Optimizing Pain Management-for Outpatient Total Joints

Alexander P. Sah, M.D.

Medical Co-Director, Institute for Joint Restoration
Director, Outpatient Joint Replacement Program
Chair, IJRR Research and Education Committee
Fremont, CA

May 20th, 2017
Disclosures

Consultant/Speaker
Medtronic, Surgical Specialties, Convatec,
Pacira, Mallinckrodt, Smith & Nephew

Research Support
Zimmer
Postoperative Pain

Fear/Anxiety
(Petrovic, et al)

Prolonged hospital/rehab stay
(Kessler, et al, Morrison, et al)

Elevated readmission rate
(Coley, et al)

Persistent pain states
(Kehlet, Perkins, Woolf, Jensen, et al)

Higher Cost
(Oderda, Pogatzki-Zahn, et al)
The Challenge

That face when your patient tells you their pain is a 10/10

Oh, texting on your phone and in 10/10 pain

No dilaudid for you!

You're certain your pain is a "10"?

So you're saying if I punch you in your incision, your pain won't be worse.
More challenges...

“I have a high pain tolerance”

Medication List

- Lisinopril 20 mg daily
- Omeprazole 20 mg daily
- Cymbalta 30 mg 2x daily
- Oxycodone 10 mg 2x daily
- Gabapentin 300 mg 2x daily
- Penoret 5/325 4-6x daily
- Aleve 200 mg 2x daily
- Ativan 0.5 mg daily
- Fish oil 1600 mg daily
- Cod 100 mg daily
Risk of Chronic Opioid Use Following Surgery

Adjusted Odds Ratios for Chronic Opioid Use

Simple mastectomy
TURP
Cataract
FESS
Cesarean delivery
Open appendectomy
Laparoscopic appendectomy
Open cholecystectomy
Laparoscopic cholecystectomy
THA
TKA

FESS=functional endoscopic sinus surgery; OR=odds ratio; THA=total hip arthroplasty; TKA=total knee arthroplasty; TURP=transurethral prostate resection.

Incidence of Chronic Opioid Use Among Opioid-naive Patients

- Simple mastectomy
- TURP
- Cataract
- FESS
- Cesarean delivery
- Open appendectomy
- Laparoscopic appendectomy
- Open Cholecystectomy
- Laparoscopic cholecystectomy
- THA
- TKA
- Nonsurgical patients

Incidence of Chronic Opioid Use (%)

Rapid Recovery TJA

Patient Selection
- Co-morbidities, fear/anxiety, support system

Preoperative protocols
- Reduce pain, nausea

Surgical Technique
- Minimally invasive, less trauma, navigation

Perioperative protocols
- Reduced pain, bleeding/swelling

Postoperative protocols
- Reduced nursing/PT interactions, medication changes, teaching opportunities
Outpatient TJA

Patient Selection
- Co-morbidities, fear/anxiety, support system

Preoperative protocols
- Reduce pain, nausea

Surgical Technique
- Minimally invasive, less trauma, navigation

Perioperative protocols
- Reduced pain, bleeding/swelling

Postoperative protocols
- Reduced nursing/PT interactions, medication changes, teaching opportunities
Outpatient Considerations

- **What’s practical?**
  - Staffing capabilities
  - Medication availability
  - Back-up resources

- **What’s efficient?**
  - Faster turnover
  - Reproducibility
  - Shorter period of time with patient (what happens when they go home?)

- **What’s cost-effective?**
  - Cost/benefit ratio
  - Affects everyone’s bottom line
Surgical Technique

• Less invasive surgery
  • less tissue trauma
  • blood management (swelling, stiffness, pain)

• Efficient surgery
  • less tourniquet time (thigh pain)
  • trained staff
  • usual instruments
  • avoiding re-cuts

• Navigation or personalized guides?
  • place/time to start?
Periop considerations

- Anesthesia type
  - General
  - Spinal/epidural
  - Nerve blocks

- Blood management
  - TXA
  - bipolar sealer
  - topical agents

- Fluid status
  - hypotension
  - voiding
  - pain?
Dehydration

Pain threshold

- dehydration brings about increased brain activity related to painful stimuli

A Multimodal Approach Addresses the Complex Nature of Pain Transmission

Peripheral nociceptors

Ascending input via Spinothalamic tract

Descending modulation

Dorsal horn

Peripheral nerve

Pain

Local anesthetics (epidural), Opioids, Alpha-2 agonists

Local anesthetics (field block), NSAIDs, Coxibs

Local anesthetics (peripheral nerve block)

Opioids, Alpha-2 agonists, Acetaminophen, some NSAIDs, NE-reuptake inhibitors

Acetaminophen, some NSAIDs, NE-reuptake inhibitors

Benefits of Multimodal Pain Management

• Reduces dosing/dosage of analgesics
• Minimizes side effects
• Fewer analgesic gaps
• Better pain relief than with single analgesic, due to synergy or additive effects
• Improved functional outcomes
• Reduced length of stay
• Improved patient satisfaction

Prior Paradigm for Acute Pain Management

- If all else fails, try more opioids . . .
- If that does not work, give more opioids . . .

Concept borrowed from Eugene Viscusi, MD, Thomas Jefferson University, Dept of Anesthesia, Philadelphia, PA.
Multimodal Acute Pain Paradigm

- A change from simple, to more complex, but perhaps more effective
- Change of culture

1. OPIOIDS
2. NSAIDS
3. APAP
   - Selective NSAIDs
   - Antidepressants, Anticonvulsants
   - MIS, Local Anesthetics
4. Patient Expectations, Behavioral and Non-pharmacological Modalities

Pain Ladder from the World Health Organization

1Pain Ladder from the World Health Organization
Regional Anesthesia

- Epidural/spinal
- Nerve blocks
  - Block failure / pain / surgical delays
  - Rebound Pain
  - Systemic toxicity
  - Fall Risk/Delayed Mobilization (1-2.8% fall rate)
  - 12% sequelae of Peripheral Nerve Blocks (Spanghel and Clarke)

- Practical? – anesthesia team
- Efficient? - turnover
- Cost-effective?
Local Anesthetics

- Targets pain at the source
- Simple and effective method to provide analgesia
- Typically avoids severe side effects
- Avoids systemic effects

*Limited by duration of effect*
Peri-articular Injections Data

- Levobupivacaine
  - Reduced opiate consumption
- Ropivacaine, ketorolac, and epinephrine
  - Reduced morphine consumption
- Ropivacaine by continuous intra-articular infusion
  - Reduced pain
  - Improved initial ambulation
- Multi-drug cocktail
  - Improved overall results

- Practical? - pharmacy
- Efficient?
- Cost-effective?

PO sustained pain relief
Local Anesthetics-an ideal treatment modality

- Targets pain at the source
- Simple and effective method to provide analgesia
- Typically avoids severe side effects
- Limited by duration of effect
Sustained release medications

- Free Bolus
- Toxic Level
- Minimum Therapeutic Level
- Sustained-Release Formulation

Drug Concentration vs. Time

DepoFoam™ (non-concentric) 10–30 μm
EXPAREL® Uses DepoFoam to Release Bupivacaine Over Time

DepoFoam is a multivesicular liposomal product delivery technology that encapsulates drugs without altering their molecular structure and then releases them over a desired period of time\(^1\)

By utilizing the DepoFoam product delivery platform, EXPAREL delivers therapeutic levels of bupivacaine over 72 hours*.

- **DepoFoam utilizes membrane components that are based on natural and well tolerated sources and are cleared by normal metabolic pathways**
  - Triglycerides, Cholesterol and Lipid membranes

- **As incorporated in EXPAREL, DepoFoam is <3% lipid, biodegradable, and biocompatible**

- **Diffusion in tissue is about 35% more specific than plain bupivacaine (10mg SQ: 365mm vs. 556mm)**

---


*As demonstrated in a pivotal soft tissue trial (hemorrhoidectomy) with a 72-hour endpoint.
Pharmacokinetics Demonstrate Plasma Levels of Bupivacaine That Can Persist for 96 Hours (TKA)

- Other formulations of bupivacaine should not be administered within 96 hours following administration of EXPAREL.
- Systemic plasma levels of bupivacaine following administration of EXPAREL are not correlated with local efficacy.
- The rate of systemic absorption of bupivacaine is dependent upon the total dose of drug administered, the route of administration, and the vascularity of the administration site.

<table>
<thead>
<tr>
<th>Peak</th>
<th>Duration</th>
</tr>
</thead>
</table>
| EXPAREL 266 mg | P1: 0-2 hours  
               | P2: 24-48 hours  
               | 96 hours        |

[Graph showing plasma concentration of bupivacaine over time, with peaks and durations indicated.]
Infiltration With EXPAREL Requires More Injections

Traditional Bupivacaine HCl

EXPAREL

EXPAREL stays more precisely where placed, requiring more injections to effectively cover the surgical area
EXPAREL does not diffuse through the tissues in the same manner as traditional bupivacaine HCl

Graphic is for illustrative purposes only.

Please see Important Safety Information on Slide 41. Full Prescribing Information is available at EXPAREL.com.
Knee Regions with Increased Neurosensory Perception

1. Suprapatellar pouch/quadriceps tendon
2. Medial retinaculum
3. Patellar tendon and fat pad
4. Medial collateral ligament and medial meniscus capsular attachment
5. Posterior cruciate ligament tibial attachment
6. Anterior cruciate ligament femoral attachment
7. Lateral collateral ligament and lateral meniscus capsular attachment
8. Lateral retinaculum

Periarticular Injections

“moving needle” technique
Caution of neurovascular bundles
NSAIDs

• reduce pain and inflammation
• can reduce opioid consumption by 20-30% (Power, 1999)
• Recommended in practice guidelines in perioperative period, around-the-clock unless contraindicated
• renal, GI, bleeding risks

• timing of dosing, around-the-clock
Acetaminophen

- few side effects
- IV form has rapid onset of action, 15 minutes peak, more reliable levels
- combined with non-steroidal agents can lead to 40-50% reduction in opioids (Vadivelu, 2010)
- liver toxicity
Gabapentin/Pregabalin

• used for seizures and neuropathic pain
• bind to voltage-gated calcium channels in the spinal cord and brain
• opioid-sparing effect

Anesthesiology, 2013
## Multimodal Options

<table>
<thead>
<tr>
<th>Acetaminophen</th>
<th>Alpha-2 agonists</th>
<th>Gabapentinoids</th>
</tr>
</thead>
<tbody>
<tr>
<td>acetaminophen</td>
<td>clonidine</td>
<td>gabapentin</td>
</tr>
<tr>
<td></td>
<td>dexmetatomidine</td>
<td>pregabalin</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Local anesthetics</th>
<th>NMDA receptor antagonists</th>
<th>NSAIDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>bupivacaine</td>
<td>ketamine</td>
<td>celecoxib</td>
</tr>
<tr>
<td>lidocaine</td>
<td></td>
<td>ibuprofen</td>
</tr>
<tr>
<td>liposomal bupivacaine</td>
<td></td>
<td>ketorolac</td>
</tr>
</tbody>
</table>
Pain Episodes

Addressing pain transitions

• From OR to recovery
  • Anesthesiologists favor it
  • PACU nurses ask for it
• From recovery to floor
  • Minimize episodes of spike of pain
• First time ambulating
  • Earlier ambulation
• Continues postop
  • Earlier discharge

Addressing pain “gaps”

• Between medication dosing
  • Smoother and more sustained pain control
Summary

✓ Benefits of multimodal analgesia

✓ Minimizing opioid burden

✓ What’s practical, efficient, cost-effective?

✓ Pain control periop continues postop

✓ Patient satisfaction and quality measures

✓ Continuing to evaluate current protocols and update
Thank you