80406 - ANALGESIA FOR PRIMARY TOTAL KNEE ARTHROPLASTY

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Introduction: Total Knee Arthroplasty (TKA) is associated with moderate to severe pain. Multimodal analgesia is commonly used perioperatively along with a Periarticular Injection (PI) or Femoral Nerve Block (FNB). FNB is not without risk and opinion is still divided as to which of the two is better. This study is a prospective double blinded randomized controlled trial comparing PI with combined Continuous Femoral Nerve Block and Posterior Capsular Injection (NB+PCI) with postoperative follow-up for 1 year.

Methods: Appropriate ethics approval was obtained. Both groups had preoperative oral analgesia with Controlled Release Hydromorphone (CRHM), Celecoxib & Acetaminophen; NB placed by ultrasound or nerve stimulator guidance or both; standardized spinal anesthesia and sedation; Intravenous Patient Controlled Analgesia (IVPCA) with HM on postoperative day 0 (POD-0); Oral analgesia with CRHM, Immediate Release HM, Celecoxib and Acetaminophen from POD-1 onwards. These treatments were the same for all patients in the study.

Patients were randomized and had either 20 ml of 0.2% Ropivacaaine through the FNB catheter or saline as a loading dose in the OR in the NB+PCI & PI groups, respectively. The FNB catheter was infused with either 0.2% Ropivacaaine or saline at 15 ml per hour until POD-1 morning, followed by 10 ml per hour until POD-2 morning. Either 20 ml of 1% Ropivacaaine or periarticular solution was injected in the posterior capsule of the knee and a sham PI with saline or a solution containing Ropivacaaine, preservative free Morphine, Ketorolac and Epinephrine was infiltrated around the joint and skin in the NB+PCI & PI groups, respectively. Physicians, patients and assessors were blinded to the group assignment.

Pain was assessed at rest and during movement twice daily on POD-1 & 2 by a Numerical Rating Scale (NRS). The worst pain experienced between the two time points, number of patients reporting mild, moderate & severe pain in each group, knee range of motion (ROM), quadriceps strength, walking distance, narcotic usage & side
effects, hospital length of stay (LOS) and patient satisfaction were also assessed. Pain score, patient satisfaction, Oxford Knee Score (OKS) and ROM were assessed again at 1 year post TKA. The study was powered to detect a 2 point difference in NRS at rest and with motion between groups (p=0.05, beta=0.2).

**Results:** 72 ASA 1-3 patients under the age of 70 years were recruited. 39 were randomized in a concealed manner to the NB+PCI group and 33 to the PI group. Baseline differences between groups were not significant. A statistically but not clinically significant trend towards reduced pain on POD-2 for PI versus NB+PCI was seen. There were small differences in IVPCA HM usage on POD-0, (2.9+/− 2.4 mg in PI group vs 4.4+/−3.2 mg in NB+PCI group, p= .03), and knee flexion at 1 year (119.9+/−10.9° in NB+PCI group vs 109.9+/− 22.4° in PI group, p=.03). There were no significant differences in other outcome measures.

**Discussion and Conclusion:** There was no demonstrated improvement in pain control with the use of NB+PCI versus PI when both groups had a background of multimodal oral analgesia. The chosen technique should have the least potential for serious complications and least impact on work flow.

**References:**


82201 - THE IMPACT OF TRANSVERSUS ABDOMINIS PLANE BLOCKS ON LENGTH OF STAY

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Introduction: Several systematic reviews exist which support the role of transversus abdominis plane (TAP) blocks in improving postoperative pain scores, and decreasing opioid consumption, nausea, and vomiting (1,2,3). However, the impact of TAP blocks on postoperative functional recovery and resource utilization, such as length of stay (LOS), is not often reported and has not been reviewed. The purpose of this systematic review and meta-analysis is to determine whether TAP blocks lead to a reduction in LOS following elective abdominal surgery. The results of this study may help to identify the impact of TAP blocks on LOS or highlight the need for further research on resource-related outcomes.

Methods: A literature search was performed in the following databases: MEDLINE, PUBMED, CINAHL, EMBASE, Web of Science, CENTRAL, PROSPERO, US Clinical Trials Database, and WHO ICTRP. A systematic review protocol was developed and registered with PROSPERO. Given the nature of the study, ethical approval was deemed unnecessary. From our literature search, two investigators will independently identify all RCT and cohort studies that report LOS and meet our inclusion criteria (Table 1). These investigators will independently and sequentially review all identified titles, then abstracts, and finally identify full text reports (including data extraction). Disagreement will be settled through a tie-break by a third investigator. Using a data collection form specifically developed and piloted for this review, data will be extracted from tables or text of the identified full text reports. Risk of bias will be assessed using the Cochrane risk of bias tool for quality assessment of RCTs and the ACORBAT-NSRI and Newcastle-Ottawa Scale for cohort studies. Quality of evidence for each study will be documented using the GRADE approach.

Results: Literature search yielded 3,712 articles and 384 registered systematic reviews and clinical control trials. Identification of studies which meet the study inclusion criteria is currently underway. A random effects model will be used to meta-analyze data extracted from included studies. As LOS data are typically right-skewed, data will be log transformed and meta-analysis performed using the geometric mean and associated standard deviations to allow meaningful comparisons of standardized mean differences. Primary outcomes data (PACU LOS and hospital LOS) will be analyzed separately.
Planned sub-group analyses include inpatient vs. outpatient surgery, laparoscopic vs. open and upper vs. lower abdominal procedures, single-shot vs. continuous infusion of local anesthetic, and pre- vs. post-operative block placement.

Discussion: The TAP block has established efficacy for improving pain outcomes following lower abdominal surgery. An understanding of the effect of TAP block on resource utilization such as LOS is needed. Knowledge of the effect of TAP block on discharge time may highlight the need for further research on resource-related outcomes and may be beneficial in understanding the role of this intervention in Enhanced Recovery Programmes.

References:
2. Colorectal Dis 2012 4(10): e635-42
84261 - PAIN FOLLOWING UNILATERAL TOTAL KNEE ARTHROPLASTY

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Introduction: Total knee arthroplasty (TKA) is a painful surgery but it requires early mobilization for successful joint function. Therefore, effective pain management is essential for rehabilitation. Multimodal analgesia including: spinal anesthetic, nerve blocks, periarticular infiltration, opioids, and co-analgesics have been shown to effectively manage post-operative pain. One of the criticisms of nerve block is the potential to impair quadriceps muscle strength which limits mobility.(1-3) Both adductor canal (AC) and peri-articular infiltration (PI) have been shown to manage pain without impairing motor function.(4-7) However, it is unclear which technique is most effective. The purpose of this 3 arm trial was to examine the effect of both AC+PI vs AC vs PI. The primary outcome was pain on walking at post-operative day (POD)1.

Methods: Following Ethics Board approval, patients undergoing unilateral TKA were approached to participate in this trial. Inclusion criteria included: 18 years or older, ASA I-III, able to speak and read English. Patients were excluded if they had a contraindication to regional anesthesia/local anesthetics, chronic pain not related to their knee, were using opioids for 3 months or longer, or had a peripheral neuropathy. The sample size was calculated based on the primary outcome, and with a α0.5 and 15% attrition rate, a sample of 159 participants was required. Eligible and consenting participants were randomized into 1 of the 3 groups. On the day of surgery, the participant was admitted to the 'block room' where they received either AC block with 30mL of 0.5% Ropivacaine or sham block. PI was performed intra-operatively with a 110mL solution of Ropivacaine 300mg, morphine 10mg, ketorolac 30mg, in normal saline. Those patients randomized to AC only received normal saline. Outcomes measured on POD1 and 2 were pain, analgesic consumption, distance walked and pain related interference.
Results: A total of 159 participants consented and 144 completed the trial. The mean age was 67 years, and 63% were female. On POD1 participants who received AC+PI reported statistically lower pain on walking (3.3) as compared to those who received AC (6.2) or PI (4.9). Participants who received AC reported statistically higher pain scores at rest and knee flexion as compared to those who received AC+PI or PI. On POD2 participants who received AC+PI reported statistically less pain on walking (3.3), as compared to those who received AC (6.2) or PI (4.9). On POD2 there was no difference between the groups for pain at rest, or flexion. Participants who received AC used more IV PCA on POD 0. There was no difference between the groups regarding distance walked.

Discussion: Participants who received both AC + PI reported statistically less pain on walking on POD1 and 2. There was no difference between the groups on distance walked, however, this was only reported 1 time per day and did not capture distance walked over a 24 hour period if the participant walked multiple times.

References:

84341 - SPREAD FOLLOWING INADVERTENT INTRATHECAL INJECTION IN SPINE MODELS

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Introduction: Rapid high spinal blockade (HSB) can result from bolus injection via inadvertent misplacement or migration of an epidural catheter into the intrathecal space. As spinal curvature may also influence such local anesthetic spread in the intrathecal space, it is important to predict how positioning affects cephalad spread in a clinical condition with altered spinal curvature, as with obstetric patients. Pregnancy is known to induce spine flattening in a supine position. Since it would be challenging to study clinically, we attempted to investigate how anatomical changes of spine curvature in different postures would affect the spread time of local anesthetic in an in vitro setting.

Methods: We simulated unrecognized placement of a lumbar epidural catheter into the intrathecal space in a straight spine (i.e., laboring patient in supine position) and a spine with normal lordosis (control). A modified model of the intrathecal space made from clear polyvinylchloride tubing filled with 115 mL 0.9% normal saline (Sp. gr 1.006) was constructed and maintained at 37°C to simulate cerebrospinal fluid (Sp. gr 1.0069). Relative degrees of kyphosis and lordosis in both spines (supine) were replicated from previously published MRI data. With spines in the supine, upright, and semi-seated (30° head-up incline) positions, a bolus of 4.9 cc of 0.25% isobaric bupivacaine with 0.1 cc of 1% methylene blue marker was injected at a constant rate of 8.5 mL/min through a length of 5 cm of 19G epidural catheter inserted into the normal saline column. Time for the bolus to reach T3-T4 (cardioaccelerator fibers) and C3-C4 (diaphragmatic innervation) was recorded. The experiment was repeated four times.

Results: The bolus did not spread to the thoracic or cervical space in either spine when supine. In the straight spine, mean time of cephalad spread to T3-T4 (97 s upright, 69 s incline; p=0.11) and C3-C4 (140 s upright, 124 s incline; p=0.43) was not significantly different with respect to position. In the normal lordosis spine, mean time for the dye to reach T3-T4 (86 s upright, 144 s incline; p=0.009) and C3-C4 (122 s upright, 255 s incline; p=0.003) was significantly different in the cephalad spread depending on position. As illustrated in Figure 1, it was only in the semi-seated position that we observed a delay in spread to T3-T4 and C3-C4 (both p < 0.05) with the normal lordosis spine.
Discussion: Our simplified model of the intrathecal space demonstrates that spinal curvature appears to affect spread of isobaric solution in a normal saline column. A clinical implication is that keeping the patient supine prevents cephalad spread. In addition, maintaining spinal lordosis is important when bolusing local anesthetic with the patient in a semi-seated position. This may delay the spread of large quantities of isobaric solution within the intrathecal space in the event of inadvertent intrathecal catheter tip placement. Since the onset of HSB following a local anesthetic bolus is multifactorial, further clinical study is needed to confirm results of the study.

References:


Introduction: Over 12000 patients experience hip fracture in Ontario each year. This will increase to over 88 000 by 2041 at a cost of $37 000. Indirect anesthetic costs include timing of surgery and the impact of anesthetic technique on recovery. The Ontario Hip Fracture Quality Based Procedure handbook recommends fascia iliaca blocks (FICBs) to improve analgesia, reduce opioids, reduce incidence and severity of delirium and decrease length of stay. We describe the challenges of implementing perioperative FICBs in a community hospital.

Methods: REB approval was approved for this project. A group was created with orthopedic, anesthetic, pharmacy, nursing, administrative and a quality improvement specialist. Lean – Six Sigma methodologies were utilised to identify improvement opportunities.

Define
A standardized evidence base approach to managing perioperative pain management for patients suffering from hip fracture in order to reduce perioperative morbidity, delirium and pain.

Measure / Analyze
A process map was created. Contact with specialist consult teams including the acute pain service were identified. Operating room time is provided daily between 1pm and 6pm so the best time to perform FICB is between 1-4 pm. The on-call and trauma anesthesiologist are able to perform the blocks with help from Anesthesia Assistants and registered nurses.

A chart review identified common risk factors. Many patients received opioids as their primary mode of analgesia and many were unsuitable for multimodal analgesic agents. Neuraxial anesthesia with spinal morphine use was typically used for intra/postoperative analgesia. Regional anesthesia to reduce opioid use was uncommon.
A scorecard was created to streamline data collection including; arrival time, time to the surgery, length of stay and discharge destination.

Literature Review: FICB is a superficial peripheral nerve block using a large volume of dilute local anesthetic to block the femoral, lateral cutaneous and obturator nerves. Ultrasound guidance increases success.

Patient Safety: It was agreed FICBs could be performed in the emergency department or the ward. Monitoring and ultrasound will need to be available in both locations. Education on local anesthetic systemic toxicity (LAST) will be provided. Patients will require 20 minutes monitoring after the block. LAST therapy will be immediately available. 30-40ml of ropivacaine (0.25%) will be used. Exclusions include anticoagulation, patient refusal or neurological compromise.

Results: Improve We have now put in place the framework for implementation of a perioperative fascia iliaca block program led by the Department of Anesthesia. We believe the intervention will improve both preoperative and postoperative analgesia and the reliance on opiate medications for these patients.

Control
We will be using the following clinical markers of success:
-Pain scores (using the numerical rating scale).
-Incidence of delirium (using the Confusion Assessment Method).
-Length of stay.

Discussion: Although QBP handbooks provide best evidence, the implementation varies between institutions. Adoption of best practices provides anesthesiologists and excuse to escape from the operating room define our role as perioperative physicians.

References:

85881 - LOCAL INFILTRATION ANALGESIA FOR KNEE REPLACEMENT: A META-ANALYSIS

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Introduction: Total knee arthroplasty (TKA) is a common surgical procedure that can result in severe postoperative pain. Local infiltration analgesia (LIA) has recently gained popularity due to the lack of undesirable motor-related adverse events associated with peripheral nerve blocks. Despite these benefits, it remains unclear whether LIA provides pain relief comparable to femoral nerve block (FNB) or another regional anesthetic technique.

Materials and Methods: Electronic literature search of Medline, Embase, CENTRAL and Cochrane Database of Systematic Reviews databases for articles on LIA published before April 2014 was conducted. Clinical trial registries and international conference abstracts published over the last five years were also searched. Randomized controlled trials comparing LIA against no injection, placebo or regional anesthesia in adults (>18 years) undergoing elective unilateral primary TKA were included. Studies investigating unicompartmental TKA, using only intra-articular LIA or comparing two different LIA methods without a control group were excluded. Outcomes included pain scores at rest and with movement and cumulative morphine consumption at 8 and 24 (+/- 4) hours postoperatively; length of hospital stay; functional outcomes and complications. Data extraction and risk of bias assessment were performed by two independent reviewers. A random-effects meta-analysis of eligible studies was conducted. The requirement for IRB approval was waived as this was a systematic review of already published studies and de-identified data was used for meta-analysis.

Results: 1670 studies were identified and screened in two stages. A total of 24 studies including 1617 patients undergoing unilateral TKA were included. Of these, 753 patients were randomized to the LIA group. Eight studies compared LIA to placebo, 10 studies compared LIA to FNB, and 6 studies compared LIA to a neuraxial technique. When compared to placebo/no injection, LIA was associated with reduced pain scores at rest at 8 hours (SMD −1.68; 95% CI −3.10, −0.27) and 24 hours after surgery (SMD −0.85; 95% CI −1.48, −0.22). Similarly, reduced pain scores with movement at 8 and 24 hours
were noted. Compared to FNB, LIA was associated with decreased pain at 8 hours at rest (SMD -2.55 (95%CI -4.22,-0.89) and with movement (SMD -0.58 (95% CI -0.99, -0.18). By 24 hours, pain scores were reduced in the FNB compared to LIA (SMD 0.44; 95%CI 0.23, 0.65). Cumulative oral morphine equivalent consumption was lower with LIA compared to placebo (SMD -49.03 mg; 95% CI -92.84, -5.23) and neuraxial techniques (SMD -1.07 (95% CI -1.68, -0.46) over 24 hours but not when compared to the FNB. Length of stay was similar between LIA versus placebo, FNB or neuraxial techniques. Functional outcomes were qualitatively better with LIA. Long-term outcomes were lacking.

**Discussion:** LIA reduces short-term pain compared to placebo and provides improved early postoperative pain relief compared to FNB but this is reversed by the first postoperative day. Future research should focus on uniform assessment and long-term follow-up of pain and function.

**References:**
2. Singh M et al. Does local infiltration analgesia (LIA) provide clinically effective analgesia in the postoperative period for patients undergoing total knee arthroplasty? A systematic review protocol. PROSPERO 2015:CRD42015006378
86119 - IMPROVEMENT OF HEARING LOSS FOLLOWING EPIDURAL BLOOD PATCH

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Introduction: Hearing loss may complicate spinal anaesthesia with a reported incidence ranging between 0.4-40%. Hearing loss relates to the degree of CSF leak and varies with size and type of needle used 1. The association of hearing loss and Post Dural Puncture Headache is less well described. The aim of this study is to investigate the incidence of hearing loss and the improvement after epidural blood patch.

Methods: Appropriate ethical approval was obtained for this study. One hundred and ten patients who had symptoms of severe post dural puncture headache following accidental dural puncture with a 16G Touhy needle were recruited for a prospective observational study. Patients were excluded who could not co-operate with audiometric testing. Patient characteristics and symptoms were recorded. Each patient was evaluated by an audiologist and tested on the same audiometric equipment. Audiometry was performed in the sitting position one hour before and 24 hours after epidural blood patch. Results were analysed by students T-test, and the hearing threshold was considered to have changed if the difference between the two tests was at least 10dB in the same direction at two or more frequencies.

Results: Thirty four patients spontaneously complained of hearing loss. On direct questioning 91 of the 110 patients felt that their hearing was impaired post dural puncture. Statistical analysis of the Audiometric data showed a significant improvement in Audiometry post epidural blood patch (p < 0.0001) in the low frequency range (< 1000Hz). 86 of the 110 patients had an improvement of ≥ 10dB at two points in the low frequency range post epidural blood patch. All patients who had complained of hearing loss felt it had returned to normal levels post epidural blood patch.

Discussion: The mechanism of hearing loss associated with dural puncture is thought to be transmission of reduced CSF pressure to the inner ear by the cochlear aqueduct, an anatomical connection between the subarachnoid space and inner ear present in most individuals. Alteration in inner ear pressures distorts the basilar and vestibular membranes and auditory hair cell function2.
This study would suggest that hearing loss after accidental dural puncture may be more common than appreciated, and that audiometric testing may have a future roll in diagnosis and management of this problem.

References:
