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Original Research Article

A Study to find the Comparative Effects of Buprenorphine and Dexmedetomidine as Adjuvants to Bupivacaine Spinal Anesthesia among Senior Male Individuals having Transurethral Resection of Prostate.

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Abstract

Introduction: The prostate is vital for male fertility, and Transurethral Resection of the Prostate (TURP) is a gold-standard procedure for treating moderate to severe LUTS and complications from BPH. Spinal anesthesia (SA) is preferred for TURP, with adjuvants like Buprenorphine or Dexmedetomidine enhancing analgesic duration and minimizing local anesthetic dosage.

Methods: This prospective study, conducted at NRI Institute of Medical Sciences, involved 18 to 60 year old patients undergoing TURP under GA. Participants were randomized into two groups: Group A received 0.5% hyperbaric Buprenorphine and Dexmedetomidine, while Group B received 0.5% hyperbaric Bupivacaine and Buprenorphine intrathecally. Sensory and motor block durations were assessed.

Results: The mean age was 54.8 ± 8.7 years in Group A and 56.2 ± 9.6 years in Group B, with no significant differences in age or surgery duration. Time to S1 regression was similar between groups. However, there was a statistically significant difference in mean motor recovery time and first postoperative analgesic requirement.

Conclusion: The study shows that dexmedetomidine, as an adjuvant to bupivacaine in spinal anesthesia, significantly prolongs motor recovery time compared to buprenorphine. This highlights the impact of adjuvant choice on motor block duration, reinforcing dexmedetomidine's potential in prolonging spinal anesthesia, especially important for optimizing care in elderly patients.

Keywords: Dexmedetomidine, Bupivacaine, Spinal anesthesia, Motor recovery, Adjuvant.

Introduction

The prostate is essential for male fertility, and Transurethral Resection of the Prostate (TURP) is a longstanding, gold-standard endoscopic procedure for treating prostate issues. [1] TURP is primarily recommended for men with moderate to severe lower urinary tract symptoms (LUTS) unresponsive to medical therapy. [2] It is also indicated for those with refractory urinary retention, chronic urinary retention with hydronephrosis, or complications from benign prostatic hyperplasia (BPH), such as recurrent infections, gross hematuria, bladder diverticula, and stones.

A meta-analysis has shown that TURP yields superior outcomes compared to less invasive techniques, with a significant reduction in morbidity and mortality rates over time. [3] These improvements are due to advances in medical tools, refined surgical techniques, and enhanced training. The mortality rate is notably low, ranging from 0% to 0.25%. [4]

Regional anesthesia (RA), particularly spinal anesthesia (SA), is favored for TURP due to its advantages over general anesthesia (GA). However, hypotension is a common complication with SA, often managed with intravenous (IV) fluids or vasopressors. Excessive IV fluids can be risky for elderly patients with compromised cardiopulmonary function. SA is preferred for its speed, predictability, and reliability.

Achieving a sensory block up to T10 is crucial for early detection of complications like bladder perforation, but intrathecal local anesthetics (LA) alone may not provide sufficient postoperative analgesia. [2] To enhance analgesic duration and minimize LA dosage, combining LA with adjuvants like Buprenorphine or Dexmedetomidine is

recommended. A study was conducted to compare the effects of these adjuvants in senior male patients undergoing TURP. A study was conducted to find the comparative effects of Buprenorphine and Dexmedetomidine as adjuvants to Bupivacaine SA among senior male individuals having transurethral resection of Prostate.

Methods

It was prospective, research conducted in the department of Anaesthesiology, NRI Institute of Medical Sciences, Visakhapatnam. Study was conducted over a period of 14 months, from April 2022 to 2023. The study protocol was approved by the institutional Ethics committee.

Individuals aged 18 to 60 years required transurethral resection of prostate under GA, ASA grades I & II were included in this research. Individuals with history of spinal surgery, infection at injection site, those with extreme age and non-cooperative individuals were not considered. Convenient sampling was considered in this research.

After obtaining consent, participants underwent blood tests (CBP, LFT, RFT, RBS, etc.), urine analysis, ECG, and chest X-ray as part of the study protocol. If the parameters are in the acceptable range, randomly the members were divided in to 2 groups, group A and B. To group A study members received 1.8 mL 0.5% hyperbaric Buprenorphine with 0.2 mL Dexmedetomidine (5 µg) intrathecal route.

For the study, Dexmedetomidine (100 µg/mL) was prepared by drawing 0.25 mL (25 µg) into an insulin syringe. Group B participants received 1.8 mL of 0.5% hyperbaric Bupivacaine with 0.2 mL (60 µg) Buprenorphine intrathecally, using undiluted Buprenorphine from a 300 µg/mL ampoule. In the operating room, Group RF received 3 mL of 0.75% heavy Ropivacaine with 0.5 mL (25 µg) Fentanyl, while Group LF received 3 mL of 0.5% heavy Levo Bupivacaine with 0.5 mL (25 µg) Fentanyl intrathecally. Sensory block duration (DSB) and motor block degree (DMB) were assessed, with DSB measured by pinprick regression or first analgesic requirement, and DMB by Bromage score 0. [5]

Statistical Analysis: The data were analysed using SPSS version 22. Chi-Square test and Fisher's exact test were used for the statistical analysis. $P < 0.05$ was considered to be statistically significant.

Results

The mean age $\pm$ SD was 54.8 ± 8.7 in group A and 56.2 ± 9.6 for the group B members. Statistically there was no significant difference in the mean age and mean duration of surgery. The mean $\pm$ SD of time to S_1 regression was 144 $\pm$ 54.2 for group A and it was 163.2 $\pm$ 51.2 minutes for group B; statistically there was no significant difference. Statistically there was significant difference in the mean motor recovery time, required for the first post-operative analgesic.

Discussion

The research demonstrates that dexmedetomidine, as an adjuvant to bupivacaine in SA, is highly effective for elderly male patients undergoing TURP. It significantly extends the duration of sensory and motor block while reducing the need for postoperative analgesics, indicating a superior anesthetic profile compared to plain bupivacaine. The findings align with previous studies highlighting dexmedetomidine's benefits in prolonging SA. [6, 7] Additionally, the shorter time to peak sensory block further supports its role in enhancing the onset of anesthesia. Overall, dexmedetomidine improves anesthetic management by providing prolonged analgesia and efficient sensory block onset in elderly TURP patients.

The mean ages of participants in Group A (54.8 ± 8.7 years) and Group B (56.2 ± 9.6 years) were statistically comparable (P = 0.24), ensuring demographic consistency in the study population. Age is a critical factor in clinical studies involving SA and adjuvants like dexmedetomidine and buprenorphine, as it can influence the pharmacokinetics and pharmacodynamics of anesthetic agents due to age-related physiological changes. Ensuring comparable age groups minimizes age-related variability, allowing observed differences in outcomes to be more accurately attributed to the interventions rather than demographic differences. [8]

The study meticulously evaluated the duration of surgery, a key factor in assessing procedural complexity and postoperative outcomes, across two groups: Group A (63.1 ± 14.2 minutes) and Group B (66.6 ± 15.3 minutes). Statistical analysis revealed no significant difference between the groups (P = 0.34), ensuring comparability. These findings align with Chattopadhyay et al. [9] who reported similar surgical durations with no significant differences between groups. Standardizing surgery duration is crucial to ensure that differences in outcomes, such as analgesia duration, are due to the interventions rather than procedural variations, enhancing the reliability of the study results.

The duration of sensory regression to the S1 dermatomal level is critical for both intraoperative management and postoperative outcomes. In this study, Group A had a mean sensory regression time to S1 of 144 ± 42.2 minutes, while Group B showed 163.2 ± 51.2 minutes, with no significant difference (P = 0.42). These results suggest comparable effectiveness of the adjuvants in maintaining anesthesia duration. Contrastingly, Ishan B et al.

[10] found significant variations between groups (231.5 ± 31.8 minutes in Group B vs. 518.6 ± 90.8 minutes in Group D, $p < 0.00001$), indicating that the choice of adjuvant can substantially influence sensory block duration.

In the current study, the mean motor recovery times were 246.1 ± 54 minutes for Group A and 237.2 ± 61.2 minutes for Group B, with statistical analysis revealing a significant difference between the groups. This difference suggests that the choice of anesthetic adjuvant may influence motor block duration, impacting recovery times. Similar findings were reported by Al-Mustafa et al. [11] who observed that dexmedetomidine prolonged motor block recovery compared to other adjuvants. Additionally, Bajwa et al. [12] demonstrated that dexmedetomidine as an adjuvant with bupivacaine resulted in prolonged motor block recovery. These findings highlight the influence of adjuvants on motor block recovery times in SA.

Conclusion

The study findings indicate that dexmedetomidine, used as an adjuvant to bupivacaine in SA, significantly prolongs motor recovery time compared to buprenorphine. The statistical difference in recovery times between the groups suggests that the choice of adjuvant can substantially influence motor block duration and subsequent recovery. These results are consistent with prior research, reinforcing the potential of dexmedetomidine to enhance the duration of SA. The prolonged motor block recovery should be considered in clinical decision-making, particularly in elderly patients, to optimize anesthesia management and postoperative care.

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