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Review Article

Pain Management in Perioperative Total Joint Arthroplasty: A Response to the Opioid Crisis

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ABSTRACT

The purpose of this article is to present a concise up-to-date review on effective perioperative pain management in Total Joint Arthroplasty (TJA). Multimodal therapy utilizing a "well-patient" concept and an "opioid stewardship" approach is introduced as a current strategy to address the critical worldwide opioid crisis which may be triggered by orthopaedic surgery in many patients. Adopting a tailored opiate pain management plan utilizing best practice criteria has demonstrated to result in minimal use of opioids during the surgical process while attaining the objectives to relieve suffering, achieve early postoperative mobilization, reduce lengths of hospital stay and produce patient satisfaction

Keywords: Perioperative pain management; Total joint arthroplasty; Opioid medication; Multimodal approach; Opioid stewardship

ABBREVIATIONS

OMES: Oral Morphine Equivalents, OA: Osteoarthritis; ON: Osteonecrosis; TJA: Total Joint Arthroplasty; US: United States; TKA: Total Knee Arthroplasty; THA: Total Hip Arthroplasty; PDMP: Prescription Drug Monitoring Programs; AAOS: American Academy of Orthopaedic Surgeons, NSAIDS: Nonsteroidal Anti-inflammatory Drugs; OR: Operating Room; SA: Spinal Anesthesia; GA: General Anesthesia; IV: Intravenous

INTRODUCTION

Significant pain in the knee or hip (both considered as large joints of the body) is not an uncommon symptom in individuals of all ages and may be associated with numerous underlying causes or etiologies. Once present, pain in a large joint (i.e., knee or hip) may become persistent, problematic and potentially debilitating compelling those who develop it to seek assistance from their medical providers. When the pain is located within the joint itself (e.g., intraarticular), it is often associated with conditions such as arthritis (i.e., Osteoarthritis (OA), Inflammatory Arthritis (IA) and Osteonecrosis (ON). Once the progression of these conditions shows evidence of joint collapse (destruction) in patients with advanced end-stage disease who have failed nonsurgical treatment, Total Joint Arthroplasty (TJA) is the surgical option of choice to provide the most effective relief of pain and dysfunction. For the purposes of this review, TJA includes both Total Knee Arthroplasty (TKA) and Total Hip Arthroplasty (THA).

TOTAL JOINT ARTHROPLASTY AND THE PERIOPERATIVE PAIN RESPONSE

TJA is a routinely performed procedure in orthopaedic surgery with the prevalence in the United States (U.S.) exceeding 1 million per year [1,2]. With a projected increased age expectancy of the American population, the demand for TJA is also predicted to increase over time [3] as will the anticipated demand for opioid pain management; thus, keeping pain management associated with TJA pivotal to the ongoing opioid crisis. Surgery, however, may be a trigger for long-term opioid use in many patients. Effective perioperative pain management in TJA is essential to relieve suffering, achieve early mobilization after surgery, reduce lengths of hospital stay and achieve patient satisfaction [4]. As described in the article, the optimal strategy for perioperative pain control consists of multimodal therapy to minimize the need for opioids and avoid overprescribing of opioids which has reached a critical level worldwide.

Perioperative pain results from inflammation caused by tissue trauma (i.e., surgical incision, dissection, burns) or direct nerve injury (i.e., nerve transection, stretching, or compression) [5]. The patient senses pain through the afferent pain pathway, which is the target of various pharmacologic agents. Tissue trauma releases local inflammatory mediators that can produce augmented sensitivity to stimuli in the area surrounding an injury (hyperalgesia) or misperception of pain due to non-noxious stimuli (allodynia).

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Other mechanisms contributing to hyperalgesia and allodynia include sensitization of the peripheral pain receptors (primary hyperalgesia) and increased excitability of central nervous system neurons (secondary hyperalgesia)[6-21].

Traditionally, acute perioperative pain management has relied solely on opioid medications to target central mechanisms involved in the perception of pain. A better approach uses several agents or techniques, each acting at different sites of the pain pathway, and is known as multimodal analgesia. This approach reduces the dependence on a single medication and mechanism, and importantly, may reduce or eliminate the need for opioids. Synergy between opioid and nonopioid medications reduces both the overall opioid dose and unwanted opioid-related side effects. The effects of an opioid-free perioperative analgesic pathway (from preoperative to postoperative period) among patients undergoing common elective orthopedic procedures is currently being undertaken across multiple orthopedic subspecialties in the United States to aid recent efforts in reducing the impact of prescription opioids on the national opioid crisis [6]. In this study, patients will be randomized to receive either traditional opioid-including or completely opioid-free perioperative medications.

During the early phase of rehabilitation, it is important to establish a therapeutic alliance and provide education on pain management strategies. Pain education may include appropriate usage of pain medication and cryotherapy.

ARTHRITIC KNEE AND HIP PAIN

As explained in the articles, Knee Osteoarthritis: A Primer [7] and Hip Osteoarthritis: A Primer [8], arthritis or ON-related pain in large joints may develop gradually and worsen over time (most common scenario) or may have an abrupt onset. OA pain and stiffness may develop in the morning, after prolonged sitting or may be associated with resting. Stiffness typically lasts for only a few minutes and subsides within 30 minutes or less. Movement and activity that relax the joint generally improve symptoms of OA. Later in the progression of the disease, painful symptoms may occur more often, including during rest or at night. Antalgic gait (limping), referred pain (pain felt in an area other than the joint itself), pain on weightbearing and swelling are common symptoms also associated with knee or hip pain. Opioid medications have been used for many years as a cornerstone of treatment for patients with ongoing hip and knee pain especially in those with arthritis or ON-related pain. These medications, however, are associated with various adverse effects and complications that may elicit chronic use, tolerance and addiction, and may lead to significant complications, especially if the patient is indicated for surgical procedures such as TJA [5,9].

OPIOID PRESCRIPTION

As noted in the article Pain Management Associated with Total Joint Arthroplasty: A Primer [5], opioid prescription is recommended for short-term use only in patients with severe joint pain related to advanced end-stage disease awaiting TJA [10]. Prescription opioids (e.g. morphine, codeine and oxycodone) for patients with chronic joint pain related to end-stage arthritis or ON who are awaiting TJA surgery is generally discouraged by the orthopaedic community [11]. Similarly, prescribing significant doses of opioids in the acute postoperative period in TJA is discouraged as higher doses of opioids have shown not to correspond with a reduction in pain control and may be associated with a greater likelihood of long-term opioid use [4,12-14], Despite these conclusions, and others showing more effective pain management and better overall outcomes with decreased opioid prescribing, an examination of the rate of opioid prescribing and level of pain control in patients who underwent TJA from 2014 to 2017 was conducted in over 90 million patients in an inpatient setting utilizing an electronic database and revealed surprising results [15]. The findings revealed evidence of a substantial increase from 2014 to 2017, in the percentages of patients receiving opioids after TJA, with no clinically meaningful improvement in postoperative pain level at discharge or up to 2 months postoperatively [15].

ASSESSMENT OF OPIOID RISK

When considering use of narcotic pain medication for a patient with knee or hip pain, conducting a careful assessment to evaluate risk of overuse and overdose is imperative for any medical practitioner prescribing opioids. Patients in the 18-25 or >50 year old age group, women and individuals with a history of chronic use are identified to be at higher risk of persistent opioid use in the general surgical population [16]. Consistent opioid use for 4 months or more before TJA is a strong predictor of ongoing use of opioids after surgery [17]. Use of statewide electronic Prescription Drug Monitoring Programs (PDMP) is now a requirement in most states in the United States for prescribers to review an individual's prescriptions prior to prescribing opiates. Best practices for prescribing opioid medications include prescribing opioids at their lowest dose and for the shortest duration necessary to manage pain with close monitoring of possible side effects [18]. For prescribers hesitant to prescribe opioid medications for individual patients with opioid use disorders or the potential for one, referral to a pain management specialist may offer a secure option.

MULTIMODAL APPROACH TO PAIN MANAGEMENT

In response to the ongoing American and worldwide opioid crisis, in 2019 a thoughtful remedy to pain management in TJA was endorsed at the annual conference of the American Academy of Orthopaedic Surgeons (AAOS) [18]. The concept of a "deliberate and well-coordinated" multimodal approach to pain management in patients undergoing TJA was proposed supported by outcome measures [19]. Strategies for pain management in the perioperative period to minimize opioid use in patients undergoing TJA identified a "contemporary, multimodal approach" introducing the concept of "opioid stewardship"[19]. As advocated, the multimodal approach alters the archetype from the "sick patient model" to a "well patient concept." Using a multidisciplinary process, the objective of the contemporary multimodal approach as presented is to maintain narcotic use at a low enough threshold to avoid side effects from any single

medication used and proactively focus on limiting the total analgesic requirement for patients [19]. Assuming patients are optimized for surgery, the well-patient concept supposes that the medical conditions of individuals undergoing TJA will not deviate from baseline by consequence of undergoing surgery. Utilizing the well-patient concept, optimized patients with stable medical conditions are deemed to not require additional unnecessary hospital resources or incur extended lengths of hospital stays following TJA surgery [19].

PERIOPERATIVE PHASES

On the day of surgery, the multimodal approach to pain management in TJA surgery consists of perioperative phases including a preoperative, intraoperative and postoperative phase [19]. Preoperatively, on the day of surgery while in the holding area, use of acetaminophen and Nonsteroidal Anti-inflammatory Drugs (NSAIDs) (e.g. celecoxib, aspirin) may be used as analgesics prior to entering the operating room (OR). Pregabalin (Lyrica), opioids (e.g., morphine, oxycodone) and gabapentin may also be used for analgesia. If prescribed for elderly patients, cautious and judicious use of these agents is recommended to avoid potential adverse sedative effects postoperatively. Management of fluids and nausea is regarded as an important component of perioperative surgical pain management [19]. Administration of dexamethasone in moderate doses (more than 0.1 mg/kg) has shown to produce a consistent analgesic effect postoperatively if given preoperatively (compared with intraoperative administration). In addition, dexamethasone has been shown to be an effective adjunct in multimodal strategies to moderate postoperative nausea, vomiting and opioid consumption [19].

For many patients undergoing TJA, Spinal Anesthesia (SA) is generally more preferred for use by anesthesiologists and orthopaedic surgeons over General Anesthesia (GA). Administered intraoperatively, spinal anesthesia is shown to provide several important benefits in the management of pain. SA has demonstrated enhanced pain control with timely resolution of motor block, allows for less nausea and pain in the immediate postoperative period, requires less sedation and eliminates the potential side effects of hoarseness and sore throat after GA. Certain types of SA, however, can delay postoperative ambulation in THA (a predictor of early hospital discharge). Mepivacaine was compared to bupivacaine spinal anesthesia in a randomized control study for early postoperative ambulation in patients undergoing THA [20]. Patients who received mepivacaine ambulated earlier than patients who received bupivacaine and were more likely to be discharged earlier, thus making mepivacaine a better option for THA patients who could be discharged the same day of surgery [20]. Mepivacaine provides the additional benefit of a shorter and more predictable half-life, allowing the dose to be tailored to predicted surgery time. If GA is used, total intravenous (IV) anesthesia is generally better tolerated than inhalation agents and has a shorter half-life (e.g., the time it takes for the amount of a drug's active substance in the body to reduce by half) [19].

Postoperatively, peripheral nerve blocks may provide significant relief from pain in TJA surgery despite their tendency to cause a motor block and potentially prolonging a patient's rehabilitation [19]. Periarticular injections (i.e., regional analgesic injections administered into surrounding tissue of the joint in the surgical field) offer a simpler option that can address pain directly at the source, that does not interfere with motor function and which can be directed by the surgical team. Hospital discharge medications may include acetaminophen, NSAIDs, and an opioid medication prescribed based on written opioid taper plan individualized to the patient. An opiate pain control plan is based on a calculated amount of narcotic medication that the patient is taking at the time of discharge from the hospital generally with a limit of 400 Oral Morphine Equivalents (OMEs) for opioid naïve TKA or THA patients [11,18]. Best practice is defined as prescribing less than 90 morphine milligram equivalents per day, to specify the total number of days of the prescription, and not to exceed 7 days unless there is clinical justification for an extended course within the patient's medical chart [11]. An example of an opioid taper plan after TJA is presented in the article Pain Management Associated with Total Joint Arthroplasty: A Primer [10]. Implementation of opioid taper guidelines has shown to result in improved outcome measures including fewer opioids prescribed with no increase in refills [19].

DISCUSSION

In this article, a response to the ongoing opioid crisis is presented reflecting widespread efforts to combat the crisis using current methods to address pain management in patients undergoing TJA. Utilizing best practice criteria when prescribing opioid pain medication for patients undergoing TJA is supported by studies that have examined the use of multimodal perioperative analgesic pathways using some form of opioid medication in orthopaedic patients. In contrast to the traditional approach to pain management using opioid pain medication solely, recent studies evaluating a multimodal approach using multiple techniques and agents to target various sites of the pain pathways, in addition to opioids, have shown this approach to be effective in pain management related to TJA. Opioid-free perioperative analgesic pathways among patients undergoing TJA have not been fully examined. It remains undisputed that patients on chronic preoperative opioid therapy are likely to experience extended Lengths of Hospital Stay (LOS), persistent pain, higher complication and reoperation rates, and decreased satisfaction. In addition, patients receiving chronic opioids before TJA are at a higher risk for prolonged opioid use and overdose postoperatively. Despite these results, and others demonstrating a considerable decrease in morphine milligram equivalent doses, there is evidence of a substantial increase in the percentages of patients receiving opioids after TJA, with no clinically meaningful improvement in postoperative pain level at discharge or up to 2 months postoperatively.

SUMMARY

In summary, in response to the opioid crisis, health care providers who prescribe opioid medication for pain management are now obliged to address the influence their prescription practices have had on the epidemic. As a response from the orthopaedic community, specific and individualized pain

management strategies associated with TJA have been developed and endorsed. Multimodal therapy utilizing a well-patient concept and opioid stewardship implemented by a multidisciplinary team individualized to each patient is one strategy used to address perioperative opiate pain management. Targeting key mechanisms involved in pain perception in the perioperative phases of TJA surgery is essential to achieve desired surgical outcomes. Reducing dependence on a single opioid medication and adopting a tailored opiate pain management plan utilizing best practice criteria has shown to result in minimal use of opioids during the surgical process. Open communication among health care providers and coordinating a plan for prescribing opioid medication and using statewide electronic PDMP are strategies that are showing effective outcomes in addressing the opioid crisis in the U.S.

CONCLUSION

This suggests that outcomes of policies and procedures aimed at reducing postoperative opioid overprescribing after TJA may be imperfect and that more effective monitoring of policies in actual every day settings would be helpful.

REFERENCES

1. Steiner C, Andrews R, Barrett M, Weiss A. HCUP projections: Morbidity/orthopedic procedures 2003-2012. HCUP Projections Report 2012-03. Rockville, MD: US Agency for Healthcare Research and Quality.
2. Maradit K, Larson D, Crowson C, Kremers W, Washington R, Steiner C, et al. Prevalence of total hip and knee replacement in the United States. J Bone Joint Surg Am. 2015;97(17):1386-1397.
3. Sloan M, Premkumar A, Sheth N. Projected volume of primary total joint arthroplasty in the U.S., 2014-2030. J Bone Joint Surg AM. 2018;100(17):1455-1460.
4. Sun D, Cusano A, Harrington MA, Halawi M. Combating the opioid epidemic: Experience with a single prescription for total joint arthroplasty. Arthroplast Today. 2020;6(4):668-671.
5. Sloan M, Premkumar A, Sheth N. Projected volume of primary total joint arthroplasty in the U.S., 2014-2030. J Bone Joint Surg AM. 2018;100(17):1455-1460.
6. Shing EZ, Leas D, Michalek C, Wally kM, Hamid N. Study protocol: Randomized controlled trial of opioid-free vs. traditional perioperative analgesia in elective orthopedic surgery. BMC Musculoskelet Disord. 2021;22:104.
7. Lespasio M, Piuzzi N, Husni M, Muschler G, Guarino A, Mont M. Knee osteoarthritis: A Primer. Perm J. 2017;21:16-183.
8. Lespasio MJ, Sultan AA, Piuzzi NS, Khlopas A, Husni ME, et al. Hip osteoarthritis: A primer. Perm J 2018;22:17-084.
9. Zywiel M, Stroh D, Lee S, Bonnutti P, Mont M. Chronic opioid use prior to total knee arthroplasty. J Bone Joint Surg AM. 2011;93(21): 1988-1993.
10. Lespasio M, Guarino A, Sodhi N, Mont M. Pain management associated with total joint arthoplasty: A Primer. Perm J. 2019;23:18-169.
11. Lespasio M, Mont M, Guarino A. Identifying risk factors associated with postoperative infection following elective lower-extremity total joint arthroplasty. Perm J. 2020;24(20):013.
12. Shah A, Hayes C, Martin B. Characteristics of initial prescription episodes and likelihood of long-term opioid use-United States, 2006-2015. MMWR Morb Mortal Wkly Rep. 2017;66(10):265-269.
13. Case-Lo C. Withdrawing from opiates and opioids: What are the symptoms of opioid withdrawal? [Internet] New York, NY: Healthline Newsletter; 2005-2018.
14. Mariano E. Management of acute perioperative pain [Internet] Alphen aan den Rijn: Netherlands: updated 2018 Aug 10.
15. Shah R, Kuo Y, Westra J, Lin Y, Raji M. Opioid use and pain control after total hip and knee arthroplasty in the US, 2014 to 2017. JAMA Netw Open. 2020;3(7):e2011972.
16. Prescription pain killer overdoses: A growing epidemic, especially among women [Internet] Atlanta, GA: Centers for Disease Control and Prevention; 2018.
17. Deveza L, Hunter D, Van Spil W. Too much opioid, too much harm. Osteoarthritis Cartilage. 2018;26(3):293-295.
18. American Academy of Orthopaedic Surgeons (AAOS). Diagnosis and prevention of periprosthetic joint infections clinical practice guideline: Hip and knee, part II.
19. Pagnano M, Mabry T. Minimizing opioids in total joint arthroplasty. In: American academy of orthopaedic surgeons diagnosis and prevention of periprosthetic joint infections clinical practice guideline: Hip and knee, part II.
20. Schwenk E, Kasper V, Smoker J, Mendelson A, Austin M, Brown S, et al. Mepivacaine versus bupivacaine spinal anesthesia for early postoperative ambulation: A randomized controlled trial. Anesthesiology. 2020;133:801-811.
21. Nowak L. America's pain points [Internet] St Louis, MO: Express Scripts; 2014. Dec 9, [cited 2018 Aug 18]. Available from: http://lab.express-scripts.com/lab/insights/drug-safety-and-abuse/americas-pain-points. [Google Scholar]