled, anti-syphon anti-reflux line

Personal clinical experience. Dept of Anesthesia. SP
Ketamine - Acute Pain: Parting Thoughts

- Viable perioperative option.
- Need further studies regarding dose dependent issues, i.e., efficacy, ae’s.
- Provides short term, opioid sparing approach in variety of patient populations with sub-anesthetic dosing.
- Further exploration regarding non-parenteral indications and routes of delivery. As of this date no FDA approval.


Multimodal - Integrative Therapies

- Cognitive modalities
- Music therapy
- TENS Electrotherapy
- Acupuncture
  Naloxone may block effects of acupuncture

Multimodal Analgesia: Postop Discharge

- Patient Education - verbal and written
- Counseling - team collaboration
- Discharge instructions - plan of care - pain - safety - and, “what to do, if”
- Pharmacological - Non-pharmacological
- Allow time for questions and reinforcement
- Follow up appointments

Personal clinical experience. Department of Anesthesia. SP
Future Directions
Robotics = less invasive procedures

Future Directions
- Genomics
- Abuse deterrent - SA opioids
- "Biased agonism" - opioids
- Multimodal - ERAS - Opioid Sparing
- Combo therapies, i.e. PNB with perarticular injection
- Education/training - simulation lab, apps, virtual reality
- Integrative Therapies - Telemedicine

Thank You.
We Cannot Change the Wind,
but
We Can Adjust the Sails………...