Preferential Unilateral Epidural Anaesthesia for Lower Limb Orthopaedic Surgeries

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ABSTRACT

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Background: A preferentially placed unilateral epidural catheter by rotating Touhy needle offers a significant reduction in intra operative and post operative morbidity and mortality when compared to conventional epidural. We aimed to study the effect of Touhy needle rotation on incidence of intra-operative hypotension & requirement of vasopressors and postoperative analgesic requirement.

Materials & Method: The study was a prospective, randomized evaluation of the effects of epidural needle rotation on the distribution of epidural block and incidence of intraoperative hypotension. Patients of ASA (American Society of Anesthesiologists) physical status 2 and 3 undergoing hip surgeries were grouped as A and B of 15 patients each, receiving conventional and preferential epidural respectively. In contrast to conventional placement, a needle rotation by 45 degree towards operating side, resulted in preferential placement unilaterally which was confirmed by radio contrast X-ray or auscultatory method. Anaesthesia was established with 10 ml of 2% lignocaine with 5ml adrenaline (1:2,00000) after a test dose of 3ml of the same.

Results: In preferential epidural, maximum sensory block level on the operative side was T9 and non operative side was L3. Significant reduction in incidence of hemodynamic instability, requiring vasopressors and post operative analgesics were noted. Conclusion: When compared to conventional epidural, a simple rotation of the Touhy needle by 450 can achieve statistically significant reduction in intraoperative hypotension, vasopressor requirement and the postoperative analgesic dose in old age patients.

Keywords: Touhy Needle, Preferential Epidural, Epidural Analgesia, Regional Anaesthesia

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INTRODUCTION

General anaesthesia and subarachnoid block in old age patients for lower limb orthopaedic surgeries have a slightly higher risk of morbidity and mortality. The factors like intra-operative hypotension, post-operative cardiac changes, DVT and neurological changes were found to have been associated with mortality in lower limb orthopedic surgeries.[1] Regional anesthesia decreased mortality, cardiovascular morbidity, deep venous thrombosis and pulmonary embolism, blood loss, duration of surgery, pain, opioid-related adverse effects, cognitive defects, and length of stay.[2] Managing intraoperative and postoperative pain related to lower limb surgeries, especially knee replacement is of particular concern to orthopedist as well as anesthesiologists.[3,4] There are evidences that the use of protocols that have included use of DVT prophylaxis, beta blockers and regional anaesthesia have improved the outcome.[5]

Turning the Tuohy introducer needle 45 degrees toward the operative side before threading the epidural catheter is a simple maneuver that produces a preferential distribution of epidural anesthesia and analgesia toward the operative side, minimizing the volume of local anesthetic required to provide adequate pain relief after lower limb orthopedic surgeries.[6] Gravity or position of patient has minimal effect on epidural block distribution. A 45° rotation of the epidural needle towards the operative side results in preferential unilateral placement of epidural catheter.

Significant intraoperative hypotension (decrease in systolic BP >30% from baseline) was treated with either crystalloids or vasopressors. For postoperative analgesia, 0.125% bupivacaine with 2 microgram fentanyl /ml as continuous infusion was used. This study is to assess the effect of Touhy needle rotation on the incidence of intraoperative hypotension and vasopressor requirement and the amount of drug needed for post operative analgesia.

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METHOD

The study was a prospective, randomized evaluation of the effects of epidural needle rotation on the distribution of epidural block and incidence of intraoperative hypotension. We evaluated the effects of turning the tip of the Tuohy needle 45 degrees toward the operative side before threading the epidural catheter (45 degrees -rotation group, n = 15) as compared to a conventional insertion technique with the tip of the Tuohy needle oriented at 90 degrees cephalad (control group, n = 15) on the effect of intraoperative hypotension and vasopressor requirement after injecting 10 ml of 2% plain lignocaine and adrenalin in 30 patients undergoing lower limb orthopedic surgeries.

Study subjects were patients of less than 85 years of age, who were undergoing lower limb orthopaedic surgeries. The study was conducted from December 2013 to September 2014. Patients less than 85 years of age with ASA 2 (American Society of Anesthesiologists 2) and 3, undergoing lower limb orthopaedic surgeries were included in this study. Those who not willing to participate, contraindication for regional anaesthesia and ASA 4 were excluded from the study.

The patients were randomly allocated into 2 groups, A and B. Group-A received conventional epidural block and Group-B received preferential unilateral block. The patients were kept nil per-oral for 8 hours and were pre-medicated with Tab. Alprazolam 0.5mg and Pantoprazole 40mg on preoperative night and on the day of surgery. The patients were placed in Lateral decubitus posture with fracture on non dependent side. Standard monitors used were ECG, SPO2 and invasive blood pressure. Under strict aseptic precautions at L3-L4 space, 0.5 -1 ml of 2% plain lignocaine was infiltrated. Patients in group-A received conventional epidural with Touhy needle rotated 90 degrees cephalad after identifying the epidural space by loss of resistance technique.

Patients in group B, after identifying the epidural space by loss of resistance technique, the needle was rotated 45 degrees towards the operative side. Catheter was inserted, and resulted in a preferential placement of the catheter towards the operative side. This placement was confirmed by injecting 2cc of air through the catheter and auscultating over the paraspinal area at the level of catheter tip. It was reconfirmed in the post operative period by a radio-contrast x-ray, after injecting 5cc of non ionic contrast through the catheter, which showed distribution of contrast preferentially towards the operative side.

Catheter fixed with 4 to 5 cm inside, and the test dose of 3 ml 2% lignocaine with 1:2,00000 adrenaline was given. Patients were turned to supine position and 10 ml of the same drug was given in two aliquots of 5 ml each. Level of sensory block -assessed by pin prick test on both sides and motor block was assessed using modified Bromage scale every 5 minutes till the commencement of surgery. Surgery commenced when we obtained complete loss of pin prick sensation up to T10 and Bromage scale ≥2. After the start of surgery, sensory and motor levels were assessed every 15 minutes. Invasive blood pressure changes were monitored and hypotension with systolic blood pressure reduction >30% from baseline was treated with fluid bolus or IV vasopressors (phenyl ephrine 50 µg IV). Vitals were also monitored post-operatively. Post-operative analgesia was maintained using continuous epidural infusion of 0.125% bupivacaine with 2µg/ml fentanyl. Total volume of drug needed for 48 hours of post-operative analgesia was noted.

Ethical clearance was obtained from Institutional Ethical Committee. Informed consents were obtained from all participants, before including in to the study. All statistical analysis was done using SPSS (version 17) and to analyze the effect of different binary values of variants, x2 test was used. Statistical significance was defined as $P < 0.05$.

RESULTS

In group-A (conventional epidural block) the maximum level of anaesthesia obtained was almost same on both sides (T9 level). In group-B (preferential unilateral block) there was a difference in the level of anaesthesia on both sides, on the operative side it was at T10 and on the non-operative side maximum level was only at L3.

60% of the patients in group-A developed intraoperative hypotension and needed vasopressors when compared to 20% of the patient in group-B. The difference in hypotension obtained in two groups is statistically significant, with a p-value of 0.02535. The

Table 1. Incidence of intra-operative hypotension

Intraoperative Hypotension	Group A Frequency (Percentage)	Group B Frequency (Percentage)	Total Frequency (Percentage)
Yes	9 (60)	3 (20)	12 (40)
No	6 (40)	12 (80)	18 (60)
Total	15 (100)	15 (100)	30 (100)

Chi-Square=5, P-value= 0.02535

patient undergone preferential unilateral block has less chance of intra-operative hypotension and need for vasopressors use.

For the postoperative analgesia, both groups received epidural infusion of 0.125% bupivacaine with 2μg/ml of fentanyl. The analgesic requirement over 48 hours was calculated as 118 ± 6.2 ml for group-A and 164.9 ± 9.4 ml for group-B, and the 2-tailed p value was found to be significant (0.0001).

DISCUSSION

The present study showed that the preferential unilateral epidural anesthesia was associated with significant reduction in intra-operative hypotension, and subsequent use of vaosopressor, when compared to conventional epidural block. Conventional epidural block resulted in intra-operative hypotension in majority of cases studied.

Conventional general anaesthesia and central neuraxial block are associated with high morbidity and mortality in old age patients coming for lower limb orthopedic procedures. Anaesthesiologists practice unilateral subarachnoid block to limit the hemodynamic fluctuations using the effect of gravity. Epidural injection is commonly used to provide intraoperative anesthesia, postoperative and obstetric analgesia, and to treat acute radicular pain.[7] Epidural and spinal anaesthesia for various types of surgery offer advantages over general anaesthesia by decreasing blood loss and transfusion requirements.[8] Study conducted by Modig J et al shows that the intra-operative blood loss in patients under epidural anaesthesia was 950 +/- 300 ml (mean +/- SD) and blood loss during the following 24 h-i.e. as long as the epidural anaesthesia was maintained-was 370 +/- 80 ml. These figures were significantly lower than the intra- and post-operative blood losses in patients under general anaesthesia with narcotics as post-operative pain treatment: 1140 +/- 200 ml (inhalational anaesthesia) followed by 480 +/- 70 ml and 1540 +/- 340 ml (artificial ventilation) followed by 500 +/- 110 ml.[9] Study by Modig J also showed that the intraoperative and postoperative blood losses were significantly reduced in patients subjected to total hip replacement under lumbar epidural anesthesia as compared with the patients receiving the two general anesthetic techniques.[10] Hemodynamic differences explained the differences in blood loss. The epidural anesthesia induced hypotension on the arterial and venous sides as compared with the two general anesthetic techniques.[10] Inhalational anesthesia also induced hypotension on the arterial and venous sides intra-operatively as compared with general anesthesia with artificial ventilation.[10]

The reduction in blood loss and consequently the reduced transfusion requirements in regional anaesthesia are beneficial in decreasing the hazards and costs of homologous blood transfusion.[8] Intraoperative blood loss, percentage of patients receiving blood substitution, and total packed red blood cells transfused were less in those patients receiving hypotensive epidural anesthesia (HEA) than those receiving hypotensive total intravenous anesthesia (HTIA), and the mean central venous pressure was lower in the HEA group than in the HTIVA group intra-operatively.[11] The calf blood flow and venous capacity is lower in patients receiving general anaesthesia when measured at the end of surgery and significantly lower in 3 h postoperatively, when compared to epidural anaesthesia. The sustained reduction of flow in the deep veins of the lower limb might be a significant contributory factor in the initiation of deep venous thrombosis.[12]

CONCLUSION

In conventional epidural placement, maximum level of block was the same on both sides. But in preferential placement group, the level of block was different on both sides and when compared to level of block on operative side, level of block on non operative side was less. So it limited the incidence of intraoperative hypotension. When compared to the conventional placement, we could maintain the same level of postoperative analgesia in needle rotation group. By Touhy needle rotation there is fewer incidences of intraoperative hypotension and vasopressor use and less amount of local anaesthetic is required for post op analgesia.

END NOTE

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Conflict of Interest: None declared

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