Review Article: Rebound Pain after Peripheral Nerve Block for Ankle Surgery and Postoperative Analgesic: Systematic Review

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ABSTRACT

Introduction: Regional anesthesia is considered an important tool in postoperative pain management while minimizing opioid use. However, post-operative recovery (characterized by peripheral nerve hyperalgesia) may reduce or completely block the effect of this change, since opioids may act better after the blockage is removed.

Material and Methods: This study was a systematic Review. We reviewed the published literature describing the pathophysiology and development of complications after peripheral artery dissection in orthopedic surgery patients. Search for related articles using PubMed, EMBASE, and Web of Science.

Results: We included 28 articles (n=28) in our review. Perioperative peripheral nerve considerations and other postoperative pain management for orthopedic surgery patients are discussed. Multimodal strategies such as preemptive analgesia, intra-articular or intravenous anti-inflammatory drugs, and adjuvants in vain block fluid before block failure will reduce the burden of rebound pain.

Conclusion: Additionally, educating the patient about the possibility of back pain is important to ensure proper use of pain relievers and to reduce the need for pain relief opioids. Understanding the effects of relapse and prevention of relapse is important to reduce the side effects associated with the use of opioids for regional anesthesia.

Introduction

While regional anesthesia is considered an important tool in reducing postoperative pain and opioid consumption, posttraumatic susceptibility may decrease and full benefit may not be seen. Back pain is a condition caused by hyperalgesia after peripheral nervous failure. When peripheral nerves work, patients experience less pain and use less opioids, but relapses often lead to more

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opioid use later on, which is not good [1-3]. Postoperative pain is one of the most dangerous surgical complications arising from patients, especially in orthopedic surgery, and is often associated with back pain. In strategies to prevent the transition from acute pain to chronic pain, opioid therapy has become an important part of pain management and postoperative procedures [4-6].

However, despite their effectiveness in the treatment of acute and chronic pain, opioids are associated with adverse side effects. On top of that, opioids are one of the leading causes of death from overdose, and for many patients their first exposure to opioids is in the perioperative period. The rise in opioid-related deaths has created an urgent need to accelerate efforts to reduce perioperative opioid use [7-9].

The use of regional anesthesia is increasing as part of a multidisciplinary approach to pain management, reducing the need for opioids and promoting early and early intervention in patients undergoing orthopedic surgery. However, peripheral nerves are associated with a rebound, hyperalgesic state that occurs 8 to 24 hours after block administration [10-12].

According to Williams et al., back pain is "another pain that occurs when the brain is mistaken for a more severe pain." In a study comparing patients who received a brachial plexus block with those who received general anesthesia but did not have joint surgery, the authors reported that 40% and 10% of patients who received a brachial plexus block experienced significant postoperative complications. Number of patients who received a single brachial plexus block under general anesthesia. In addition, patients in the brachial plexus group experienced more pain in the first 48 hours than patients who received general anesthesia [13-15].

Therefore, the benefits of effective pain management and reduced opioid use may be outweighed by the recurrence of pain during intervention. Treatment is still poorly understood, with few studies evaluating the overall efficacy of regional anesthesia as a strategy to reduce long-term pain and opioid use. We review the published literature describing the pathophysiology and outcomes of competitive recovery after peripheral nerve blocks during orthopedic surgery [16-18].

Material and Methods

This review reviewed the English literature from January 2014 to January 2019 using PubMed, EMBASE and Web of Science. Keywords "rebound tenderness", "rebound hyperalgesia", "rebound tenderness and regional anesthesia", "rebound tenderness and orthopedic surgery", "rebound tenderness and serial block", "rebound tenderness and single" Peripheral Nerve Block " and "Rebound" Pain. ". Orthopedics "Peripheral Nerve Blocks" "Post-operative Rebound Pain" "Ribound Pain and Regional Analgesia" "Recurrent Pain and Peripheral Nerve Blocks" "Peripheral Nerve Blocks, Postoperative Recurrent Pain and Regional Anesthesia. Clinical studies, meta-analyses, reviews and reviews describe the use of peripheral nerves alone or in combination with anesthesia Orthopedic surgery centers and non-orthopedic surgery trials were excluded.

Results

A total of 768 manuscripts were identified, 408 of which were printed. For this purpose, a title/summary review was conducted on 360 articles. Since then, 332 articles have been reviewed for findings on orthopedic surgery (n = 325), non-orthopedic surgeons (n = 2), study protocols (n=3), and pre-interview topics (n = 2). . A total of 28 articles were included in this review. Half of these articles are about people with back pain, and the other half are about people with low back pain.

The most frequently discussed nerve blocks are shoulder arthroplasty, shoulder arthroscopy

and distal radius fracture fixation, and intercarpal scalene, suprascapular, axillary and subclavian nerve blocks.

Femur blocks, sciatic nerve, lumbar plexus, fascia iliaca and periarticular injections are used in lower extremity surgery including total knee replacement (only), arthroscopic hip surgery, ankle and anterior cruciate ligament. reconstruction. Boluses and continuous infusion blocks were used similarly in the experiment. local anesthetic (eg, bupivacaine, ropivacaine, levobupivacaine, liposomal bupivacaine and lidocaine) alone, in combination (including bupivacaine and lidocaine), or with corticosteroids (triamcinolone), dexmedetomidine, administtrophin. In addition, blocks are often administered prophylactically with sedation or anesthesia (as part of a multimodal approach) [19]. Each study shows a different way to compete for prizes.

Discussion

Abnormal Specific Nerve Fibers Spontaneous Hyperactivity

Preclinical studies of sciatic nerve blocks in rats using 0.5% ropivacaine showed transient thermal hyperalgesia in animals 3 hours after cessation of mechanical analgesia, but there was no evidence of permanent changes in mechanical sensitivity or nerve damage [20-22]. The similarity between recurrent pain and neuropathic pain (burning pain, hyperalgesia) suggests that abnormality in C-fiber hyperactivity and nociceptor hyperactivity without nerve damage may play a role as part of the pathophysiological process. Kleggetveit et al. used microneurography to examine the function of nociceptors in patients with neuropathic burns and found that patients with this condition showed hypersensitivity and hyperactivity to mechanically insensitive C nociceptors [23]. Additionally, this study shows that axons are involved in sensory processing.

Patient-Related Factors

It has been reported that patient-related factors also play a role in the incidence and severity of recovery after peripheral nerve blocks. Psychosocial factors such as pre-existing medical conditions, age <60 years, gender, emotional disorder and depression were identified as the most important factors affecting peripheral nerve complications. There is evidence that back pain is less frequent and less severe in patients over 65 years of age [24-26]. A recent prospective study by Sort et al. Among patients undergoing emergency surgery for ankle fractures, the rate of recurrence was less at the age of >60 years and more severe at the age of 20 to 60 years [27]. The difference in frequency and severity of back pain in elderly patients can be explained by various factors such as changes in pain perception and depth of soft tissue nociception. Lautenbach et al. A prospective study of young and elderly volunteers found that baseline density decreased with age, had no effect of summer residence, and the threshold may be higher for stress-free adults.

Surgery-Related Factors

Surgical trauma can produce abnormal plasticity at the level of peripheral nociceptors and central neurons involved in receiving and processing direct and indirect inputs. Damage to peripheral nociceptors leads to inhibition of pain, resulting in increased sensitivity to pain (hyperalgesia) or an adverse response to normal pain stimuli (allodynia) [28-30]. A central state of pain sensitivity stores and activates nociceptive signals called "pain memory". As the blockage of the signal decreases, the sensation increases. This process of amnesia may explain why increasing the duration of peripheral nerve blocks using serial procedures and/or using adjuvants does not reduce the occurrence and severity of difficulty [31].

Anesthesia-Related Factors

Reversible neurotoxicity of local anesthetics has been proposed as an effective mechanism by which repeated exposures occur. Local anesthetics reduce perioperative pain and surgical response to pain by reversibly blocking voltage-gated sodium channels (VGSCs) and axonal conduction of nerve cells. Another beneficial effect of local anesthetics is the time-dependent and reversible inhibition of G protein-coupled receptor-mediated anti-inflammatory effects reported both in vitro and in vivo. Other preclinical studies have demonstrated disease and local resistance in different animal models. Many human studies have shown that lidocaine has anti-inflammatory properties in different conditions and during surgery [32-34].

Local anesthetics also target potassium channels and N-methyl-D-aspartate (NMDA) receptors. In contrast, other studies have shown that local anesthetics have protective effects. Gordon et al. In a prospective study in dental patients, bupivacaine induced higher cyclooxygenase 2 (COX-2) gene expression, increased prostaglandin E2 (PGE2) production, and greater pain following cessation of general anesthesia in the village (LA). Nerve injury associated with regional block is a combination of etiological processes such as direct nerve injury, neurotoxicity of LA, ischemia, or a combination of these processes [35].

Intravenous injection during peripheral nerve block (PNB) usually does not cause serious injury unless intraneural injection occurs, which may cause intraneural pressure to exceed capillary occlusion pressure, and after neuroischemia and focal demyelination. Ischemia can also result from direct injury or occlusion of extraneural vessels and perineural hemorrhage. Increased volume, increased volume, and longer length of LA reduces blood vessels in the blood. Interfascicular solution injection and high injection can disrupt interfascicular blood vessels and produce neuroischemia. It is unclear whether nerve damage during PNB exacerbates rebound sensitivity after the block has resolved [36].

Different types of LA can produce neurotoxicity through different mechanisms. Amides and esters of local anesthetics cause DNA damage, calcium depletion in the endoplasmic reticulum, calcium overload in the mitochondria, a decrease in the membrane, and a significant reduction in the cleavage of ATP synthesis by oxidative phosphorylation.

Rebound Pain and Interscalene Nerve Block

Comparison of interscalene brachial plexus block (ISBPB) with 0.5% ropivacaine and periarticular local anesthesia (LA) infiltration with liposomal bupivacaine. While ISBPB reduced pain at 8 hours after surgery ($p < 0.001$), no difference at 16 hours ($p = 0.348$), pain scores in the periarticular infiltration group were lower at 24 hours ($p = 0.021$). The authors reported that patients in ISBPB experienced improvement in pain and visual analog scale (VAS) pain scores increased from 1.4 (8 hours) to 4.9 (24 hours). There was no change in pain 24 hours after surgery in patients in the periarticular infiltration group.

It shows pain control at 8 hours of rest and opioid retention for up to 24 hours. Regardless of local anesthetic choice, dose or sensation, rebound pain can occur 8 to 24 hours after block. Kim et al. The incidence of recurrence was compared with patient-controlled interscalene blocks in patients undergoing arthroscopic shoulder surgery with block. Analgesia improved 12 hours after surgery in patients in the continuous infusion block group ($p < 0.005$) However, the use of local anesthesia was different in each group, making it difficult to determine whether the improvement in the periarticular LA group was due to avoidance of ISBPB or the use of liposomal bupivacaine. Interestingly, total use of morphine equivalent

(intraoperative plus postoperative) was still lower in the ISBPB group as intraoperative use decreased ($p < 0.001$) and no rematches have been reported in the past 24 hours. Although continuous perineural infusions of local anesthetics offer an option to reduce back pain, there are important limitations. Shoulder surgery, such as rotator cuff repair, is associated with pain longer than perineural infusions of local anesthetics, usually after 7 days.

Rebound Pain and Suprascapular Nerve Block (SSNB)

SSNB has been described alone or in combination with an axillary nerve block (ANB) to provide anesthesia for arthroscopic shoulder surgery. When comparing SSNB alone with the combination of SSNB + ANB, the authors found that the combined group had an improvement in VAS, higher patient satisfaction, and fewer back racing episodes within the first 24 hours. Similarly, another study comparing three groups IV PCA alone, IV PCA plus SSNB and IV PCA plus SSNB plus ANB found that SSNB plus ANB plus PCA provided better anesthesia for 12 hours and all 3 groups at 12 and 36 hours. He found that he was experiencing Rebound Pain. after surgery. A study comparing the combination of SSNB + ANB with ISBPB showed that the ISBPB group had better pain control in the first 8 hours, while the combination of SSNB + ANB again achieved better pain control without short or long-term pain. Similar to what is observed with periarticular infiltration, SSNB + ANB compared to ISBPB may result in lower pain scores and opioid consumption, while providing less pain medication.

In a specific study, Lee et al. conducted a randomized controlled trial with 48 patients undergoing arthroscopic rotator cuff repair. Ultrasound guided interscalene block and arthroscopically guided suprascapular block were performed in 24 patients, and interscalene block with only ropivacaine was performed in 24 patients. The authors reported that the combination group had lower VAS scores up to 28 hours after surgery, while the control group had higher scores up to 36 hours. Both teams faced back-to-back matches.

In addition, six patients in the ISBPB + SSNB group experienced a "double relapse" phenomenon in which they had two different periods of hyperalgesia, corresponding to the expected cutoff of all affected. However, the onset of relapse was slower ($p < 0.001$) and less severe ($p = 0.001$) in the ISBPB + SSNB group compared to ISBPB alone. Therefore, the length of the blocks given with the combination of these blocks appears to be more important than the block alone in reducing pain even before the pain is healed. Therefore, it is possible to use the difference in study times to increase the analgesic effect of a single injection as an alternative to continuous perineural infusion.

Rebound Pain and Other Brachial Plexus Blocks

However, in the brachial plexus group, pain gradually increased at 12 and 24 hours, resulting in a significant increase (<0.001) in opioid intake 6 to 12 hours after brachial plexus block surgery. Therefore, total opioid consumption did not differ between the two groups. Ganta et al. A trial was conducted to examine the efficacy of single subclavian blocks versus continuous subclavian blocks in patients with fractures.

The authors failed to show improvement or improvement in opioid intake within 12-24 hours after surgery. Unfortunately, studies examining the potential superiority of supraclavicular or axillary nerve blocks over subclavian blocks in curing back pain are limited.

Rebound Pain and Femoral Nerve Blocks

Recoil sensitivity has also been reported with low nerve levels. The femoral artery provides good anesthesia for knee surgery with

limitations of back pain and risk of falls due to quadriceps weakness. Xing et al. described better pain control with the femoral nerve compared to general anesthesia alone within 6 hours of surgery. However, pain relief precluded a later reduction in opioid consumption compared with the anesthesia-only group.

Improvement in the analgesic effect of PAI compared to FNB was observed in the first eight hours after surgery, probably due to the involvement of pain in the distribution of the sciatic nerve. Interestingly, their findings showed that adding FNB to PAI prevented relapses seen with PAI alone. On the other hand, Stathellis et al. found a competitive improvement (after discontinuation of the catheter/infusion) in patients receiving continuous intravenous infusion (CFNB) compared to the postoperative intra-articular infusion (PIAC) group. In particular, ketorolac, which has anti-inflammatory and anti-inflammatory properties, helps the PIAC team avoid rebound.

Rebound Pain and Combined Sciatic/Saphenous Nerve Blocks

Henningson et al. A patient who underwent combined sciatic and saphenous nerve block as the first general anesthesia for the joint was interviewed. Even before acetaminophen and ibuprofen were prescribed, some patients experienced pain that lasted for up to two hours after surgery and in some cases did not respond to pain relief with morphine [37-39]. Although patients are explained about the possibility of back pain and the necessity of drug resistance before starting blocks, most patients are still unsure when taking the drug, especially when one block seems to disappear before the next. This can result in increased pain as well as increased need for opioids. The authors emphasize the importance of good patient education and communication that preventive analgesic drugs can be used to prevent pain once the blockage is resolved.

Rebound Pain in Lower Extremity Nerve Blocks When Compared to Neuraxial Blocks

While the focus of this article is recovery after peripheral nerve blocks, central neuraxial blocks are an established anesthetic technique for low back surgery and offer comparable advantages to peripheral nerves when measuring back pressure [40-42]. Spinal blocks are known to have a faster onset of analgesia, while femoro-popliteal blocks are known to have a longer duration of analgesia. Future studies comparing spinal anesthesia with peripheral nerve anesthesia may provide more information on the strengths and weaknesses of each modality and potential side effects such as the incidence of pain and/or overall relapse of opioid use in both groups. Kurt et al. Patients who underwent arthroscopic surgery with a lumbar plexus and fascia block reported a reduction in pain 2 hours after surgery.

Adjuvants to Local Anesthetics for Peripheral Nerve Blocks and Rebound Pain

Adjuvants are used with local anesthetics, including clonidine, dexmedetomidine, dexamethasone, buprenorphine, midazolam, epinephrine, tramadol, magnesium, morphine, and others. In addition to prolonging the duration of anesthesia, these adjuvants help reduce the need for general local anesthesia. However, there are concerns about the neurological side effects and toxicity of these adjuvants. Knight and others. In contrast, dexmedetomidine has been shown to improve blood pressure when used as a supplement without the risk of local anesthetic neurotoxicity.

Similarly, in a rat model, the addition of perineural dexamethasone to bupivacaine prevented axonal degeneration and demyelination, as was seen in rats treated with

bupivacaine alone for sciatic nerve blockade. Rebound hyperalgesia was observed only in the bupivacaine group, not in the bupivacaine + dexamethasone (high and low) group. This suggests that the effects of local anesthetics on competing blood vessels are reversed by adding dexamethasone to the periphery of the blood vessels. But the effect of dexamethasone was not observed when using the drug. Dexamethasone also prolongs the antinociceptive effect of bupivacaine in doses.

In the literature, dexamethasone appears to show a similar ability to delay peripheral nerve activity along with buprenorphine, clonidine, dexmedetomidine, and magnesium. The reaction occurred to buprenorphine, while higher perineural doses of dexamethasone were associated with more severe pain compared to lower doses (or perhaps a specific 2 mg dose of plexus block). Therefore, the optimal use of these adjuvants should be further explored to exploit their beneficial effects in reducing and potentially preventing relapse.

Conclusion

Rebound tenderness after peripheral nerve blocks in orthopedic surgery may reduce all the benefits of regional anesthesia. Multimodal strategies such as preemptive opioid analgesia before block failure, use of intra-articular or intravenous steroids and NSAIDs, use of adjuvants in nerve blocking solutions to prolong analgesia, and serial blocks. compared to a block) can be used to reduce the incidence of back pain. A future area of research that may benefit the nature of back pain is the absence of pain when the brain takes action to reduce chronic pain after the pain has subsided. The question to ask instead is how much weight makes certain side effects less serious. Similarly, studies of local anesthetics may differ in the experience of back pain. Different organizational strategies have been proposed in patients who have undergone orthopedic surgery as part of a multimodal strategy involving peripheral nerves. However, the best way to reduce back pain is still unclear. A better understanding of the impact of pain relief on long-term pain management and opioid use and the development of strategies to prevent use and abuse are primarily required.

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