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COMPARISON OF "COMBINED SPINAL AND EPIDURAL ANESTHESIA" AND "SPINAL ANESTHESIA WITH ULTRASOUND GUIDED CONTINUOUS FEMORAL NERVE BLOCK" FOR POST OPERATIVE PAIN RELIEF FOLLOWING TOTAL KNEE ARTHROPLASTY.

Dr Sathish Bobba DA, DNB, Assistant Professor, Gandhi Medical college.

Dr N. Keerthana* DNB, Assistant Professor, Gandhi Medical College. * Corresponding Author

Dr. Seshendra A DNB, Consultant Anaesthesiologist, Sunshine hospitals.

ABSTRACT

Background and objectives: Peripheral neural blockade provide effective analgesia with potentially fewer side effects than epidural blockade. The present study was undertaken to compare Ultrasound Guided Continuous Femoral Nerve Blockade (CFNB) with Continuous Epidural Analgesia (CEA) for postoperative pain control following TKR.

Methods: The patients belonging to ASA grade I and II are scheduled for TKR surgeries under spinal anesthesia were enrolled in this study. They were randomly divided (computer based) into 2 equal groups of 30 patients each. The Group I patients received Continuous Femoral Nerve Blockade and in the Group II patient's Epidural catheter was placed preoperatively. Post operatively continuous infusion with 0.125% Bupivacaine and Fentanyl 2 mcg/ml started at 5 ml/hr. for 24 hrs in both the groups. Data on VAS pain scores, hemodynamic changes, side effects at 0, 1, 2, 4, 8, 12, 16, 20 and 24 hrs and requirement of analgesic doses for first 24 hrs of the surgery were noted.

Results: In both the groups pain was well controlled, mean VAS of pain were 0.2, 0.6, 2.47, 2.07, 2.07, 1.5, 1.43, 1.37 and 1.3 for Femoral and 0.13, 0.93, 2.57, 2.17, 2.33, 1.6, 1.43, 1.30 and 1.33 for Epidural group during 0, 1, 2, 4, 8, 12, 16, 20 and 24 hrs which was not statistically significant. Hemodynamics were stable throughout in both the groups, the rescue analgesic consumption was 17 doses in Femoral and 19 doses of inj. Tramadol in Epidural group at various times during first 24 hrs postoperatively. The patients in CEA had more incidence of pruritus and urinary retention.

Conclusion: CFNB provides post-operative analgesia equivalent to with that obtained with CEA but with fewer side effects.

KEYWORDS : Combined spinal Epidural block, Ultrasound guided continuous femoral nerve block

INTRODUCTION

Major knee surgery such as Total Knee joint Replacement (TKR) is associated with moderate to severe postoperative pain. This lower limb procedure is amenable to regional anesthesia techniques which reduce neuroendocrine stress responses, central sensitization of nervous system and muscle spasms which occur in response to pain stimuli. [1] Inadequate relief of postoperative pain may result in harmful physiological and psychological consequences that lead to significant morbidity; this may delay recovery and return to daily activities. In addition, the presence of postoperative symptoms including pain significantly contributes to patients 'dissatisfaction with their anesthetic and surgical experience. It has been recognized that inadequately treated postoperative pain may lead to chronic pain. [2]

In orthopedic surgery, epidural analgesia is popular over recent decades as there is evidence for reduced blood loss and fewer thromboembolic complications. Epidural analgesia offers superior postoperative analgesia compared with systemic opioids including intravenous patient-controlled analgesia. An alternative regional anesthesia technique is, peripheral nerve blockade of the lower limb. In the past few years there is resurgence in the use of ultrasound guided regional anesthetic techniques. It offers immense benefit to the patient in the perioperative period to the extent that it might decrease the perioperative morbidity and influence the overall outcome. One of the advances in regional anesthesia is the ultrasound guided continuous peripheral nerve blocks (CPNB) also known as continuous perineural blocks, which offer tremendous advantage in the perioperative period. CPNBs are site specific and offer superior analgesia and are not associated with the possible side effects of opioid, analgesia like nausea, vomiting, sedation and respiratory depression. The quality of anesthesia is equal to that of epidural analgesia, but devoid of certain complications like hypotension, urinary retention and pruritus with lower incidences of autonomic side effects, less motor block and fewer neurological complications compared with the epidural analgesia.

Aims And Objectives:

1. To compare the efficacy of analgesia with ultrasound guided continuous femoral nerve block and continuous epidural analgesia for 24 hours following surgery.
2. To compare requirement of rescue analgesic agents in the first 24 hours of surgery.
3. Hemodynamic monitoring with pulse and blood pressure during continuous analgesic infusion and to determine postoperative adverse effects like pruritis, hematoma.

Materials And Methods:

This study was conducted in the Department of Anesthesiology and Critical care at Sunshine Hospitals over a period from January 2014 to July 2015 after obtaining approval from the Ethical Committee. The selection of patients was carried out with computer-based randomization, depending on the list of operations submitted by the surgical team. A written informed consent was obtained from all patients, patients aged 40-80yrs with ASA Ⅰ, Ⅱ and posted for TKR under regional anesthesia were included in study. Patients with ASA Ⅰ Ⅱ and bilateral TKR, with coagulation and spine abnormality are excluded from study, relevant investigations were carried out before taking up the patient for surgery, Patients were explained about the procedure of spinal, continuous epidural anesthesia and continuous femoral nerve block for post operative pain control at the time of pre-anesthetic evaluation and consent taken.

Patients were randomly allocated into two groups:

Group I: Continuous Femoral Nerve Blockade of the operative limb.
Group II: Continuous Epidural Analgesia.

In **group I,** with the patient in the supine position, continuous femoral block was given under USG guidance and catheter is placed beneath fascia iliaca. Catheter position is observed on ultrasound as the catheter is being inserted and/or with an injection through the catheter to document its proper location. Then the catheter was secured in place by subcutaneous tunneling and fixed with a transparent adhesive plaster.

In **group II** patients' continuous epidural analgesia was administered under strict aseptic precautions. The catheter was secured to skin with a transparent adhesive plaster. Intraoperatively no anesthetic agent was given through the epidural catheter.

Patients were monitored continuously using electrocardiography, noninvasive blood pressure and pulse oximetry. All the patients in both the groups were administered spinal anesthesia with a standard technique using 0.5 % hyperbaric bupivacaine with an addition of 25 mcg of fentanyl.

Postoperatively continuous local anesthetic infusion was started at 5 ml/hr with an infusion pump in both the groups. The infusate for the infusion pump consisted of 0.25% bupivacaine - 22.5 ml, Fentanyl 50 mcg/ml (2 ml) made up to 50 ml by adding normal saline 25.5 ml. Hence the infusion contained 0.125% of bupivacaine and fentanyl 2 mcg/ml.

Postoperative hemodynamic monitoring continued, data on pain scores using Visual analogue scale (VAS) and any adverse effects were

noted for 24 hours. Patients were asked to point out the intensity of pain on the VAS pain scale. The rescue analgesia of inj. Tramadol 50 mg IV was given if the patient complained of pain. This point corresponded to poor analgesia on the scale. Total dose of rescue analgesics administered to the patient during first 24 hours was noted.

DISCUSSION

Treatment of postoperative pain is provided to alleviate nociception induced responses, such as the endocrine, metabolic and inflammatory responses to surgery. These stress responses activate autonomic reflexes with adverse effects on organ function, reflexes leading to muscle spasm, and other undesirable results. Psychological consequences due to inadequate pain relief include anxiety, fear, anger, depression and reduced patient satisfaction. Uncontrolled pain has shown delayed recovery, increased need for hospitalization, delayed return to normal daily living, increased health care resource utilization and increased health care costs.[2] Effective pain control is essential for optimum care of patients in the postoperative period. Opioids remain the standard drug for acute pain management and are the first choice for the treatment of moderate to severe acute pain. They are limited by their significant side effects.

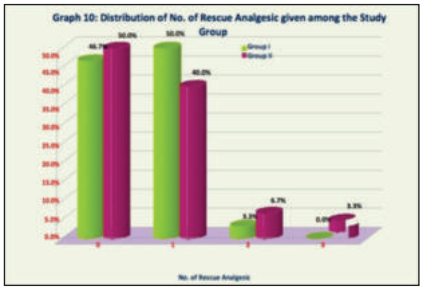
Epidural analgesia: Epidural analgesia [3, 4] continues to be the emphasis of anesthesia-based acute pain services. Typically, opioid-local anesthetic combinations are infused continuously for several days in the postoperative period. In general, most recent studies continue to demonstrate advantages of epidural analgesia if local anesthetics are using in combination with opioids**.**

Peripheral Nerve Blocks and continuous catheter techniques:

Peripheral nerve blocks provide intense, site-specific analgesia and are associated with a lower incidence of side effects when compared with many other modalities of postoperative analgesia.[5,6] Continuous catheter techniques further prolong these benefits. These advantages can facilitate a prompt recovery and discharge and achieve significant perioperative cost savings. This is of tremendous value in a modern health care system that stresses cost-effective use of resources and a continued shift toward shorter hospital stay as well as outpatient surgery.

Because of the intensity and duration of pain that occur with these procedures require the use of continuous femoral nerve blockade. A number of studies have documented dense analgesia with up to 50 % reduction in pain VAS scores for 48 hours, up to 64% lower postoperative opioid requirements, [7,8] a reduced incidence of side effects [9] and a 20% shorter hospital stay, [10] with femoral catheters when compared with Intravenous patient-controlled analgesia (IVPCA). An additional benefit includes improved short term post operative rehabilitation and joint mobilization.[8, 9] In an attempt to determine the best LA infusion regimen for continuous femoral blocks used for total knee arthroplasty (TKA), Singelyn and Gouverneur compared continuous infusion alone versus continuous infusion with boluses versus intermittent boluses alone. Reduced IVPCA opioid consumption was noted in the continuous infusion group with a mean of 0 attempts over 48 hours compared with 44 to 66 attempts in the other groups. [11]

Our study showed no significant hemodynamic changes in both the groups during the infusion for 24 hours. The VAS remained within the mild pain range throughout the study period. Patients who complained pain with corresponding VAS $\geq$ 4 received rescue analgesia (17/19 CFNB/CEA) in the form of inj tramadol 50 mg IV. The consumption of analgesic doses among the groups was not significant. The patients in CEA group, as compared to CFNB group, had more incidence of side effects and is statistically significant (p value <0.001).



In group I, 14 patients did not require any analgesia in comparison to 15 patients in group II; 15 patients in group I and 12 patients in group II consumed one dose; one patient in group I and two patients in group II required 2 doses and one patient in group II required 3 doses over 24 hours.

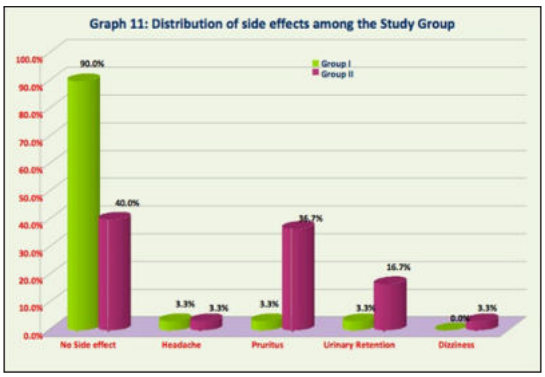
To compare the efficacy of analgesia:

The efficacy of analgesia in our study is similar to the trend observed by Dauri M et al. [12] during 36 hours postoperatively. In the study by Sundarathiti N et al. [13] 31 patients received a combined spinal epidural anesthesia; 30 patients received SA and CFNB. They found that there were no significant differences in the VAS scores for the first hour and at postoperative 12-72 hr between the two groups. At postoperative 6-12 hr, the VAS scores were significantly greater in the CFNB compared with the CEI. In our study there were no significant differences in the VAS scores over 24 hrs. In our study the intraoperative anesthesia for surgery was SAB with Bupivacaine and Fentanyl, as the addition of intrathecal Fentanyl prolonged the analgesia without the motor block in both the groups during immediate postoperative period. In their study, patients with epidural infusion, who complained of significant pain as there was failure to increase the rate which may be to avoid the risk of causing or worsening the hypotension. In comparison, our study had a combination of local anesthetic concentration of 0.125% with opioid in the infusions which has synergistic effect on the analgesia[5,6,10] and there was no incidence of hypotension. The innervation of the knee by the sciatic nerve component is minimal. Studies have evaluated the equivalent analgesia with or without sciatic nerve blockade for knee surgeries. The femoral-sciatic block may lead to complications because of motor block of the hamstrings added to the femoral block of the quadriceps muscle might increase the risk of falls and there also a risk of developing heel ulcer. [14]

Requirement of rescue analgesic agents in first 24 hours:

Sundarathiti N et al. [13] found cumulative tramadol IV requirement for postoperative 72 hr were more in the CFNB group compared with the CEI group. In comparison to our study, we studied analgesic requirement for first 24 hrs which did not differ between the groups, 16 patients in CFNB group received rescue analgesia in comparison to 15 patients in CEA group this is statistically insignificant. Patients of CEA group in their study received bolus of 0.125% levobupivacaine 10 ml plus morphine 2mg preoperatively and morphine was added 0.125% levobupivacaine only in the CEA group. In comparison to our study patients of CEA group did not receives the bolus and patients in both the groups received the same infusion of 0.125% bupivacaine and fentanyl 2mcg/ml5, 6, 10

Adverse effects: In the study by Davies et al. [14] the adverse events included episodes of nausea, vomiting, confusion, pruritus, and a degree of motor block. Urinary retention was more frequent in CEI group. We did not find motor blockade in either the group of patients as we used lower concentrations (0.125%) of bupivacaine [6, 15] and increased incidence of side effects in the CEI group are due to systemic absorption of opioids. In the study by Singelyn et al. [8] urinary retention and catheter related problems were significantly more frequent in CEI group. They found CFNB induces nearly 4 times fewer side effects than epidural analgesia. Our study is in consistence with their study regarding urinary retention and in our patients, we took utmost care regarding fixing the epidural catheter and subcutaneous tunneling was done to secure femoral catheter in place for three days.



In the study by Sundarathiti P et al. [13] patients in the CEI group experienced side effects more than the CFNB group. Dizziness, pruritus, and postoperative nausea and vomiting were greater significantly in CEI group. However, numbness sensation was

significantly greater in the CFNB group. The side effects like pruritus and dizziness are in consistence with our study.

CONCLUSION:

This study shows that continuous infusion of lower concentration of (0.125%) bupivacaine with fentanyl 2 mcg/ml at the rate of 5 ml/hr, for both continuous epidural analgesia (CEA) and continuous femoral nerve blockade (CFNB) provides an effective postoperative analgesia. The mean VAS scores remained within the mild pain range (<3) at any point of evaluation for 24 hours and the rescue analgesic consumption for first 24 hours was comparable in both the groups. Hemodynamic stability was maintained throughout the infusion in both the groups. CFNB has fewer side effects than epidural analgesia, which is statistically significant (p value < 0.001) in our study. Pruritus and urinary retention were seen more frequently in CEA group.

Hence, we conclude that CFNB can also be considered as an effective regional component of a multimodal analgesic strategy after knee surgery. CFNB is preferable for those who present challenges regarding epidural catheter placement like previous lumbar spine surgery and vertebral anomalies.

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