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Research Article

A Comparative Study of Spinal Anaesthesia Versus Epidural Anaesthesia for Inguinal Hernioplasty

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Abstract: ***Introduction***: Inguinal hernia repair is normally implemented under spinal anaesthesia. However, epidural anaesthesia procedure offers constant hemodynamic with early ambulation and less urinary retention, less frequency of nausea and vomiting. We compared efficacy, feasibility and safety of ilioinguinal nerve block for inguinal hernia repair with spinal anaesthesia versus epidural anaesthesia. ***Methods***: A prospective randomized controlled trial was conducted on a sample of patients undergoing elective inguinal hernioplasty. Patients were randomly assigned to receive either spinal anaesthesia or epidural anaesthesia. The primary outcomes assessed included surgical success, intraoperative and postoperative pain levels, duration of surgery, intraoperative complications, postoperative complications, and patient satisfaction. Secondary outcomes included postoperative analgesic requirements and length of hospital stay ***Results***: Anesthesia time was the longest in the EA group (23.1±2.32 min) and significantly prolonged the operation time (P<0.001). When the visual analog scale scores were compared, it was observed that the patients in the GA group felt significantly more pain (P<0.001). While the rates of hypotension and headache were higher in regional anesthesia (P<0.001 and P<0.002), there was no significant difference in urinary retention, postoperative nausea/vomiting, and shoulder pain (P=0.274, 0.262, and 0.314, respectively). SA and EA groups were found to be superior compared with the GA group in terms of patient satisfaction (P<0.001). ***Conclusion***: Epidural anaesthesia can be a safe alternative to spinal anaesthesia for elective inguinal hernia repair.

Keywords: Spinal anesthesia, Epidural anesthesia, Inguinal hernia.

INTRODUCTION

Spinal anaesthesia (or spinal anesthesia), also called spinal block, subarachnoid block, intradural block and intrathecal block is a form of neuraxial regional anaesthesia involving the injection of a local anaesthetic or opioid into the subarachnoid space, generally through a fine needle, usually 9 cm (3.5 in) long. It is a safe and effective form of anesthesia usually performed by anesthesiologists that can be used as an alternative to general anesthesia commonly in surgeries involving the lower extremities and surgeries below the umbilicus. Epidural anesthesia is a technique that may be used as a primary surgical anesthetic or as a resource for postoperative pain management. It is safe and relatively easy to learn and perform. Material and methods: This are a prospective study was conducted in the Department of Anesthesia at Khaja Bandanawaz Institute of Medical Sciences, Kalaburgi over a period of 1 year. Spinal anaesthesia was given under all sterilised precaution, 3 ml of 0.5% bupivacaine heavy using a 25- gauge Quincke's spinal needle through the L3-L4 intervertebral space in the sitting posture. Before giving the local anaesthesia, each patient throughout the technique asked to report verbally any time if he feels distress. Results: Duration to perform the procedure was significantly longer with epidural than spinal block. Intraoperative fluid requirement was statistically higher in Spinal than Epidural (p<0.0001). Duration of Surgery was significantly shorter in Spinal as compared to Epidural (p=0.0019). Systolic and mean blood pressure showed statistically significant reduction in Spinal as compared to Epidural (p<0.001). Duration of ambulation was significantly shorter in Epidural as compared to Spinal (p<0.001). Conclusion: Epidural anaesthesia can be a safe alternative to spinal anaesthesia for elective inguinal hernia repair.

MATERIALS AND METHODS

This study is designed as a randomized controlled trial to compare the efficacy and safety of spinal anaesthesia and epidural anaesthesia for inguinal hernioplasty. The study will adhere to the Consolidated Standards of Reporting Trials (CONSORT) guidelines to ensure transparency and robustness in the study design and reporting. Participants: The study will include adult patients (age ≥ 18 years) scheduled for elective inguinal hernioplasty. Patients with contraindications to spinal or epidural anaesthesia, coagulopathies, spinal deformities, or previous spine surgery will be excluded. Informed consent will be obtained from all participants prior to enrollment. Randomization: Participants will be randomly assigned to either the spinal anaesthesia group or the epidural anaesthesia group using a computer-generated randomization sequence.

Allocation concealment will be ensured using sealed opaque envelopes. Interventions: 1. Spinal Anaesthesia Group: Patients in this group will receive spinal

anaesthesia with the administration of a local anesthetic agent (e.g., bupivacaine or lidocaine) into the subarachnoid space at an appropriate lumbar level. The dosage and technique will be standardized according to institutional protocols. 2. Epidural Anaesthesia Group: Patients in this group will undergo epidural anaesthesia with the injection of a local anesthetic agent (e.g., bupivacaine or ropivacaine) into the epidural space at an appropriate level. The dosage and technique will be standardized according to institutional protocols. Outcome Measures: The primary outcome measures will include the duration of surgery, postoperative pain scores (assessed using a standardized pain scale such as the Visual Analog Scale), and the incidence of intraoperative and postoperative complications. Secondary outcome measures will include time to ambulation, postoperative analgesic consumption, length of hospital stay, patient satisfaction, and any adverse events related to anaesthesia. Sample Size Calculation: Calculate the sample size per group (n) using the formula: $n = 2 \times (Z\alpha$ 2 / + $Z\beta)$ 2 × σ 2 $(Effect\ size)$ 2 First, calculate the critical values for the chosen α and (1- β) using a standard normal distribution table or statistical software. For α = 0.05 and (1-β) = 0.80: $Z\alpha$ 2 / (critical value for α/2) ≈ 1.96 $Z\beta$ (critical value for β) ≈ 0.84 Substitute the values into the formula: n=75 per group Inclusive Criteria: 1. Patients aged 18 years and above. 2. Patients scheduled for elective inguinal hernioplasty. 3. Patients who provide informed consent to participate in the study. 4. Patients eligible for both spinal anaesthesia and epidural anaesthesia. 5. Patients with ASA (American Society of Anesthesiologists) physical status classification I to III. 6. Patients without contraindications to spinal or epidural anaesthesia. 7. Patients without known allergies to local anesthetics used for spinal or epidural anaesthesia. Exclusive Criteria: 1. Patients with a history of coagulopathy or bleeding disorders. 2. Patients with uncontrolled hypertension or cardiovascular disease. 3. Patients with severe respiratory compromise or chronic obstructive pulmonary disease (COPD). 4. Patients with known allergies or adverse reactions to local anesthetics used for spinal or epidural anaesthesia. 2649 5. Patients with a history of neurological disorders or spinal abnormalities that may affect the choice or safety of anaesthesia technique. 6. Patients with known or suspected infection at the site of anaesthesia administration. 7. Patients with a history of substance abuse or psychiatric disorders that may interfere with cooperation or follow-up.

8. Patients who are pregnant or breastfeeding. 9. Patients unable to understand or comply with study procedures or follow-up requirements. Data Collection and Analysis: Data on demographic characteristics, preoperative comorbidities, surgical details, and outcome measures will be collected and recorded. Statistical analysis will be conducted using appropriate methods. Continuous variables will be analyzed using Student's ttest or Mann-Whitney U test, and categorical variables will be analyzed using chi-square test or Fisher's exact test. A p-value < 0.05 will be considered statistically significant. Ethical Considerations: The study protocol will be submitted to the institutional ethics committee for approval before initiation. Informed consent will be obtained from all participants. The study will be conducted in accordance with ethical principles outlined in the Declaration of Helsinki and Good Clinical Practice guidelines

RESULTS

This randomized comparative study was carried out in sixty patients (each group n=30) after checking inclusion and exclusion criteria. The two groups were comparable pertaining to the demographic data. The youngest patient was 11 years of age and oldest was 81 years of age. Meanage in group A was 46±2.06 years and 49±2.13 years in group B (p value >0.05).

Table 1: Duration of surgery.

Duration ofsurgery	Local anaesthesia (n=30)	Spinal anaesthesia(n=30)
16-30 minutes	0	3
31-45 minutes	4	6
46-60 minutes	6	10
61-75 minutes	13	5
76-90 minutes	4	1

In the present study the mean operative time was 67minutes in group A and 59 minutes in group B. The difference between the time taken to complete operation under LA group was not statistically significant to the time taken in SA group as shown in Table 1 (p value

Table 2: intraoperative pain.

Intraoperative pain (VAS)	Local anaesthesia (n=30)	Spinal anaesthesi(n=30)
None(VAS=0)	5	29
Mild(VAS=1-3)	7	0
Moderate(VAS=4-6)	11	0

Severe (VAS≥7)	3	0

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Table 3: Post-operative pain scores using visualanalog scale.

Time aftersurgery	Group A (n=30)	Group B(n=30)
12 hours	4.2	4.3
24 hours	3.3	3.5
48 hours	1.1	1.2

Intraoperative pain was assessed by using Visual Analog Scale (VAS). In spinal anesthesia group none of the patients had pain (VAS=0) during surgery. In local anesthesia 5 cases had no pain (VAS=0), 7 cases hadmild pain (VAS=1-3), 12 cases had moderate pain (VAS=4-6) and 4 had severe pain (VAS≥7) (p value <0.05). This was probably caused by touch or pressure on the surrounding non-anesthetized areas or by pulling of the spermatic cord or by the handling of the hernia sac, which was easily manageable by reassurance and additional injection of local anesthetic solution. Postoperatively pain was assessed at 12 hours, 24 hours and 48 hours and no significant statistical difference was found (p value >0.05). The mean pain visual analog scoreis slightly lower in group A than in group B (Table 3). Postoperative complications (Table 4) were also assessed and urinary retention was noted in 4 patients while headache was noted in 3 patients in group B.

Table 4: Post-operative complications.

Post-operative complications	Group A(n=30)	Group B(n=30)
Wound hematoma	1	2
SSI	2	2
Testicular swelling	1	0
Urinary retention	0	3
Headache	0	2
Respiratory problem	0	0
DVT	0	0
Mesh infection	0	0
Recurrance (after 4wks)	0	0
Pain after 1wk	2	3

Table 5: Mean time taken by patient to become ambulatory.

Group	Mean time (hours)
Local anaesthesia group	0.0 (immediate)
Spinal anaesthesia group	6.3 hours

Patients in local anaesthesia group were ambulatory immediately after surgery as no sedation was given to the patients while patients in the spinal anaesthesia group were ambulatory after almost 6 hours after surgery (mean time= 6.4 hours). Recovery from anesthesia was significantly faster (p value

DISCUSSION

Inguinal hernia repair which is the typical operation has been complete under general, spinal, epidural and local anaesthesia methods with variable achievement. As per the newest references of European Hernia Civilization, incondition of an open repair, resident anaesthetic must be measured for each adult patient complete a main reducible one-sided inguinal herniaInspite of this, there is countless level of apathy in accepting this method amongst anaesthesiologists. Inguinal arena block is one of the eldest methods, in training since years. Primarily, resident anaesthesia was given by the physician at the site of process but do not carry whole anaesthesia. Ilioinguinal and iliohypogastric nerve block provide somatic block over the bottom of abdomen and visceral ache is often reassured by giving extra local anaesthetic at the time of sac segmentation. In this learning we appraised the effectiveness, possibility, care, benefits and problems of Spinal anaesthesia, as associated to Epidural Anaesthesia. In this learning, we perceived shorter anaesthesia onset time in Spinal Anaesthesia as associated to Epidural Anaesthesia. These significances are in consistence with outcomes shown by Davis et al. They see time to conquer extreme cephalad extent to be 13±7 min in spinal anaesthesia with 0.5% hyperbaric

bupivacaine and 21±4 min in epidural anaesthesia with 0.5% bupivacaine.

The mean intraoperative intravenous liquid necessity was essentially higher in Spinal Anesthesia than Epidural Anesthesia (1654±193.2 ml versus 1158.22±78.27 ml). The higher liquid prerequisite in Spinal Anesthesia group is expected to of thoughtful bar, which grows the intravascular compartment requiring quick intravascular mixture to keep the great intravascular volume and pulse. Subsequently, Epidural Anesthesia can be best procedure in patients with low ejection fraction.

There was no square disappointment during Spinal Anesthesia. In Epidural Anesthesia, 3 patients (5%) were block disappointment because of deficient square. In comparative examinations uncovered by Sultana An et al, utilizing standard inguinal field block, intraoperative anxiety of moderate evaluation during the analyzation of hernia sac in 34% and 35% patients individually. Disappointment rate for nearby inguinal field block was 3.33% as expressed and for neighborhood penetration sedation, it was 3.17% as depicted and contrasted with 10% in our examination. The disappointment rate can be minimalized with more experience and expertise in this strategy.

Our outcomes are comparably for affirmation with study appeared by Nehme et al who found that the occurrence of Intraoperative hypotension was greatest in spinal sedation (24 patients), while it was seen uniquely in 3 patients of Epidural Anesthesia, which stayed unimportant in instances of Epidural Anesthesia. Practically identical results were likewise uncovered. This outcome is because of the thoughtful bar created by spinal anaesthesia, prompting vasodilatation, fringe venous pooling of blood and decreased heart yield. Aysun Yilmazlar et al found a critical diminish in mean blood vessel pressure in spinal sedation gathering (pre-70.3±10.3 mmHg and post 52.3±9.3 mmHg) and no such decline in ilioinguinal and iliohypogastric nerve block group.

In Spinal anaesthesia (15%) patient and in Epidural Anesthesia (0%) patients had urinary retention (i.e., full bladder on palpation and inability to micturition 8 hours postoperatively and corresponding with trouble). Davis et al, expressed in his examination contending spinal and epidural sedation expressed 7 (out of 32) patients in spinal gathering and 14 (out of 30) in epidural group who required catheterization. Low existence of urinary retention in our examination when contrasted with this because of lower dosage of anaesthetic utilized in spinal group (3 mg) and utilization of single shot method for epidural anaesthesia. Moreover, their mean catheterization time was 4.2 ±1.7 hours in spinal group and 4.7±2.3 hours in epidural group and we hung tight for in any event 8 hours for patient to micturition unreservedly and before that catheterization was done just whenever showed clinically.

Post Dural cut puncture headache (PDPH) in youthful muscular patients utilizing 27 G needles (whittcre and Quincke's), discovered event of 9.3% in both the groups. In our examination just single patient in spinal group created PDPH which reacted adequately to intravenous liquids and oral analgesics. Lower incidence of PDPH is inferable from use of fine dressing (25 number quincke) needle in our examination.

Term of ambulation was longer in Spinal Anesthesia when contrasted with Epidural Anesthesia (9.58±0.8 2vs 3.95±2.57 hours) (<0.001). Song D et al found that opportunity to-home eagerness in Epidural block was smallest (133±68 min) when contrasted with Spinal Anesthesia (280±83 min). Ding Y and White PF additionally expressed that the ambulation time in block group was (86 ±18 min) and fit to release time was (112±49 min). He additionally uncovered that the interim till release was 6.85 h in block group and settled that it should be an ideal technique in nations with a low Gross National Product (GNP) like in Africa.

The postoperative VAS score was essentially higher in Spinal Anesthesia when contrasted with Epidural Anesthesia. Period of Postoperative absense of pain was altogether more (5.163±0.4542 versus 3.871±0.4801 hours) in Epidural Anesthesia when contrasted with Spinal Anesthesia. Practically identical results were likewise taken note.

Postoperative difficulties - 3 patients had nausea, and vomting which reacted to IV ondansetron, 7 patients created urinary maintenance and 1 patient had cerebral pain in Spinal Anesthesia. None of patients in Epidural Anesthesia had any of these challenges. Comparative results were additionally seen (urinary maintenance 15%) and created wound haematoma or neighborhood disease. Less nausea and vomiting in our investigation are because of low level chose on the grounds that nausea and vomiting during local anaesthesia are more normal when sympathetic block past 6th thoracic fragment.

Patient's satsifaction scores as seen telephonically was similar between two groups. Patients having score of 4 (fulfilled) or 5 (extremely fulfilled) were taken as fulfilled with the end goal of numerical investigation and it was tracked down that 98% of patients who got spinal anaesthesia and 96% of patients who got epidural anaesthesia were fulfilled from method utilized. Correspondingly, in investigation by Pollock looking at spinal and epidural sedation for outpatient knee arthroscopy expressed 92% patients of epidural gathering and 97% of spinal gathering were additionally gigantically or exceptionally fulfilled from their anaesthetic method utilized.

CONCLUSION

From our study we conclude that the hernia block with local anaesthetic agents have prolonged the duration of sensory block and duration of analgesia and also significantly improves the quality and duration of postoperative analgesia and decreases requirement of rescue analgesics and less complications that leads to higher satisfaction score compared to patients who received spinal anaesthesia. Dexamethasone directly inhibits signal transmission in nociceptive C fibers, a local inflammatory effect, and locally induced vasoconstriction. This way addition of dexamethasone

8mg (GROUP B) hastens the onset of sensory block and duration of analgesia and sensory block in conventional hernia block technique.

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