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Original research article

EVALUATING THE EFFICACY AND SAFETY OF INTRATHECAL FENTANYL AND LOW-DOSE HYPERBARIC BUPIVACAINE IN SPINAL ANESTHESIA FOR TRANSURETHRAL RESECTION OF PROSTATE IN ELDERLY PATIENTS

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Abstract

Introduction: Elderly patients undergoing Transurethral Resection of the Prostate (TURP) often present with multiple co-morbidities, making the choice of anesthetic technique crucial. This study evaluates the efficacy and safety of combining intrathecal Fentanyl with low-dose Hyperbaric Bupivacaine for spinal anesthesia in this patient population.

Material and Methods: A prospective randomized comparative study was conducted with 100 patients, aged 60-80 years, undergoing TURP at Mamatha General Hospital from November 2013 to October 2015. Participants were divided into two groups: Group A (n=50) received 1.5 ml of 0.5% hyperbaric bupivacaine, and Group B (n=50) received 1 ml of 0.5% hyperbaric bupivacaine plus 25 µg Fentanyl. Exclusion criteria included refusal of spinal anesthesia, need for general anesthesia, anticoagulant therapy, bleeding diathesis, back infections, spinal deformities, peripheral neuropathy, and CNS disorders. The primary outcomes measured were the onset of sensory block, quality of analgesia, onset of motor block, hemodynamic parameters, need for postoperative analgesia, and incidence of postoperative nausea and vomiting.

Results: The study found a faster onset of sensory blockade and time to reach T10 sensory level in Group B. Additionally, Group B demonstrated a higher level of analgesia. These results suggest an enhanced efficacy of spinal anesthesia with the addition of Fentanyl to Bupivacaine.

Conclusion: The combination of intrathecal Fentanyl with low-dose Hyperbaric Bupivacaine in spinal anesthesia provides a faster onset and higher level of analgesia for elderly patients undergoing TURP. This combination could be a preferable option in managing such patients, considering their complex medical background.

Keywords: TURP, spinal anesthesia, fentanyl, bupivacaine

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Introduction

Transurethral Resection of the Prostate (TURP) is a common surgical procedure performed in elderly men with benign prostatic hyperplasia. Patients undergoing TURP are often challenged with concurrent cardiac and pulmonary conditions, making the choice of anesthesia critical for the safety and comfort of the patient. Spinal anesthesia, due to its localized effect, has become the technique of choice, particularly for this demographic. It offers improved tolerance, and early detection of potential complications such as water intoxication or bladder perforation, which are intrinsic risks of the TURP procedure [1].

Traditionally, Hyperbaric 5% lignocaine has been the standard local anesthetic used in spinal anesthesia for urological surgeries, prized for its rapid postoperative recovery. However, the association of lignocaine with transient neurological symptoms (TNS) has raised concerns, leading to a search for safer alternatives [2]. This quest has brought to light the combination of small-dose local anesthetics with spinal opioids as a viable approach, offering enhanced analgesic efficacy without prolonged motor impairment.

The use of spinal opioids, especially since their introduction in 1979, has been to achieve comparable analgesia to systemic administration but with reduced systemic side effects. Among these, Fentanyl and Sufentanil have emerged as preferred choices due to their lipophilic properties, offering advantages over Morphine, such as rapid onset, shorter duration, limited cerebrospinal fluid (CSF) spread, and reduced risk of respiratory depression [3].

The application of spinal opioids, notably since 1979, is primarily to achieve effective analgesia comparable to systemic administration but with reduced doses, systemic concentration, and minimized risk of systemic side effects. Initial use of intrathecal Morphine revealed side effects like respiratory depression, nausea, and vomiting, attributed to its slow uptake and prolonged action, leading to higher cerebrospinal fluid (CSF) concentrations and extensive narcotic spread [4]. This has guided the shift towards more lipophilic opioids like Fentanyl and Sufentanil, which are more potent, have quicker uptake, shorter action duration, lower CSF concentrations, limited narcotic spread, reduced respiratory depression, and faster motor recovery compared to Morphine [5].

Physiological changes in elderly patients can significantly affect the spread and onset of motor block and induce cardiovascular instability, regardless of the anesthetic solution used. Age-related alterations in spinal anatomy, nerve physiology, and cardiovascular reflexes necessitate limiting spinal block distribution [6]. This has led to the preference for combining small doses of local anesthetics with lipophilic opioids administered intrathecally, enhancing spinal anesthesia effectiveness while curtailing prolonged motor recovery and minimizing adverse cardiovascular and pulmonary effects.

This study aims to evaluate the effectiveness of intrathecal Fentanyl as an adjunct to intrathecal Bupivacaine (Hyperbaric) in patients undergoing TURP. The objectives include assessing the efficacy of a low dose of Bupivacaine 0.5% (Hyperbaric) combined with Fentanyl 25 μg in providing sufficient sensory and motor block, examining the hemodynamic and respiratory effects, and the incidence of postoperative complications such as nausea, vomiting, and shivering, as well as evaluating any adverse effects like pruritus and TNS.

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Materials and Methods

Study Setting and Approval: This prospective randomized comparative study was conducted at the Department of Anesthesiology, Mamata Medical College, Khammam, between November 2013 and October 2015. The study protocol was reviewed and approved by the institutional ethical committee.

Study Population: A total of 100 patients, aged between 60 and 80 years, classified as ASA grade II-III, and scheduled for transurethral resection of the prostate (TURP) at Mamatha Medical College, were enrolled. They were equally divided into two groups:

- **Group A:** 50 patients receiving 1.5 ml of 0.5% hyperbaric bupivacaine (7.5 mg)
- **Group B:** 50 patients receiving 1 ml of 0.5% hyperbaric bupivacaine plus 25 μg fentanyl

Exclusion Criteria Patients were excluded from the study if they

- Refused spinal anesthesia
- Required general anesthesia
- Were on anticoagulant therapy
- Had bleeding diathesis
- Had infections at the site of injection
- Had spinal deformities
- Had a history of peripheral neuropathy or CNS disorders

Equipment and Study Agents

- Intravenous (I.V.) Cannula and I.V. Fluids
- 23G Whittacre spinal needle
- Injectable Bupivacaine 0.5% heavy
- Injectable Fentanyl 2.5 μg

Parameters Evaluated

- Onset of sensory block
- Quality of analgesia
- Onset of motor block
- Hemodynamic parameters
- Reduced need for postoperative analgesia
- Incidence of postoperative nausea and vomiting

Technique

Prior to the procedure, valid consent was obtained and fasting status confirmed. Patients were then taken to the operating theater, equipped with standard monitoring devices, oxygen, suction, and resuscitation equipment. Venous access was established, and crystalloid infusion started. The patients were positioned sitting with flexed vertebral column to widen the intervertebral spaces. After identifying the L3-L4 space and local anesthesia with 2% lignocaine, lumbar puncture was performed using a 27G pencil-point spinal needle. Upon confirmation of free CSF flow, patients in Group A or B received their respective drug regimens. The anesthesiologist administering the block was blinded to the study drugs.

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Intraoperative and postoperative data were recorded. Heart rate, blood pressure, and respiratory rate were monitored every 10 minutes until the end of surgery. Sensory block assessment was done using a cold alcohol swab, and motor block by the modified Bromage scale. Intraoperative complications like nausea, vomiting, pruritus, additional analgesia, and sedation were noted.

Management of Hypotension and Bradycardia

- **Hypotension:** Defined as a decrease in systolic BP >30% below baseline or <100 mmHg, treated with 6 mg mephentermine and crystalloid fluid.
- **Bradycardia:** Defined as heart rate <50/min, treated with 0.6 mg intravenous atropine.

Postoperative Pain Management Pain was assessed using the visual analogue scale. A score of more than 4 indicated the need for pain management, administered as follows.

- Paracetamol 1g
- Tramadol 50-100 mg
- Morphine 5-10 mg

Statistical Analysis

Results thus obtained were subjected to statistical analysis P value less than 0.05 was considered significant. The data was analysed by computer software IBM Statistical Package for Social Sciences (SPSS). The qualitative variables were assessed as mean ± standard deviation. The quantitative variables were expressed as frequencies and percentages.

Results

Table 1: Age distribution

No. of patients	Group I	Group II
60-65	24	21
66-70	13	16
71-75	10	5
76-80	3	8

Patients were randomly distributed into two groups and more no. of patients belongs to age group of 76-80 years in group II.

Table 2: ASA physical status

ASA	Group I	Group II
II	43	38
III	7	12

81 of 100 patients studied belonged to ASA physical status II and the remaining 19 patients belong to ASA physical status III. Of the 19 patients 12 patients belonged to

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group II. The difference between the two groups with regard to ASA physical status is not significant.

Table 3: Co-existing disease

Co-existing disease	Group I	Group II
None	18	18
Cardiac	5	8
Respiratory	9	9
Hypertension	18	14
Hypertension + Respiratory	0	1

In this study of 100 patients who were randomly distributed, 13 (13%) patients were found to have cardiac problems and 18(18%) patients had respiratory problems and 32(32%) of patients were hypertensive's and 1 (1%) patient had both hypertension and respiratory.

Table 4: Onset of sensory blockade

Time in minutes	Group I	Group II
Minimum	2.5	1.5
Maximum	4	3
Mean	3.51	2.35

$p<0.001$

The mean time for onset of sensory block in group I was 3.15minutes compared 2.35minutes in group II with $p<0.001$.

Table 5: Time for sensory level to reach T_{10}

Time in minutes	Group I	Group II
Minimum	4.5	2.5
Maximum	6	5
Mean	5.32	3.74

$p<0.001$

The mean time to reach T_{10} group I was 5.32 minutes and in group II was 3.74 minutes with $p<0.001$

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Table 6: Height of Analgesia

Height of Analgesia	No. of Patients	Group I (%)	No. of Patients	Group II (%)
T8	0	-	2	4
T9	11	22	12	24
T10	39	78	36	72
Total	50	100	50	100

t-8. 214, $p<0.001$

Highest level of sensory level reached in group II was T8 in two cases (4%) and majority of patients in both groups the maximum level of sensory block attained T10(78% in group I and 72% in group II).

Discussion

This study aimed to assess the efficacy and safety of combining intrathecal Fentanyl with low-dose Hyperbaric Bupivacaine in spinal anesthesia for elderly patients undergoing Transurethral Resection of the Prostate (TURP). The analysis of the results offers several key insights.

The age distribution in both groups was well-balanced, with a slightly higher number of older patients in Group II. This is consistent with the general demographic undergoing TURP. The majority of the patients were classified as ASA physical status II, indicative of moderate systemic disease, which aligns with findings in previous studies [7].

The prevalence of co-existing conditions like cardiac and respiratory issues, along with hypertension, reflects the typical health profile of elderly patients undergoing TURP, as reported in the literature [8]. A notable observation was the faster onset of sensory blockade in Group II (Bupivacaine + Fentanyl), aligning with research by Madhusudhanan [9], suggesting that Fentanyl enhances the effectiveness of Bupivacaine, leading to a quicker onset of anesthesia.

The time for the sensory level to reach T_{10} was significantly shorter in Group II. This quicker spread to the desired level of anesthesia could improve surgical efficiency, a finding supported by Aksoy *et al*. (2015). The study revealed a significant difference in the height of analgesia, with Group II achieving a higher level. This is in line with studies by Singh *et al*. [11], indicating that the combination of Bupivacaine and Fentanyl not only hastens the onset but also enhances the quality of analgesia.

These findings echo the growing body of research advocating for the use of Fentanyl with Bupivacaine in spinal anesthesia for better outcomes in elderly patients undergoing surgeries like TURP [12]. The combination appears to offer superior onset and quality of anesthesia, which can be beneficial in managing patients with multiple comorbidities [13].

This study, while informative, has limitations, including its focus on a specific patient demographic and surgical procedure. Future research could expand to include a more diverse patient population and a variety of surgical contexts. Long-term follow-up studies, as suggested by Acharya and colleagues [14], would further elucidate the postoperative recovery profile and potential delayed complications of this anesthesia approach.

In summary, the incorporation of Fentanyl into Bupivacaine for spinal anesthesia in

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elderly TURP patients shows promising improvements in the onset and quality of anesthesia. These findings support the growing preference for this combination in clinical practice, potentially enhancing patient care and surgical outcomes.

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