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A RANDOMIZED STUDY COMPARING THE EFFECTS OF DIFFERENT REGIONAL ANESTHESIA DURING HOLMIUM LASER PROSTATECTOMY (HoLEP)

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Authors Dr. Brijesh Tiwari, and Dr. Pranchil Pandey declare that they have no conflict of interest.

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Abstract

Introduction

HoLEP(Holmium Laser Enucleation Of Prostate) surgery has lower morbidity due to a lower transfusion rate and lesser risk of dilutional hyponatremia; nevertheless, the disadvantages are attributed to a longer procedure time and a steep learning curve. The anesthetic aspects of HoLEP have not yet been fully established. The majority of published studies concentrated on HoLEP's urological features.

The aim of the current study was to assess different regional anesthesia techniques for HoLEP surgery and to identify the most effective regional anesthesia technique.

Material and methods:

Following approval from Institutional Ethics Committee (IES-SSMC-0145), a prospective, randomized, comparative study was conducted. The study included 45 patients who were scheduled for HoLEP. Patients who had severe systemic infections or local infections at the injection site, coagulopathy, serious disorders of the central nervous system or peripheral nerves, and history of allergies to local anesthetics, were excluded from the study. Patients (n=15) were randomly assigned to one of three groups (epidural block, spinal block, or saddle block) using the sealed envelope method.

Result :

Time to T10 dermatome block (P=.024) and time to maximal sensory level block (P=.003) were statistically different between groups A and B. The maximal sensory block level was comparable between groups B

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and C but higher between groups A and C. The time to 2-segment sensory regression differed statistically substantially between groups and was significantly longer in group A than in group C (P=.007).

Conclusion:

we conclude that saddle block has a quicker onset, more effective sensory block, and faster recovery in HoLEP surgery.

Keywords: HoLEP, Regional Anesthesia, Saddle block

Abbreviations:

1. HoLEP: Holmium laser enucleation of the prostate
2. BPH: Benign prostatic hyperplasia
3. TURP: Transurethral resection of the prostate
4. IEC-SSMC: Institutional Ethics Committee- Shyam Shah Medical College
5. ECG: electrocardiogram
6. CSF: cerebrospinal fluid
7. SBP: systolic blood pressure

Introduction:

With a prevalence of up to 50% in men over the age of 50, benign prostatic hyperplasia (BPH) is a prevalent urologic illness in males.[1] BPH can result in a physical blockage of the prostatic urethra and result in lower urinary tract symptoms.[2] The suggested approach of treatment for BPH is transurethral resection of the prostate (TURP). The holmium laser enucleation of the prostate (HoLEP) is a relatively new procedure that has shown superior long-term outcomes to TURP and open prostatectomy in terms of longevity, safety, and efficacy.[3]

HoLEP surgery has various benefits in terms of anesthetics, including lower morbidity due to a lower transfusion rate and removing the risk of dilutional hyponatremia; nevertheless, the disadvantages are attributed to a longer procedure time and a steep learning curve. [4] Due to the potential for excessive irrigation solution absorption during the procedure, TURP surgery can result in circulatory volume overload, which can have a detrimental impact on older patients with cardiopulmonary disorders. As a result, it's crucial to maintain a steady hemodynamic condition when under anesthesia. It is easier to identify TURP syndrome indicators under regional anesthesia than under general anesthesia. Regional anesthesia also lessens the necessity for tracheal intubation and aids in postoperative analgesia. Various studies have compared different regional anesthesia techniques for TURP surgery. [5]

To choose the best anesthetic approach, multiple types of anesthesia should be taken into account because the anesthetic aspects of HoLEP have not yet been fully established. The majority of published studies concentrated on HoLEP's urological features.

The current study's objectives were to assess different regional anesthesia techniques for HoLEP surgery and to identify the most effective regional anesthesia technique.

Materials and methods

Following approval from Institutional Ethics Committee (IEC Approval No: IEC-SSMC-0145), a prospective, randomized, comparative study was conducted. The study included 45 patients who were scheduled for HoLEP to treat BPH at the Department of Urology at Super Specialty Hospital Shyam Shah medical college Rewa and had an American Society of Anesthesiologists Physical Status score of I to III. Patients who had severe systemic infections or local infections at the injection site, coagulopathy, serious disorders of the central nervous system or peripheral nerves, a history of allergies to local anesthetics, or who had rejected the regional anesthetic technique were excluded from the study.

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Noninvasive blood pressure, heart rate, respiration rate, and ECG monitoring began as soon as the patient entered the operating room. Patients (n=15) were randomly assigned to one of three groups (epidural block, spinal block, or saddle block) using the sealed envelope method.

In group A, a 16G Tuohy needle was used to puncture the skin after skin preparation with chlorohexidine was applied to the patient's lateral decubitus posture. The epidural space was located using the loss of resistance approach. Next, a test dose of 3ml of hyperbaric 0.5% bupivacaine (15mg) was given. Within 30 seconds of confirming the epidural space, 12 ml of 0.5% bupivacaine (60 mg) and 50mg of fentanyl were administered.

In group B, spinal anesthesia was administered using a 25G spinal needle in the L3-4 interspace through a midline approach after the patient was positioned in a sitting posture. Following the appearance of CSF fluid in the needle, 3ml of 0.5% hyperbaric bupivacaine (15mg) and 50mg of fentanyl were intrathecally administered. The patient was then placed in the supine posture following the injection.

In group C, 3mL 0.5% bupivacaine and 50mg fentanyl were delivered with a 25G spinal needle at the L3-L4 via a midline approach after the patient was seated and free flow of cerebral fluid was noted. The patient was kept in a sitting position for five minutes following the injection.

A simple mask was used to deliver 5 L/min of oxygen during the procedure. At 5-min intervals, systolic blood pressure (SBP), heart rate, respiration rate, and peripheral oxygen saturation were measured. A 20% drop from baseline or systolic blood pressure of less than 90 millimeters was considered a sign of intraoperative hypotension. 6 milligrams of Mephentermine were injected intravenously when hypotension was seen. Additionally, 0.25 mg of atropine was injected intravenously when the heart rate was less than 50 beats per minute.

Every 5 minutes, a pinprick test was used to evaluate the sensory blockage on both sides of the midclavicular line. Time to maximum sensory block, time to 2-segment regression, and time to block of the thoracic 10 (T - 10) dermatome were all noted. 50mg of fentanyl was given intravenously whenever the patient complained of pain throughout surgery, and the total dose of extra analgesics was noted. In cases where a patient complained of pain repeatedly, general anesthesia was employed. After surgery, the motor block level was evaluated in the recovery room using the modified Bromage scale (0=no motor block, the patient can bend their knees in a supine position; 1=partial motor blockade; 2=almost complete motor blockade; and 3=complete blockade, the patient is unable to flex their ankle joints).

The studies done on TURP patients were utilized as the basis for the 3-group significance test based on the patients scheduled for HoLEP surgery. 15 patients were deemed essential for each group when the sample size was evaluated and computed using the mean difference and the standard deviation.

When analyzing the data, SPSS version 18.0 was used. One-way analysis of variance was used to evaluate demographic information, operation time, T-10 dermatome block time, maximal sensory block time, and 2-segment regression time. The Bromage scores were compared using the chi-square test. A P value of less than .05 was regarded as statistically significant.

Results:

Age, weight, and the American Society of Anesthesiologist's Physical Status scores were similar across all groups in terms of demographics. Additionally, there were no differences between the groups in terms of the length of the procedure before and after the procedure, or the overall volume of irrigation fluid (Table 1). Time to T10 dermatome block (P=.024) and time to maximal sensory level block (P=.003) were statistically different between groups A and B. Preoperative and postoperative sodium levels were comparable in each group. Additionally, the maximal sensory block level was comparable between groups B and C but higher between groups A and C (Table 2). The time to 2-segment sensory regression differed statistically substantially between groups and was significantly longer in group A than in group C (P=.007). Motor block results showed a statistically significant difference (P .05) (Table 3). although systolic blood pressure and heart rates did not differ significantly across the three groups (Fig. 1).

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Table 1: Demographic characteristics and operation details.

Data are presented as mean±standard deviation, n. Group A=epidural block; Group B=spinal anesthesia; Group C=saddle block

Table 2: Comparison of various types of regional anesthesia

	Group A	Group B	Group C	P value
Time to T10 block (min)	10.7±8.3	4.7±4.3	6.9±4.8	0.024
Time to maximal level block (min)	27.3±14.2	15.2±7.8	16.8±6.1	0.003
Maximal sensory block level	4.7±1.4	5.7±1.6	6.3±1.8	0.006
Time to two-segment regression (min)	118.3±24.3	97.6±23.4	95.8±14.3	0.007

Data are presented as mean±standard deviation, n. Group A=epidural block; Group B=spinal anesthesia; Group C=saddle block

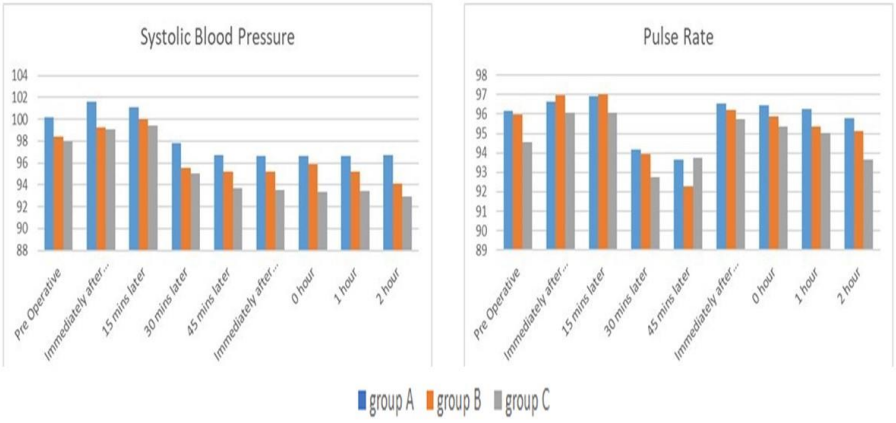
Table 3: Comparison of Bromage score among groups

	Group A (n=15)	Group B (n=15)	Group C (n=15)	P - value
Age (years)	68.2±4.3	69.3±5.4	70.3±3.4	0.076
Weight (kg)	60.5±4.6	62.3±5.4	59.5±5.5	0.081
Height (cms)	163.4±4.5	167.4±4.2	165.6±3.6	0.432
ASA (I/II/III)	6/8/1	5/9/1	4/9/2	0.267
Duration of surgery (minutes)	96.4±36.4	94.4±25.4	92.8±38.3	0.457
Pre- / postoperative Na+ level (L/mEq)	141.2±2.5/140.2±1.8	141.3±2.1/141.5±2.3	140.4±1.9/141.3±2.1	0.435/0.678

	Group A (n=15)	Group B (n=15)	Group C (n=15)
BS 0,1	9 (60%)	2(13.3%)	5(33.3%)
BS 2,3	6(40%)	13(86.6%)	10(66.6)

Data are presented as mean±standard deviation, n. Group A=epidural block; Group B=spinal anesthesia; Group C=saddle block, BS: 0=no motor block, 1=partial motor blockade, 2=almost complete motor blockade, 3=complete motor blockade. BS=Bromage score.

Figure 1: Hemodynamic variables



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Discussion:

HoLEP has developed into a desirable procedure with similar indications to TURP. The studies reveal low morbidity and successful clinical outcomes. [6] The current study examined the outcomes of several regional anesthesia techniques for HoLEP.

T11 sympathetic fibres carry the pain signal from bladder distension to L2 sympathetic fibres. Given this innervation, a regional block's height up to T10 is enough for TURP operation. In the current investigation, all three procedures' block heights exceeded the T10 level and provided adequate anesthesia for HoLEP. According to Tuominen [7], the concentration and volume of the local agent as well as the patient's position both during and after the injection are the main parameters impacting the distribution of local anesthetics. It's crucial to employ a steady anesthesia technique with little hemodynamic fluctuations. Approximately 30% of patients experience hypotension when under spinal anesthesia [8], which is due to sympathetic tone block and significant intravascular volume fluctuations as a result of venous dilatation. In the current study, the majority of patients in the three groups displayed stable hemodynamic conditions, and no significant differences in heart rate or systolic blood pressure were observed. It has been shown in various trials that combining low-dose fentanyl with low-dose local anesthetics during spinal anesthesia lowers the risk of hypotension. [9] Fentanyl is a potent lipophilic opioid drug with a low molecular weight. As an adjuvant, intrathecal fentanyl can improve sensory blockade without altering the severity of sympathetic blockade.[10] Additionally, the patient in group C spent the shortest amount of time sitting (5 minutes), which may have had an impact on the outcomes of the sensory block and systolic blood pressure between groups B and C. Maintaining a sitting position for two to three minutes after the injection may be adequate to allow the bupivacaine's 15mg dosage to distribute the anesthesia evenly.

Controlled hypotension is used to reduce intraoperative blood loss and create the best surgical environment possible.[11] It can be indicated in HoLEP, and its advantages include less blood loss and better surgical outcomes. As previously indicated, a drop in SBP following neuraxial block is typical and might be helpful when using the controlled hypotension strategy. In this study, SBP dropped after local anesthetic injections by an average of 28.45 mm Hg. Although there were no variations in the maximum fall in SBP between the three groups, all three groups decreases in SBP were statistically significant (P.05).

HoLEP has the advantage of requiring less irrigation solution, Furthermore, regular saline can be utilized. Water intoxication causes TURP syndrome, which develops when hypotonic irrigation fluid is absorbed and causes systemic symptoms. According to reports, mild to moderate TURP syndrome occurs between 0.5% and 8% of the time.[12] Early detection and diagnosis are crucial because the early symptoms and indications are ambiguous and nonspecific. Due to its quick recognition of early signs such as a change in mental status, the subarachnoid block is the anesthetic technique most frequently utilized during TURP. The risk of classic TURP syndrome is eliminated with minimal fluid absorption. In the current study, none of the three groups' preoperative and postoperative sodium levels significantly decreased. It is preferable to utilize a general anesthetic with fast-acting inhaled anesthetic gases or even IV sedation because TURP syndrome's systemic consequences are less likely with these techniques. HoLEP requires further research comparing general anesthesia with regional anesthesia.

Technically challenging HoLEP surgery needs a long, steep learning curve. When enucleating the prostate, the HoLEP takes longer to complete than a traditional TURP. [13] In the current study, the 2-segment sensory regression time was more than 90 minutes in all 3 groups, and the average operation time was over 93 minutes. HoLEP during the learning phase takes longer than when carried out by an expert surgeon. According to Soto-Mesa et al. [6], the conversion rate from spinal anesthesia to general anesthesia was higher during the learning phase than during the stabilization phase. Therefore, picking a method that provides the proper level of anesthesia for a lengthy surgical procedure is still crucial. Epidural block with lengthy sensory regression time may be considered when the surgical team is still in the learning phase, but general anesthesia should also be a possibility. As a result, it's crucial to estimate how long the procedure will last and to speak with a knowledgeable anesthesiologist. Along with the surgeon's experience, the size of the prostate can affect how long the procedure takes. After surgery, early mobilization and adequate recovery play a key role in determining how long patients stay in the hospital. According to several studies, adding intrathecal fentanyl to spinal anesthesia improves its quality without prolonging patients' hospital stays or the time it takes for their sensory or motor functions to recover.[21] The use of an epidural block in the present study was

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linked to a weaker motor block following surgery, but group A's 2-segment sensory regression time was noticeably longer. In contrast, group C saw a higher rate of motor and sensory recovery than the other groups.

In conclusion As a result of the quick sensory regression time and weaker postoperative motor blockade with steady hemodynamic alterations, saddle block induced by the combination of 15 mg 0.5% bupivacaine and 50 mg fentanyl is superior. Saddle block was found to have a quicker onset, more effective sensory block, and faster recovery.

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