Review Article ISSN (O):2395-2822; ISSN (P):2395-2814

Recent Updates in Post-Operative Pain Management in Hip Surgeries: A Narrative Review

Krishna Prasad G V[1]

[1]Assistant Professor, Department of Anaesthesiology, Range Hills, Kirkee, Pune, Maharashtra 411020.

Received: January 2020
Accepted: January 2020

ABSTRACT

Most patients undergoing surgical procedures experience the acute post-operative pain, but the evidence recommends that less than 50% report adequate post-operative pain relief. Several pre-operative, intra-operative, and post-operative management strategies and interventions exists for managing and reducing post-operative pain. The American Pain Society, with the input from American Society of the Anesthesiologists, specially made an inter-disciplinary expert panel to develop the clinical practice guideline promoting evidence-based, safer and effective postoperative management of pain in children & adults. Total hip surgery or Total hip arthroplasty (THA) has shown to enhance the long term quality of life (QoL), although immediate post-operative period may be associated with the intense post-operative pain that hinders rehabilitation. Effective post-operative analgesia is the paramount in recovery period. The collaboration and understanding of orthopaedic surgeon, anaesthesiologist and pain management physicians would improve the peri-operative outcome of THA. The appropriate pain-management may reduce the related gross direct costs of medical for the lower extremity joint-replacement surgeries by reducing the hospital stays and services needed during hospitalization. Factors contributing to shorter hospital stay involve homogenous entities like regular staff and nursing care, use of up-to-date and timely information including expectations on the short stay, early mobilization, functional discharge criteria, and use of the multimodal analgesia and focus on the opioid sparing.

Keywords: Pain, total hip surgery, Postoperative pain management, regional anaesthesia.

INTRODUCTION

Target Scope and Audience

The intention of this narrative review is to provide the evidence based suggestions for management of post-operative pain. The targeted audience is all the clinicians who manage post-operative pain. Management of the chronic pain, acute nonsurgical pain, dental pain, and peri-procedural (non-surgical) pain are beyond the scope of review.

Literature search

Reports of prospective randomized controlled trials (RCTs), reviews, meta-analysis, and overview articles were systematically sought. The search was performed using PubMed database with restriction to the English language. The literature was reviewed using MeSH terms "Arthroplasty, Replacement, Hip" or "Hip Phrosthesis" or "Hip Joint" and "Pelvis Joint" and "Pain Postoperative" and Anesthetics, Local" and "injections, Intra-Articular" Further, reviewed the PubMed literature using free text search "local infiltration analgesia" and "Hip". Finally the PubMed literature was reviewed using MeSH terms "Randomized Controlled Trials" and "Reproducibility of Results" or "Patient Participation" or "Patient Selection" and in combination with free text search "external validity" or "non-participants" or "nonparticipation". Additional reports not obtained in the primary search were identified from reference lists of retrieved reports and review articles.

Name & Address of Corresponding Author
Dr. Krishna Prasad G V
Assistant Professor,
Department of Anaesthesiology,
Range Hills, Kirkee, Pune,
Maharashtra 411020.

Introduction

Pain is the repulsive feeling which is conveyed to brain by the sensory neurons. These dis-comfort signals which are potential or actual injury to the body. Pain pathways form the complex, cognitive, sensory, dynamic, and the behavioral system that go forward to detect, coordinate, and integrate the protective response to the incoming noxious stimuli which intimidates tissue injury or the organism survival.

More than 80% of the patients who undertake surgical procedures experience the acute postoperative pain and about 75% of those with the post-operative pain report severity as moderate, severe, and extreme. Evidence recommends that less than 50% of the patients who undertake surgery

report the adequate post-operative pain relief. The in-adequately controlled pain negatively influences the function, quality of life, and the functional recovery, risk of post-surgical complications, and risk of the persistent postsurgical pain. Several preoperative, intraoperative, & postoperative management and interventions strategies are present and continue to progress for managing and reducing post-operative pain. The American Pain Society (APS), with the input from American Society of Anesthesiologists (ASA), recommended the guidelines on management of postoperative pain to promote the evidence based, safer, and effective post-operative pain management in both children and the adults, addressing the areas that involve pre-operative education, per-operative planning of pain management, use of various non-pharmacological and pharmacological modalities, organizational procedures and policies, and the transition to out-patient care. The ASA published the practice guideline for the acute management of pain in peri-operative setting in 2012; the APS has no guidelines published previously on the management of the post-operative pain.

Patient Education and Rehabilitation

The purpose of the hip joint's surgery is to restore the painful hip joint and provide initial functional recovery. After hip surgeries the rehabilitation protocol is mandatory to enhance the range of the motion and strengthen the muscle strength around the hip joint. It should include pre-operative education, postacute rehabilitation like starting ambulation with exercise aids & muscle strengthening and exercise. The structured post-acute rehabilitation must be provided by the trained professionals with experience at the accurate timing after hip surgeries. And for early application of acute-rehabilitation, well designed multimodal management of pain is necessary. Also, the pre-operative education may influence the patient's perception of post-operative pain, walking and complete rehabilitation program.

For management of pain after hip surgeries, it is much more important to provide information about post-operative pain than informing about biomedical model of anatomy, pathoanatomy, and biomechanics of disease and hip surgery. Educational sessions which aim to improve patient's knowledge of pain processing and pain science by nervous system can help patients to experience less anxiety and fear, and ultimately help ease post-operative pain. Increasing the patient's knowledge regarding pain science can alter their perception of danger and they can then experience less anxiety and fear. Additionally, the increased knowledge and understanding of pain science can help to modulate the pain experience. Also the patients feel less pain maybe because they were stressed less and were prepared better to cope up with the pain. Anxiety been reported to increase the sensitivity to pain and to reduce the anxiety decrease.

Cryotherapy

Cryotherapy includes the application of the bag of cooled or ice water to skin surrounding wound and the operation area, and has been used traditionally in postoperative recovery. The cold temparature go through soft tissues and, when it is applied over the joint, decrease in the tissue metabolism related with reduction in the enzymatic activity, and/or preventing the tissue damage due to injury. Cryotherapy can decrease leukocyte migration and also slow down the nerve signal transmission, giving the reduction of the inflammation and producing the short term analgesic effect. The local hypothermia provokes vasoconstriction and decreases the extravasations of blood into the surroundings tissues, edema production and local inflammation. Several studies investigating the benefits of the cryotherapy on the recovery after the joint surgeries have shown the reduction in blood loss.

Regional Anesthesia

As noted already, the regional anesthesia may be used as primary anesthetic choice such as spinal (i.e., sub-arachnoid block) or the epidural anesthesia or as the means of providing post-operative analgesia after general anesthesia (epidural or lumbar plexus block.) Regional anesthesia is generally the mode of the anesthesia for hip-fracture surgeries, and different regional anesthetic techniques been described to gain surgical anesthesia of hip, which needs blockade of femoral, lateral cutaneous, and obturator the nerve of thigh. Subarachnoid block (SAB) and the peripheral nerve blockade are two techniques usually employed. The post-operative result in the elderly patients undergoing the surgical repair for proximal femoral fractures and type of anesthesia used has still not been determined with certainty other than spinal and epidural anaesthesia.

Spinal and Continuous Spinal

Spinal anaesthesia offers nerve blockade in the large part of body during surgery with the smaller dose of local anaesthetic and the shorter surgery onset-time. However, the spinal anaesthesia can lead to the adverse haemodynamic changes, like prolonged and severe hypotension in high risk patients. The continuous spinal anaesthesia (CSA) offers extending blockade during the surgery and adaptable pain management during post-operative period through an indwelling catheter, permitting intermittent injection of the local anaesthetic into subarachnoid space. Good cardiovascular stability, less-local anaesthetic need, good control of anaesthesia level and the lower risk of local anaesthetic toxicity were observed in CSA procedure compared with the single dose spinal anaesthesia technique.

Lumbar Plexus Block

Peripheral nerve blockade, lumbar plexus block (LPB) is used as the method of analgesia & regional anesthesia for several years; however, it's not been used regularly, primarily because of lack of experience and the unidentified complications. It could be safe due to the targeted somatic-nerve block in the psoas region that prevents dispensable sympathetic-block even in the cardiovascular compromised patients. The prevalence of the complications in the oriented specialist hands is not repressive.

Epidural

Epidural space is potential space posterior to dura mater that comprises of spinal nerve roots, blood vessels, connective tissue, and fat. The small epidural catheter placed in space to introduce local anesthetic solutions for the operative anesthesia and the post-operative analgesia. For hip surgeries, catheters are generally placed in the middle to lower lumbar interlaminar spaces (e.g., L3–4 or L4–5).[11]

Erector Spinae Block at Lumbar Level

Erector spinae plane block is the novel ultrasound guided block that influences either dorsal or both dorsal and the ventral rami of spinal nerves, and it potentially could be used to treat the cases of low-back pain and postop surgical pain management in hip surgeries. A study reported that Erector spinae plane block was effective for peri-operative analgesia in the lumbosacral spine surgery.

Supra Inguinal Fascia Iliaca Block

Fascia iliaca block includes block of femoral and lateral femoral cutaneous nerve (LFN), been reported to be the efficient analgesic technique for the hip surgery. The traditional fascia iliaca block, with the local anesthetic injection in to inguinal region, might not always block the both nerves because LFN can branch proximally at level of anterior superior iliac spine. Ultrasound guided fascia iliaca block by supra inguinal approach, with the local anesthetic injection super-ficial to iliacus muscle, better than infra-inguinal ligament, would block both femoral and LFN completely. This is due to the femoral and LFN are not branched off & have more reliable course at this location.

PENG (PEricapsular Nerve Group)Block

Peripheral nerve blocks are becoming immensely popular for the hip arthroplasty anesthesia. The modern regional anesthesia for most important hip surgery involves the use of the single shot and spinal injections or continuous epidural, continuous lumbar plexus blockade and continuous peripheral blockade of fascia iliaca (FI) block, femoral nerve (FN), 3-in-1 FN block & sciatic nerve. The use of either single shot or the continuous peripheral nerve blocks is becoming immensely popular. These techniques have shown safe and effective control of post-operative pain, resulting in the lower opioid consumption, enhanced earlier rehabilitation and patient satisfaction. Taking into the account previous anatomical studies, the anterior hip capsule is innervated by the accessory obturator nerve (AON), obturator nerve (ON), and FN1. PENG block blocks these three nerve branches which supplies the anterior hip joint.

Quadratus Lumborum Block

Quadratus lumborum block (QLB), described as the variant of the TAP block, and is widely used for postoperative analgesia in the abdominal surgery. This technique includes the procedure of injecting the local anesthetic into fascial plane between quadratus lumborum & psoas muscles. The quadratus lumborum muscle start offs from iliac crest and inserts on 12th rib and the transverse processes of the vertebrae L1–L5. The local anesthetics extend along with the muscles and offer T6-L3 sensory-block. Therefore this been used in the hip and pelvic surgeries as presented by few cases.

Advances and future trends in postoperative analgesia in hip surgeries

With several advances in management of pain for surgical patient, surgeons and pain-care providers have countless choices of the analgesic pharmaco-therapy and the analgesic techniques to decide to provide the adequate post-operative pain control for surgical patient in 21st century. However, several factors should be considered before getting on the type of the pain therapy to be given to the patient. These involve the patients' comorbid conditions, exposure to analgesic therapies, psychological status, and type of the surgical procedure.

In future, genetically informed "personalized medicine" can become the reality even for the acute pain management. With recent advent of the studies documenting the genetic poly-morphisms with respect to the pain response to pressure pain sensitivity and morphine, this thrilling possibility looks hopeful in near future.

General Versus Regional Anesthesia

Clinical equipoise is defined as a state of the genuine ambiguity as to the pros or cons of each therapeutic arm. The choice of the primary anesthetic technique been the long standing debate, because the prospective studies are usually underpowered to detect the difference in short and long term outcomes. The cost and time of such randomized trials is the limiting factor, and it is impossible to blind the patients, nurses, surgeons, and the anesthesiologists to primary anesthetic technique provided. Huge data sets and meta analyses are started to shed the light on acute peri-operative effects of choice of the primary anesthetic. A meta-

analysis of 10 randomized trials comparing neuraxial to the general anesthesia for THA showed significant acute perioperative benefits to neuraxial anesthesia, including decreased risk for the deep venous thrombosis and pulmonary embolism, decreased blood loss, and transfusion risk.

Long-Term Benefits of the Regional Anesthesia

Neuraxial anesthesia emerges to be superior to the general anesthesia for most of the acute peri-operative measures studied. Data regarding long term effects of the regional anesthesia are limited incredibly. As been described by Ilfeld et al in TKA, extending duration of the local anesthetic infusion for four days, as opposed to one day, for the lumbar plexus catheters enhances acute post-operative pain, but appears to have no effect on the long term pain or function at one year after arthroplasty. Assessing pain and the functional outcomes is more challenging than a lot of acute peri-operative outcomes studied. Such variables are not easily obtained from the existing information, but there are ongoing efforts. Future study is needed to understand whether there is any association between the choice of the primary anesthetic technique and long-term outcomes.

Multimodal Analgesia

Multi-modal analgesia strategy combines analgesics with various mechanisms of the action to improve post-operative management of pain. This approach targets various path-ways and neuro-transmitters involved in the nociception and can allow the reduction in dose of each analgesic drug. By using the non-opioid adjuncts, the peri-operative opioid needs and opioid related side-effects may be reduced like sedation, nausea, vomiting, respiratory depression, constipation and urinary retention. In this portion, we reviewed the following multi-modal analgesic adjuncts: non-steroidal antiinflammatory drugs (NSAIDs), acetaminophen, selective cyclo-oxygenase-2 (COX-2) inhibitors, and gabapentinoid
.

Non-steroidal Anti-inflammatory Drugs and Cyclooxygenase-2 Inhibitors

The NSAIDs has strong facts supporting efficacy for peri-operative analgesia, and there are several NSAIDs with the different onset, route of administration, duration, efficacy, and side effect profile. The Procedure Specific Post-operative Pain Management Group briefed the significant literature on peri-operative analgesia particularly for the patients undergoing THA. They observed that NSAIDs reduced the morphine consumption & VAPS by 4 - 10 , upto 32 hours post-operatively when compared to placebo. The side effects of NSIADs involve gastrointestinal mucosal damage, platelet dysfunction, and renal dysfunction. Selective COX-2 inhibitors have the minimal adverse hemostatic and gastrointestinal effects; consequently, these agents can be preferred in peri-operative setting. Various studies have reported that COX-2 inhibitors enhance post-operative analgesia and decrease opioid consumption in the patients undergoing THA. Recently, few authors have mentioned the cost effectiveness and safety of using the fixed dose combination of NSAIDs and the proton pump-inhibitor compared to the COX-2 inhibitors. Therefore, use of the NSAIDs in the combination with the proton pump inhibitor might be an alternative option in high-risk of cardiovascular (CVD) events. Also there are concerns about the inhibitory effects of the COX-2 inhibitors and NSAIDs on bone healing because the animal research reported that such agents may decrease new bone formation by inhibiting osteoclast and osteoblast function, but the effect of small doses administration for short-periods of time to the human is to be determined yet.

Injectable NSAIDs

Ketorolac tromethamine is NSAID with activity at both the COX enzymes, thus blocking pro-staglandin production. Ketorolac is available for ophthalmic, enteral, and parenteral delivery and was only the parenteral NSAID until recently. The ketorolac has onset of action of approximately ten minutes, a peak analgesic effect at 2 to 3 hours, and analgesic duration of 6 to 8 hours, making it attractive for postoperative analgesia. It has been used to cure mild to severe pain following the major surgical procedures, including gynecologic, general abdominal and orthopaedic surgery. Various studies have examined analgesic potency of ketorolac, and in the animal models analgesic potency has been expected to be 180 - 800 times that of aspirin.

Gabapentinoids

The gabapentinoids are the effective post-operative analgesics that decrease opioid consumption by up to 50% compared with placebo. Gabapentin and pregabalin are presently classified as the gabapentinoid. Pregabalin is known to offer the faster onset and much more reliable, dose dependent bio-availability than gabapentin because of enhanced absorption profile. The commonest side effects of gabapentinoids include dizziness and somnolence and may be minimized with the dose reduction. According to the published data, use of the gabapentinoid alone for the analgesia following the major orthopedic surgery reduce opioid consumption but there were no significant differences in scores of pain compared with placebo. In addition to the analgesia and decreased opioid consumption, gabapentinoids can confer other ancillary advantages throughout early peri-operative period.

Acetaminophen

Acetaminophen (paracetamol) produces the analgesic effect by hindering central pro-staglandin synthesis with the minimal inhibition of the

peripheral prostaglandin synthesis. NSAIDs and Acetaminophen have important differences, like weak anti-inflammatory effects of acetaminophen and its poor capability to inhibit the COX in presence of the high-concentrations of per-oxides, as are found at the sites of inflammation. It also doesn't have an adverse effect on the platelet function or the gastric mucosa. The comparative efficacy of the different analgesics also been reported to vary with type and extent of the surgical procedure. A qualitative systematic review comparing NSAIDs and acetaminophen in post-operative pain management found NSAIDs to be far superior after the dental surgery; however, acetaminophen had no significant differences after orthopaedic procedures. Intravenous acetaminophen has reliable bioavailability and onset of the meaningful pain relief of 25 to 27 minutes in patients undergoing THA.

Ketamine

Ketamine is a well-known agent used by anesthesiologists for general anesthesia and sedation for the past three decades. Ketamine's mechanism of action is as the non-competitive NMDA receptor antagonist. With discovery of NMDA receptor and its link to the nociceptive-pain transmission and the central sensitization, there is a renewed the interest in using the ketamine as the potential anti-hyperalgesic agent. Although high doses (>2 mg/kg) of the ketamine have been concerned in causing the psychomimetic effects (e.g., cognitive dysfunction, excessive sedation, nightmares, hallucinations), subanesthetic or low-doses (<1 mg/kg) of ketamine have described significant analgesic effectiveness without the above side effects. Furthermore, there is no evidence to indicate that low-dose ketamine exerts any adverse pharmacologic effect on respiration, cardiovascular function, nausea, vomiting, urinary retention, constipation, or postoperative ileus.11 Recent reviews have reported that low dose ketamine as sole analgesic agent decreases pain following IV, IM, and the subcutaneous routes. In contrast, there is the little evidence to favour low-dose epidural ketamine by itself for postoperative analgesia.

Periarticular Injection

Intra-operative peri-articular injection of the multimodal drugs is amongst the major procedures in the multimodal pain control protocol. , , Injection using the opioid and the local anesthetics into stretched or injured nerves or the tissues under guidance of the surgeon may block the axonal sodium channels & inhibit conduction of the pain messages. The wound infiltration with the local anesthetic may act locally to decrease peripheral nociception with some systemic adverse effects. Various authors described its efficacy on reducing post-operative pain and enhancing post-operative mobility after THA.

Opioids

Opioid receptors are found at pre and the post-synaptic sites of the ascending pain transmission system in dorsal horn of spinal cord, thalamus, brain stem, and cerebral cortex. Opioid receptors are also found in midbrain peri-aqueductal gray, the nucleus raphe magnus, and rostral ventral medulla, which comprise the descending inhibitory system modulating spinal pain transmission. There are at least three opioid receptors, mu which are located at dorsal horn of spinal cord, the dorsal root ganglion, and peripheral nerves.

One way that opioids are managed is through patient controlled analgesia (PCA) pumps. In patients who underwent THA, those who did not receive the neuraxial anesthesia, patient-controlled analgesia is often used. The efficacy of PCA, as opposed to the intermittent dosing, been established, and the studies have reported equal amounts of the opioid consumption and the pain scores between the 2 groups. The only difference was that the patients with PCA exhibit greater patient satisfaction with their management of pain. Disadvantages of PCA involve errors in the pump programming, need of maintaining the intravenous access, limited mobility, and pump maintenance. Seriousness of pump malfunction cannot be understated; FDA has recalled numerous pumps citing the devices that could "cause serious injury or death." FDA-led infusion pump initiatives have been developed to ensure much more strict safeguards and overall enhanced safety of PCA pumps.

Pearls and Pitfalls

1. Regional anesthesia plus sedation is often preferred for hip surgeries.
2. Combinations of pain-medications are the additive, and sometimes synergistic, in giving analgesia.
3. Poorly managed acute-pain may lead to chronic pain.
4. Combinations of sedating medications (including opioids), obesity, and the obstructive sleep apnea increase the risk for adverse respiratory events.
5. Analgesia medical monotherapy offers inferior analgesia compared with the multi-modal regimes and often confers increased side-effects.
6. Newer opioid medications generally contain acetaminophen (e.g., hydrocodone–acetaminophen); this amount of acetaminophen should be taken into account to keep the total daily dose of acetaminophen less than 3000 mg.

CONCLUSION

Although the patient education & rehabilitation protocols are essential in facilitating the patient's recovery after the total joint-arthroplasty, it cannot be over-emphasized that focus of rehabilitation

protocol after the joint-replacement must be in controlling peri-operative pain. The multimodal management of pain has become the major part of peri-operative care of patients undergoing the total joint arthroplasty. The principle of the multi-modal therapy is to use various techniques that target numerous different steps of pain pathway, permitting effective-pain control with lesser side effects.

REFERENCES

1. Melzack R. From the gate to the neuromatrix. Pain. 1999;(6):S121–S126.
2. Apfelbaum JL, Chen C, Mehta SS, Gan TJ: Postoperative pain experience: Results from a national survey suggest postoperative pain continues to be undermanaged. Anesth Analg. 2003;97:534-540,
3. Gan TJ, Habib AS, Miller TE, White W, Apfelbaum JL: Incidence, patient satisfaction, and perceptions of postsurgical pain: Results from a US national survey. Curr Med Res Opin. 2014;30:149-160
4. Kehlet H, Jensen T, Woolf C: Persistent postsurgical pain: Risk factors and prevention. Lancet. 2006;367:1618-1625,
5. American Society of Anesthesiologists: Practice guidelines for acute pain management in the perioperativesetting: An updated report by the American Society of Anesthesiologists Task Force on Acute Pain Management. Anesthesiology. 2012;116:248-273,
6. Lundblad H, Kreicbergs A, Jansson KA. Prediction of persistent pain after total knee replacement for osteoarthritis. J Bone Joint Surg Br. 2008;90:166–171.
7. Ranawat AS, Ranawat CS. Pain management and accelerated rehabilitation for total hip and total knee arthroplasty. J Arthroplasty. 2007;22(7 Suppl 3):12–15.
8. Louw A, Diener I, Butler DS, Puentedura EJ. Preoperative education addressing postoperative pain in total joint arthroplasty: review of content and educational delivery methods. Physiother Theory Pract. 2013;29:175–194.
9. Giraudet-Le Quintrec JS, Coste J, Vastel L, et al. Positive effect of patient education for hip surgery: a randomized trial. Clin Orthop Relat Res. 2003;(414):112–120.
10. Min BW, Kim Y, Cho HM, Park KS, Yoon PW, Nho JH, Kim SM, et al. Perioperative Pain Management in Total Hip Arthroplasty: Korean Hip Society Guidelines. Hip Pelvis 2016;28(1): 15-23,
11. Young AC, and Buvanendran A. Pain Management for Total Hip Arthroplasty. Journal of Surgical Orthopaedic Advances 2014;23(1):13–21,
12. Maxwell L, White S. Anaesthetic management of patients with hip fractures: An update. Contin Educ Anaesth Crit Care Pain. 2013;13:179–83.
13. Moore JM. Continuous spinal anesthesia. Am J Ther. 2009;16:289–94.
14. Maurer K, Bonvini JM, Ekatodramis G, Serena S, Borgeat A. Continuous spinal anesthesia/analgesia vs. single-shot spinal anesthesia with patient-controlled analgesia for elective hip arthroplasty. Acta Anaesthesiol Scand. 2003;47:878–83.
15. Hamid Reza Amiri,1 Mohammad Mahdi Zamani,1,2 and Saeid Safari. Lumbar Plexus Block for Management of Hip Surgeries. Anesth Pain Med. 2014 Aug; 4(3): e19407.
16. Hidemasa Takahashi and Takeo Suzuki. Erector spinae plane block for low back pain in failed back surgery syndrome: a case report. JA Clinical Reports. 2018;4:60
17. Hironobu Ueshima, and Hiroshi Otake. Supra-inguinal fascia iliaca block under ultrasound guidance for perioperative analgesia during bipolar hip arthroplasty in a patient with severe cardiovascular compromise. Medicine (Baltimore). 2018 Oct; 97(40): e12746.
18. Girón-Arango L, Peng PWH, Chin KJ, Brull R, Perlas A (2018) Pericapsular nerve group (PENG) block for hip fracture. Reg Anesth Pain Med 43: 859-863.
19. Indelli PF, Grant SA, Nielsen K, Vail TP. Regional anesthesia in hip surgery. Clin Orthop Relat Res 2005;441: 250-255.
20. Ahmet MuratYayik, SevimCesur, FigenOzturk, AliAhiskalioglu, Erkan CemCelik. Continuous quadratus lumborum type 3 block provides effective postoperative analgesia for hip surgery: case report. Brazilian Journal of Anesthesiology, Volume 69, Issue 2, March–April 2019, Pages 208-210
21. Nalini Vadivelu, Sukanya Mitra, and Deepak Narayan. Recent Advances in Postoperative Pain Management. Yale J Biol Med. 2010 Mar; 83(1): 11–25.
22. Mauermann, WJ, Shilling, AM, Zuo, Z. A comparison of neuraxial block versus general anesthesia for elective total hip replacement: a meta-analysis. Anesth. Analg. 2006;103:1018–1025.
23. Ilfeld BM, Meyer RS, Le LT, et al. Health-related quality of life after tricompartment knee arthroplasty with and without an extended-duration continuous femoral nerve block: a prospective, 1- year follow-up of a randomized, triple-masked, placebo-controlled study. Anesth. Analg. 2009;108:1320–1325.
24. Ilfeld BM, Mariano ER, Madison SJ, et al. Continuous femoral versus posterior lumbar plexus nerve blocks for analgesia after hip arthroplasty: a randomized, controlled study. Anesth. Analg. 2011;113:897–903.
25. Oshodi TO. The impact of preoperative education on postoperative pain. Part 1. Br J Nurs. 2007;16:706-10.
26. Guignard B, Bossard AE, Coste C, et al. Acute opioid tolerance: intraoperative remifentanil increases postoperative pain and morphine requirement. Anesthesiology. 2000;93:409-17.
27. Fischer HB, Simanski CJ. A procedure-specific systematic review and consensus recommendations for analgesia after total hip replacement. Anaesthesia. 2005;60:1189-202.
28. Toms L, McQuay HJ, Derry S, Moore RA. Single dose oral paracetamol (acetaminophen) for postoperative pain in adults. Cochrane Database Syst Rev. 2008;(4):CD004602
29. Capel M, Tornero J, Zamorano JL, et al. Efficiency of naproxen/esomeprazole in association for osteoarthrosis treatment in Spain. Reumatol Clin. 2014;10:210-7.
30. Malan TP Jr, Marsh G, Hakki SI, Grossman E, Traylor L, Hubbard RC. Parecoxib sodium, a parenteral cyclooxygenase 2 selective inhibitor, improves morphine analgesia and is opioid-sparing following total hip arthroplasty. Anesthesiology. 2003;98:950-6.
31. Burke A., Smyth E., Fitzgerald GA. Analgesic-antipyretic and anti-inflammatory agents. In Goodman and Gilman's The Pharmacological Basis of Therapeutics, , edited by L. Brunton, J. Lazo, K. Parker, The McGraw-Hill Companies, New York, 2006;11:671–716.
32. Buckley MM, Brogden RN. Ketorolac. A review of its pharmacodynamic and pharmacokinetic properties, and therapeutic potential. Drugs 1990;39:86–109,.
33. Gillis, J. C., Brogden, R. N. Ketorolac. A reappraisal of its pharmacodynamic and pharmacokinetic properties and therapeutic use in pain management. Drugs 1997;53:139–188.
34. Harder AT, An YH. The mechanisms of the inhibitory effects of nonsteroidal anti-inflammatory drugs on bone healing: a concise review. J Clin Pharmacol. 2003;43: 807-15.
35. Mathiesen O, Jacobsen LS, Holm HE, et al. Pregabalin and dexamethasone for postoperative pain control: a randomized controlled study in hip arthroplasty. Br J Anaesth. 2008;101:535-41.
36. Graham GG, Scott KF Mechanism of action of paracetamol. Am. J. Therap. 2005;12:46–55.
37. Keskinbora K, Pekel AF, Aydinli I. Gabapentin and an opioid combination versus opioid alone for the management of

neuropathic cancer pain: a randomized open trial. J. Pain Symptom Manage. 2007;34:183–189.
38. Tiippana EM, Hamunen K, Kontinen, VK, et al. Do surgical patients benefit from perioperative gabapentin/pregabalin? A systematic review of efficacy and safety. Anesth. Analg. 2007;104:1545–1556.
39. Oscier CD, Milner QJ. Peri-operative use of paracetamol. Anaesthesia 2009;64:65–72.
40. Sinatra RS, Jahr JS, Reynolds LW, et al. Efficacy and safety of single and repeated administration of 1 gram of intravenous acetaminophen injection (paracetamol) for pain management after major orthopedic surgery. Anesthesiology 2005;102:822–831.
41. Schmid RL, Sandler AN, Katz J. Use and efficacy of low-dose ketamine in the management of acute postoperative pain: a review of current techniques and outcomes. Pain 1999;82:111–125.
42. Lundblad H, Kreicbergs A, Jansson KA. Prediction of persistent pain after total knee replacement for steoarthritis. J Bone Joint Surg Br. 2008;90:166-71.
43. Viscusi ER. Patient-controlled drug delivery for acute postoperative pain management: a review of current and emerging technologies. Reg Anesth Pain Med. 2008;33:146-58.
44. Parvataneni HK, Ranawat AS, Ranawat CS. The use of local periarticular injections in the management of postoperative pain after totalhip and knee replacement: a multimodal approach. Instr Course Lect. 2007;56:125-31.
45. Korean Knee Society. Guidelines for the management of postoperative pain after total knee arthroplasty. Knee Surg Relat Res. 2012;24:201-7.
46. Viscusi ER, Parvizi J, Tarity TD. Developments in spinal and epidural anesthesia and nerve blocks for total joint arthroplasty: what is new and exciting in pain management. In: Marsh LJ, ed. Instructional course lectures, vol 56. Rosemont (IL): American Academy of Orthopaedic Surgeons; 2007; 139-45.
47. Vendittoli PA, Makinen P, Drolet P, et al. A multimodal analgesia protocol for total knee arthroplasty. A randomized, controlled study. J Bone Joint Surg Am. 2006;88:282-9.
48. Parvataneni HK, Shah VP, Howard H, Cole N, Ranawat AS, Ranawat CS. Controlling pain after total hip and knee arthroplasty using a multimodal protocol with local periarticular injections: a prospective randomized study. J Arthroplasty. 2007;22(6):33-8.
49. Bottros J, Klika AK, Milidonis MK, Toetz A, Fehribach A, Barsoum WK. A rapid recovery program after total hip arthroplasty. Curr Orthop Pract. 2010;21:381-4.
50. Wellman SS, Murphy AC, Gulcynski D, Murphy SB. Implementation of an accelerated mobilization protocol following primary total hip arthroplasty: impact on length of stay and disposition. Curr Rev Musculoskelet Med. 2011;4:84-90.
51. Holtsman M and Fishman SM. Opioid receptors. In Essentials of Pain Medicine and Regional Anesthesia, edited by H. T. Benzon, S. N. Raja, R. E. Molloy, et al., Elsevier–Churchill Livingstone, Philadelphia, 2005;2:87–93.
52. Cortazzo MH, Fishman SM. Major opioids and chronic opioid therapy. In Raj's Practical Management of Pain, , edited by H. T. Benzon, J. P. Rathmell, C. L. Wu, et al., Mosby–Elsevier, Philadelphia, 2008;4:597–611.

How to cite this article: Prasad GVK. Recent Updates in Post-Operative Pain Management in Hip Surgeries: A Narrative Review. Ann. Int. Med. Den. Res. 2020; 6(2):AN10-AN16.

Source of Support: Nil, **Conflict of Interest:** None declared