Is there a difference in analgesic efficacy between nerve block and intraarticular administration of analgesia for patients undergoing knee or hip arthroplasty?

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Response / Recommendation for TKA

Local infiltration analgesia (LIA) and peripheral motor-sparing nerve blocks (PNB),when performed properly, have similar analgesic efficacy after total knee arthroplasty (TKA).

Response / Recommendation for THA

Local infiltration analgesia (LIA) can provide added analgesia for patients undergoing total hip arthroplasty (THA). Peripheral nerve block (PNB) has not demonstrated additional analgesic benefit after THA. In addition, PNB may interfere with muscular strength, and therefore may delay the recovery process.

Level of Evidence: moderate

Rationale: Total hip and knee arthroplasties are associated with significant postoperative pain that must be controlled to allow the patients an optimal rehabilitation process. Enhanced recovery after surgery (ERAS) protocols for major joint arthroplasty provide significant clinical and economic benefits, and pain control plays a crucial role in faster recovery and patient satisfaction (1). Hence, a variety of regional and local techniques have been developed to provide analgesic benefit without undue reliance on opioids (2).

For patients undergoing orthopedic procedures, local infiltration analgesia (LIA) and peripheral motor-sparing nerve blocks (PNB) can have an additional analgesic effect when performed properly. Early mobilization, reduced length of hospital stay (LOS) overall costs, reduced use of analgesics (especially opioids), less frequent side effects (nausea and vomiting) are possible benefits of these analgesia techniques after total joint arthroplasty (TJA). LIA and PNB have been shown to be a safe and reproducible procedure that can reduce postoperative pain without interfering with rehabilitation protocol.

For LIA, a single local anesthetic such as ropivacaine or bupivacaine should be considered. The addition of epinephrine and/or tranexamic acid as part of the LIA cocktail provides other advantages, such as reduced postoperative bleeding. There is no clear evidence advocating the use of additional substances, like glucocorticoids, NSAIDs, opioids or antibiotics. Application of LIA can be performed in one or more steps during the surgery, the exact anatomical location of the injections should be chosen based on the innervational anatomy of the target joint.

For PNB, a local anesthetic is applied by the anesthetist, optimally under ultrasound guided visualization, prior to or after the surgical intervention. In case of TKA, an adductor canal block is achieved by injection of local anesthetic around the sensory fibers of the femoral nerve (saphenous nerve) without causing any muscle weakness. In case of THA, the analgesic effect

around the hip is achieved by injection of local anesthetic in the soft tissue envelope around the hip joint, where several nerves are blocked (femoral, obturator, superior gluteal and sciatic nerves). Furthermore, the combination of these two techniques as a multimodal approach, can theoretically strengthen their beneficial effects. Even though some of those beneficial effects are statistically better, they may not always result in relevant clinical improvement.

A systematic review was done using three databases: Pubmed, Embase and World of Science. The most appropriate MeSH terms were utilized in order to find all relevant papers about the analgesic efficacy of LIA and/or PNB in patients undergoing TKA or THA. A total of 351 papers were found. We included only comparative studies. After exclusion of non-relevant studies, 102 papers were included for final evaluation, including 90 TKA studies, 9 THA studies and 3 studies involving both, TKA and THA.

In the systemic review of Andersen and Kehlet (3), the analgesic efficacy of LIA was evaluated. In patients undergoing THA, no additional analgesic effect of LIA compared with placebo was reported in trials with low risk of bias when a multimodal analgesic regimen was administered perioperatively. Compared with intrathecal morphine and epidural analgesia, LIA was reported to have similar or improved analgesic efficacy. In patients undergoing TKA, most trials reported reduced pain and reduced opioid requirements with LIA compared with a placebo/no injection. Compared with femoral nerve block, epidural or intrathecal morphine LIA provided similar or improved analgesia in the early postoperative period, but most trials had a high risk of bias due to administration of different systemic analgesia between groups. Overall, the use of wound catheters for postoperative administration of local anesthetic was not supported in the included trials, and LOS was not related to analgesic efficacy. Despite the many studies of LIA, final interpretation is hindered by methodological insufficiencies in most studies, especially because of differences in use of systemic analgesia between groups. However, LIA provides effective analgesia in the initial postoperative period after TKA in most randomized clinical trials even when combined with multimodal systemic analgesia. In contrast, LIA may have limited additional analgesic efficacy in THA when combined with a multimodal analgesic regimen. Postoperative administration of local anesthetic in wound catheters did not provide additional analgesia when systemic analgesia was similar, and LOS was not related to use of LIA with a fast-track set-up.

In an RCT of Spangehl et al (4) patients after TKA receiving LIA had similar pain scores, shorter lengths of stay, less likelihood of peripheral nerve dysesthesia, but greater narcotic use on the day of surgery compared with patients receiving peripheral nerve blocks. Periarticular injections provide adequate pain relief, are simple to use, and avoid the potential complications associated with nerve blocks.

There are controversial opinions and conflicting results regarding the use of PNB in patients undergoing THA. Marques et al, concluded that local anesthetic infiltration is effective in reducing short-term pain and hospital stay, while Yin et al, concluded that it does not influence the later stages of recovery (5,6). A meta-analysis done by Jiménez-Almonte et al, after analyzing 35 randomized control trials (RCTs) reported that local infiltration analgesia reduced pain scores and opioid consumption when compared with placebo, but there was no difference between LIA and PNB (7). This meta-analysis involving 2,296 patients compared LIA and PNB (femoral nerve block, 3-in-1 block, lumbar plexus block, psoas compartment block and fascia iliaca compartment block), and found no difference in pain scores and opioid consumption 24 hours after THA.

When comparing three groups: LIA combined with spinal anesthesia, only spinal anesthesia and spinal anesthesia with fascia iliaca compartment block (FICB), Demeulenaere et al, found

a lower pain score for LIA up to 4 hours postoperatively. In opposition to FICB, the spinal anesthesia group had better rehabilitation potential at 12 hours postoperatively. Thus, they concluded that LIA is a beneficial adjuvant therapy to spinal anesthesia in THA and adjuvant FICB only provides lower opioid consumption (8). Another RCT made by Lennon et al, found that adding an erector spinae plane block to patients who have already received neuroaxial blocks, local anesthetic infiltration and oral multimodal analgesia, does not provide additional analgesic benefit (9).

Another promising analgesic method has been emerging which consists of ultrasound-guided pericapsular nerve block (PENG) preoperatively. This technique has not demonstrated differences in pain control, hip function and length of stay when compared with LIA. Therefore, PENG should not be used as a single analgesia technique. However, as happens with LIA, PENG is advantageous to the femoral nerve block technique as it is simpler and does not interfere with the quadriceps strength which could affect the recovery process (10). Another RCT by Ye et al (13) compared ultrasound-guided pericapsular nerve group block (PENG) with LIA in 80 patients and concluded that the analgesic effect and functional recovery of PENG applied alone after THA are not superior to those of LIA. However, a combination of PENG and LIA has been shown to improve postoperative pain relief without weakening the quadriceps muscle (14,15). Nevertheless, it did not translate into improved quality of recovery or longer lasting postoperative effects (15).

An RCT by Yang et al (11) compared lumbosacral plexus block (LSPB) and LIA in 117 patients undergoing THA under general anesthesia, examining postoperative quality of life (QoL) and pain. Using the EQ-5D as an index for QoL, they showed that LSPB is better than LIA for up to 6-months postoperatively. However, the overall analgesic effect of LIA within 72 hours postoperatively was no less than that of LSPB.

Another RCT by Lennon et al (12) involving 64 patients undergoing THA under spinal anesthesia showed that there was no appreciable analgesic benefit to adding an erector spinae plane block to patients already receiving LIA.

Based on the evaluation of current evidence, it appears that use of LIA and/or PNB in patients undergoing TKA provides addiotnal analgesic efficacy. This is not, however, entirely true for patients undergoing THA. Due to lower level of pain, patients undergoing THA do not seemt o benefit from the us eof PNB but administration of LIA may provide additional analgesic efficacy without interefering with rehabilitation.

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