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Comparison of Epidural Bupivacaine and Epidural Ropivacaine in Patients Undergoing Inguinal Hernia Repair Surgery

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ABSTRACT:

Objective: The efficacy and adverse effects of 0.5 percent ropivacaine and 0.5 percent bupivacaine were evaluated for single-shot epidural anaesthesia in patients undergoing inguinal hernia repair surgery.

Methodology: We conducted our research using a randomised, double-blind, placebo-controlled methodology. It lasted for six months, from July 2021 to December 2021 at Khyber teaching Hospital . The study involved 60 hernia repair surgery patients with an ASA physical status of I and II. Thirty patients were divided into two groups and given 0.5 percent ropivacaine (0.5%) or (0.5%) bupivacaine (0.5%). The initiation, maximum, and median heights of sensory block, as well as the time passed before two segment recession occurred, were all measured. Motor obstruction was determined using a modified Bromage scale. All of the most common side effects, as well as the block's overall length and duration, were noted.

Results: Both patient groups were comparable in terms of age, height, weight, gender, and ASA status. There was no significant difference in the time required for the sensory block to commence and reach its maximum height. The maximum level of sensory block was T6 (T5-T8) in those who received ropivacaine, while the highest level was T5 in those who received bupivacaine (T4-T7). Both groups received the same amount of time for the durations of two-segment regression and sensory block. The bupivacaine group had a considerably longer overall duration of motor block (159.01 minutes vs 134.22 minutes, p <0.001). Additionally, the modified Bromage scale was considerably higher in the group receiving bupivacaine (2.84 vs 1.94 min, p0.001). Both groups experienced adverse symptoms such as hypotension, bradycardia, nausea, vomiting, and shivering.

Conclusion: Epidural anaesthesia with 0.5 percent ropivacaine was both safe and effective. Early patient mobilisation following inguinal hernia repair surgery may be beneficial, since motor blockade was reduced when 0.5 percent bupivacaine was used.

INTRODUCTION:

Ropicaine®, a Howards-manufactured ropivacaine, is now accessible in Pakistan. In this study, patients undergoing inguinal hernia repair surgery received the same doses of 0.5 percent bupivacaine and 0.5 percent ropivacaine. Because an aminoamide, such as bupivacaine or mepivacaine, is structurally identical to ropivacaine, it may be used to treat pain. However, ropivacaine is the only entirely unbiased (S)-enantiomer (S). The S enantiomer produces analgesia that lasts longer than the racemate form produces anaesthesia (1). S enantiomers are believed to be less toxic to the central nervous system and heart than R enantiomers. They have varying degrees of affinity for sodium, potassium, and calcium channels (2). Ropivacaine has also been shown to have vasoconstrictor properties (3). The monohydrate salt of 1-propy (l, 2), 6-pipecoloxylidide is easily available. According to animal research, ropivacaine is less toxic to

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the central nervous system and heart than bupivacaine (4). In preliminary clinical trials of epidural anaesthesia, rophivacaine's pharmacological and pharmacokinetic properties were shown to be equivalent to those of bupivacaine (5-6). Both drugs have the same level of sensory blockade and anaesthetic efficacy.

In comparison to bupivacaine, ropivacaine produces a less severe motor blockade. Ropivacaine is less likely than bupivacaine to cause cardiac arrhythmias or poisoning (7). The majority of ropivacaine's adverse effects are due to its suppression of the sympathetic nervous system (hypotension, bradycardia, nausea and vomiting). In general, ropinivacaine (8) and bupivacaine (9) appear to have comparable rates of these adverse events.

METHODOLOGY:

Between July 2021 and December 2021, patients undergoing inguinal hernia repair surgery at the Khyber teaching Hospital , Department of Anaesthesia were enrolled in these randomised controlled studies. The study enrolled a total of 60 participants, who were randomly assigned to two groups of the same size. Anesthetics were delivered at the manufacturer-specified amounts of 0.5 percent (ropivacaine- Group 1) and 0.5 percent (bupivacaine-Group 2). Each patient signed a written informed consent form. This study requires participants to be at least 18 years old and weigh between 60 and 90 kilogrammes.

Beta adrenergic blockers and pregnant women were excluded from the trial. Each patient signed a written consent form following a pre-operative checkup. For at least eight hours, nil per oral was maintained. Anesthesiologists administered the research solutions using identical 20-ml disposable syringes prepared by a consultant anesthesiologist and then recorded the drug's effects throughout operation. Each patient was given Ringer's solution (10 ml/kg) before to the operation. Three millilitres of lignocaine were injected into the skin while the patient was seated. A decrease in resistance at the L2-3 or L3-4 interspace in the midline was used to find the epidural space with a 16 or 18 gauge Tuohy needle. A 3 to 5 cm long catheter was introduced into the epidural space using a needle with a cranially tilted bevel. After the initial dose was administered, they were given an additional 17 cc of the research medicine while laying supine for three to five minutes. Each participant in the clinical trial received 100 mg of the investigational medication (0.5 percent of 20 ml).

Vital indicators such as blood pressure, heart rate, and respiratory rate were monitored on a regular basis. The patient's blood pressure plummeted significantly, and his heart rate accelerated and decelerated dramatically. T10 was dubbed the sensory block tipping point since it was the point at which all sense was lost. The block's maximum height has been defined. The sensory block's length was determined using regression analysis at time T12. Apart from that, motor and sensory function could be restored to normal. Motor block was determined using the Bromage scale, which quantifies an individual's incapacity to lift an extended leg, bend the knee, or totally

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bend the knee at 0, 1, 2, or 3. Due to a failure epidural block, the patient was removed from the research and a new one had to be found.

Data Analysis:

SPSS for Windows version 20 was used to analyse the data statistically. The findings were communicated using descriptive statistics. The chi-square test was used to compare qualitative variables between groups, whilst the independent sample t-test was used to determine the statistical significance of qualitative variables. In this investigation, statistical significance was determined as a p-value less than 0.05.

RESULTS:

The study enlisted 60 subjects and delivered 0.5 percent ropivacaine and 0.5 percent bupivacaine to 30 and 30 participants, respectively. Each patient was identical in terms of age, height, weight, gender, and ASA status (table-1). Sensory loss began instantly and intensified until it peaked about the same time. Although the difference was not statistically significant, bupivacaine had a lower maximal level of sensory block than ropivacaine (T5-T8) (T4-T7). In all groups, two-segment regression and sensory block regression to T12 required approximately the same length of time (table-2). A modified Bromage scale was used to determine the degree of motor block. The bromage scales for each group are shown in Table 3, along with the total time spent in the motor block. The motor blockage in the bupivacaine group took longer to resolve than in the placebo group ($p < 0.001$). Thirteen hypotensive individuals reported who received ropivacaine, whereas fourteen hypotensive patients reported who received bupivacaine. Shivering and itching were more frequently reported side effects than bradycardia, nausea, vomiting, and hypotension. Both groups received ephedrine and atropine to treat hypotension and bradycardia, respectively (table-4)

Table 1:

	Group 1 (N=30)	**Group 2 (N=30)**	**P Value**
Age in years (Mean ±SD)	46.66 ±11.75	49.12 ±10.79	0.222
Weight in kgs (Mean ±SD)	65.43 ±8.87	62.33 ±8.25	0.073
Height in cm (Mean ±SD)	155.9 ±20.0	157.3 ±10.46	0.354
Gender (M/F) ratio	18/12	21/09	0.422
ASA Status (i/ii) ratio	17/13	18/12	0.851

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Table 2:

	Group 1 (N=30)	**Group 2 (N=30)**	**P Value**
Sensory Block Onset in Minutes	15.62 ±1.46	15.74 ±1.66	0.420
Sensory Block at Maximum Level (Time)	35.26 ±3.52	36.22 ±3.22	0.144
Two Segment Regression in minutes	86.74 ±9.25	86.45 ±9.78	0.471
Sensory Block Duration in Minutes	182.01 ±6.81	180.44 ±16.75	0.325

Table 3:

	Group 1	**Group 2**	**P Value**
Motor Block Duration in Minutes	134.22 ±11.31	159.01 ± 10.12	< 0.001
Bromage Scale	1.94 ± 0.93	2.84 ± 0.88	< 0.001

Table 4:

Side Effects	**Group 1 (N=30)**	**Group 2 (N=30)**	**P Value**
Hypotension	13 (43%)	14 (46%)	0.421
Ephedrine required	09 (30%)	10 (33%)	0.763
Bradycardia	7 (23%)	8 (26%)	0.554
Atropine required	7(23%)	8 (26%)	0.731
Nausea	4 (13%)	3 (10%)	0.316
Vomiting	3 (10%)	2 (6%)	0.167
Shivering	1 (3%)	2 (6%)	0.658

DISCUSSION:

Rophivacaine, a newly licenced local anaesthetic in Pakistan, was compared to bupivacaine in terms of how well it behaved when epidurally administered at comparable doses and volumes. Inguinal hernia repair surgery was done on study participants. Currently, the most often utilised technique for hernia surgery is lumbar epidural anaesthesia. Patients are able to stand and move more quickly following surgery due to the long-lasting analgesia offered by epidural analgesia. Epidural treatment has been shown to decrease blood loss during surgery while also lowering post-operative complications such as ileus (9). Cardiotoxicity is the primary disadvantage of bupivacaine in epidural blocks. Ropivacaine was developed to avoid the toxicity associated with Bupivacaine (11-12).

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We observed comparable start times for sensory block at T10 with ropivacaine and bupivacaine. Campbell (13) and Dresner (14), as well as a number of other researchers, reached the same conclusion. Two groups demonstrated the greatest degree of sensory obstruction at T5 in our analyses. In comparison to Finegold (16), Wolff (15) produced comparable results. In comparison to Katz et al., who discovered comparable two-segment regression durations of 162 ±48SD and 204 ±60SD minutes for bupivacaine and ropivacaine, we discovered 86.74 ±9.25SD and 86.45 ±9.78SD minutes. We discovered that sensory block retreated to T12 at the similar pace with both medications. McGlade(18) reached the same conclusion. The Bromage scale was altered to assess motor block. With ropivacaine, it was 1.94 ± 0.93 and with bupivacaine, it was 2.84 ± 0.88. Ropivacaine has a lower affinity for big myelinated motor fibres, resulting in reduced motor block (19). To avoid motor blockage, it is advantageous to keep the motor and sensory systems as independent as feasible. Morrison et al (20) came to the identical conclusion. According to Brown et al (21), neither drug was more effective at inhibiting motor function. Brown et al. discovered no difference in the strength of the motor blockade produced by the two medicines. Epidural analgesia may benefit from a lower amount of motor blockade when used in conjunction with obstetric or postpartum epidural anaesthesia. After doing an in-depth analysis, we determined that ropivacaine and bupivacaine had a motor block time of 134.22 ±11.31 and 159.01 ± 10.12 minutes, respectively. The motor block of ropinivacaine is shorter than that of bupivacaine. Brown et al (21) reported similar findings. Hypotension and bradycardia were the most often reported adverse effects (14 versus 13). There is an eight-to-seven tie (in this case). Both the ropivacaine and bupivacaine groups developed hypotension, which required the administration of ephedrine. Atropine, like ropivacaine and bupivacine, was utilised to treat bradycardia in all of the patients administered atropine. Both groups experienced nausea, vomiting, shivering, and itching as a result of the treatment. This study established that 0.5 percent epidural ropivacaine and 0.5 percent bupivacaine had comparable clinical effects.

CONCLUSION

Ropivacaine is a new topical anaesthetic with a lengthy half-life. Reduced motor blockade caused by bupivacaine may be beneficial in some cases. This medication reduces the risk of CNS and cardiac damage.

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