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Post-Operative Pain Management in Orthopedic Surgery Patients

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Abstract

Post-operative pain is a common and expected part of surgery. In the last few decades, the focus on pain management has grown as a result of the opioid crisis in America. Given the many known potential consequences associated with narcotics, it is imperative that alternative pain management options are considered and utilized for surgical patients. This case highlights an orthopedic surgery candidate with pre-operative joint pain and her pain management options post-operatively. The benefits and risks of NSAIDS, opioids, and multimodal options for pain management were further evaluated in the literature and their implications for clinical use will be discussed throughout this paper.

Background

This case details a 46-year-old female presenting for pre-operative clearance for orthopedic surgery. She is taking ibuprofen and acetaminophen for her pain pre-operatively and this is effective. Pain control is a serious issue that can affect a patient's post-operative outcomes if not treated appropriately. In this report the provider will be able to determine what type of pain management, opioids, Non-steroidal anti-inflammatories (NSAIDS), or multimodal options would produce the best outcomes for the patient.

Prescription opioids are often used to treat chronic and acute pain, and when used appropriately, can be an important component of treatment. However, serious risks are associated with their use, and it is essential to carefully consider the risks of using prescription opioids alongside their benefits. These risks include misuse, opioid use disorder (addiction), overdoses, and death (Center for Disease Control and Prevention, 2018). In 2017 there were almost 58 opioid prescriptions written for every 100 Americans, these same prescribed opioids accounted for 35% of all opioid overdose deaths that year (Center for Disease Control and Prevention, 2018).

A common first line non-narcotic medication recommended for pain relief are NSAIDS. Non-steroidal anti-inflammatories are more than just pain relievers. They help to reduce inflammation and lower fevers. They prevent blood from clotting, which is good in some cases but not so beneficial in others (American Academy of Orthopedic Surgeons, 2009).

The purpose of this review is to answer the following question: Do orthopedic surgical patients have improved post-op pain management with opioid pain management versus NSAID or multimodal pain management?

Case Report

A 46-year-old Caucasian female with past medical history significant for hypertension, obesity, type 2 diabetes, hypothyroidism, and squamous cell skin carcinoma. Presents for preoperative clearance for right knee arthroscopy after meniscal tear suffered approximately 6 months ago. Currently treating the pain with Ibuprofen 600 mg three times a day, and Tylenol 1,000 mg three times a day. She has allergies to amoxicillin and morphine. Her surgical history is significant for hysterectomy, skin biopsies, and c-sections to which she denied any anesthetic complications. Other medications she takes daily include Lisinopril 10mg, metformin 1000mg twice a day, Rybelsus 7mg, Synthroid 125 mcg, and aspirin 81mg. She is a current smoker, one pack per day for 20 years, rare alcohol use and no illicit drug use. Family history revealed risk factors for heart disease, breast cancer, and melanoma. No family history of complications with anesthesia.

On exam her vitals were as followed: BP: 136/88, Pulse : 78, T: 98.5, SPo2: 95%, Height: 5’6”, Weight : 211 lbs, BMI: 34. Remainder of the review of symptoms was negative other than what is listed above. Her physical exam was within normal limits other than some tenderness to her right knee.

Labs ordered on this patient included a complete metabolic panel, complete blood count with differential and platelet, a TSH, and an Electrocardiogram (ECG). The comprehensive metabolic panel gives information about fluid balance, levels of electrolytes like sodium and potassium, and how well the kidneys and liver are working. The complete blood count checks for a low number of red blood cells (anemia) and infection. An ECG records the electrical activity of the heart. It shows abnormal rhythms (arrhythmias or dysrhythmias), finds heart muscle damage, and helps find the cause of chest pain, fluttering heartbeats (palpitations), and heart

murmurs (John's Hopkins Medicine, 2020). It is important to perform these lab tests before surgery to catch underlying conditions that could affect the surgery before proceeding. The labs were all within normal limits and the EKG showed normal sinus rhythm.

She was cleared for surgery and given instructions to return for blood pressure check with nurse as this was slightly elevated and she relayed taking all of her medication regularly. She was also instructed to stop taking her ibuprofen and aspirin five days before her procedure per the consensus of guidelines reviewed. She was a class I on the revised cardiac risk index. She should follow up with the orthopedic surgeon as recommended post-operatively.

The following literature review will discuss this patient's post-operative pain management treatment options. It will review the risks and benefits of an orthopedic surgery recovery with the use of NSAIDS versus opioids.

Literature Review

Millions of Americans suffer from pain and are often prescribed opioids to treat their conditions. Pain memories have been implicated in the development of chronic pain, so it's important for providers to try to give patients the most positive post-op pain experience possible (Noel et al., 2019). However, the dangers of prescription misuse, opioid use disorder, and overdose have been a growing problem throughout the United States (Center for Disease Control and Prevention, 2018). Patients and providers need to know that there are more options to treat pain after surgery in addition to, or instead of, opioids. The use of more than one type of pain medication after surgery has the potential to reduce post-operative pain and reduce the use of opioids. The literature review was conducted using both CINAHL and PubMed databases. Keywords used were post-op pain, orthopedic surgery, opioids, NSAIDS, and pain management. 293 articles were initially identified. English language, five years old or less, and peer reviewed

were used as limitations. This reduced articles to 49. Upon further review, 13 were identified as relevant for this review. These articles were chosen based on their relevance to the question which included information on the use of post-op pain, NSAIDS, opioids, or alternative pain management options in orthopedic surgery patients. In additions, the Center for Disease Control and Prevention as well as the American Society of Anesthesiologist website were used to gather general information and recommendations.

To improve the patient's post-op pain management in the setting of this case report, it will be important to have a plan in place. The continued use of NSAIDS post operatively for this patient should be considered. Nonsteroidal anti-inflammatory drugs (NSAIDs) are a sensible choice because of their effectiveness after surgical procedures (Zhao-Fleming et al., 2018). There are currently no guidelines specific to multimodal pain management after orthopedic surgeries. Multimodal approach to pain management is when providers use two or more different methods or medications to manage pain (American Society of Anesthesiologists, 2018). Multimodal pain management protocols have consistently been demonstrated to allow for improved pain control with less reliance on opioids (Devin & McGirt, 2015). One systematic review addressed the benefit of adding NSAIDS to traditional opioid pain management immediately post-operatively. The outcomes measured in the study are chronic pain, opioid utilization during the 48 hours after definitive fixation, and surgery for nonunion in the year after fixation (Castillo et al., 2018). They discovered that with the use of multimodal pain management with NSAIDS in the first 48 hours, pain control was better managed and patients had less interference with rehabilitation efforts. The use of NSAIDS are still an underutilized analgesic treatment option that may enhance a multimodal approach to pain management and minimize opioid-related adverse effects in surgical populations (Howard et al., 2018).

Discussion on the mode of administration was also a topic addressed in much of the pain management research. The three main routes of administration of medication after surgery include parenteral, intrathecal/epidural, and oral. The value of multimodal analgesia and analgesia by different routes has long been known and has resulted in effective pain relief with minimal side effects (American Society of Anesthesiologist, 2018). Post-operative administration of parenteral non-steroidal anti-inflammatory drugs, such as Diclofenac, reduces patient opioid requirements and reduces the incidence and severity of opioid-induced adverse events (McNicol et al., 2018). The use of continuous infusions of NSAIDS was found in some orthopedic surgery, various continuously infused NSAIDs demonstrated a decrease in postoperative pain scores and a reduction in supplemental analgesia (Howard et al., 2018). If intravenous NSAIDS are considered, it will be important for the provider to know the last dose of NSAIDS for the patient in any form before administration to prevent toxicity. Providers should be hesitant to prescribe NSAIDs or aspirin to patients with Willebrand's disease, thrombocytopenia, or other coagulation factor deficiencies. They should also be cautious in patients who have exaggerated NSAID and aspirin-related bleeding times, have alcohol in their system, or have a history of alcoholism with significant liver impairment in the perioperative period due to their increased risks for prolonged bleeding time and spontaneous bleeding (Zhao-Fleming et al., 2018). Having double checks and strict guidelines in place before administration would be important to prevent these types of adverse effects. The meta-analysis by Zhang et al. (2017), demonstrated that NSAIDs are effective in post-operative pain management, especially in post-operative pain caused by inflammation such as lumbar spine surgery. A fourth route of administration to consider is periarticular injection (PAI) also known as local infiltration analgesia or periarticular multimodal drug injection. It is an alternative regional analgesic that

involves administering analgesics into the surrounding tissue in the operative area (American Society of Anesthesiologist, 2018). The downside of regional injectable analgesic is the potential to cause damage from a percutaneously placed needle, infection, and local toxicity which we will discuss with the side effects. There is also an increased risk for fall after surgery with some of the local periarticular injections (Childs et al., 2017).

Other forms of anti-inflammatory medications include selective cyclooxygenase (COX)-2 inhibitor drugs. COX-2 selective inhibitors, which selectively target the inducible COX-2 enzyme and decrease the level of local inflammation factors have shown to significantly reduce knee pain and morphine consumption after total knee arthroplasty (Du & Gu, 2018). Intravenous use of COX-2 inhibitor drugs was found to be effective in reducing knee pain and opioid consumption in patients with total knee replacement and decreased use of opioids.

Opioids will most likely be prescribed by the surgeon for acute post-operative pain, as opioids have classically been the workhorse for the treatment of surgical pain (Stevenson et al., 2018). Opioids are effective through the binding of mu, kappa, and delta receptors at the dorsal root ganglion and CNS levels of the pain reception pathway (Stevenson et al., 2018). Multimodal use of medication such as the perioperative use of NSAIDs, acetaminophen, and the neuromodulatory agents pregabalin and gabapentin as adjuncts to the use of opioids had positive outcomes (Yoo et al., 2019).

One of the considerations when deciding on a post-operative pain management plan is the potential for medication side effects. Opioid related side effects include nausea, vomiting, constipation, pruritis, miosis, sedation, and respiratory depression (Castillo et al., 2017). Devin and McGirt (2015) and Castillo et al., (2017) mention similar side effects stemming from the overuse of opioids such as somnolence, confusion, urinary retention, ileus, and death. They

addressed the issue of opioids affecting the ability to control post-op pain by desensitizing peripheral and central pathways further contributing to the development of hyperalgesia with the result of increased pain. Howard et al., (2018) addressed the same side effects of opioids as listed above but found that opioid-related adverse events were more likely to occur in surgical patients receiving greater than or equal to 10 mg of morphine equivalents daily. Opioid-tolerant patients have complex pain management needs, and untreated acute pain may lead to development of persistent pain (Laffoon et al., 2016). One way to improve pain management in post-operative surgical patients is with the use of Ketamine. Ketamine works by resetting opioid receptors, decreasing opioid requirements post-operatively and decreasing opioid side effects. In order for it to be effective in the perioperative setting and to prevent pathologic pain, ketamine needs to be administered at least throughout the operation and likely for a period of time into the postoperative phase. By administering Ketamine, the provider is attempting to reduce sensitization of central and peripheral pain pathways (American Society of Anesthesiologist, 2005).

The benefits of NSAIDS to pain management treatment cannot be considered without recognizing the potential side effects. Possible side effects from NSAID use include renal impairment, gastrointestinal irritation, platelet inhibition constraint, impaired osteogenesis at high doses, variability in muscle and ligamentous injury healing, and surprisingly high rates of nonunion. There is also issues with NSAID inhibition of osteoblast cell production and bone metabolism (McGirt, 2015). The issue with the pre-operative use of NSAIDS is that they have classically been held in the peri-operative period due to concern for increased bleeding. It would be at the discretion of the surgeon and the type of procedure to decide if NSAIDS could be

continued post-operatively, or if there was a higher risk for bleeding in this setting (Stevenson et al., 2018).

In considering regional anesthetics for pain management, there is one very lethal side effect to consider and that is local anesthetic toxicity. This occurs when there is an inadvertent intravascular injection or vascular uptake from local anesthetic spread. Signs of local anesthetic toxicity present with prodromal symptoms and signs, such as perioral numbness, tinnitus, agitation, dysarthria, and confusion. These may be followed by more severe central nervous system derangements such as seizures and coma (American Society of Anesthesiologist, 2018).

Summary Recommendations

The consensus of this literature review is that there is value to the use of NSAIDS in post-operative orthopedic surgery. Although the use of opioids is beneficial in overall pain control, especially in the first 48 hours after surgery, long term use poses many risks to the patient and their recovery. Further research is warranted to help providers determine best possible individualized post-operative pain management strategies. Consideration should always be taken to decrease side effects and improve clinical outcomes for patients.

Learning Points

- Post-operative pain management is a major indicator of recovery outcomes for patients.
- NSAIDS are a reasonable medication to be used after orthopedic surgery and are widely accepted by surgeons. More research needs to be done on the effects of delayed bone healing in their use.
- The use of opioids alone in post-op pain management is ineffective and can cause long term side effects such as chronic pain. The addition of NSAIDS reduces opioid requirements which in turn minimize opioid-related adverse effects.

- Multimodal treatment with the use of opioids and anti-inflammatories has the best outcome for pain control reported by patients.

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