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Postoperative Analgesia, Adverse Effects and Patient Satisfaction with Intrathecal Dexmedetomidine versus Fentanyl in Perianal Surgeries

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Abstract **Original Research Article**

***Background*:** Spinal anesthesia is commonly used for lower limb and perianal surgeries, offering effective intraoperative and early postoperative analgesia, though achieving optimal pain control remains a challenge due to the limited duration of standard local anesthetics and potential opioid-related side effects. This study aimed to compare the postoperative analgesic efficacy, safety, and patient satisfaction of intrathecal dexmedetomidine versus fentanyl in patients undergoing perianal surgery. ***Methods*:** This quasi-experimental study at the Departments of Anaesthesia, Analgesia and Intensive Care Medicine, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, included 64 perianal surgery patients receiving intrathecal bupivacaine with either fentanyl or dexmedetomidine. Sensory and motor blocks, hemodynamics, pain, analgesia duration, adverse effects, and satisfaction were recorded and analyzed using SPSS 23.0 ($p < 0.05$). ***Results*:** In 64 patients (32 per group), demographics were comparable (mean age 45.3 ± 8.5 y, 75% male, 57.8% ASA I). Group B had longer sensory (292.1 vs 205.6 min) and motor blocks (162.5 vs 126.5 min) and prolonged analgesia (278.5 ± 16.2 vs 198.7 ± 25.2 min). VAS scores were lower in Group B at 2–6 h ($p \leq 0.033$). Adverse effects were mild, with pruritus only in Group A, and patient satisfaction was high and similar between groups (4.58 ± 0.5 vs 4.53 ± 0.5). ***Conclusion*:** Intrathecal dexmedetomidine provides superior and prolonged postoperative analgesia with good safety and high patient satisfaction in perianal surgeries.

Keywords: Postoperative Analgesia, Adverse Effects, Patient Satisfaction.

INTRODUCTION

Spinal anesthesia is widely employed for lower limb surgical procedures. Depending on the technique applied [1-2], it offers significant advantages such as reduced intraoperative blood loss, decreased risk of deep vein thrombosis, and enhanced early postoperative pain control. Effective management of postoperative pain can facilitate earlier hospital discharge and improve patient tolerance to physical therapy. Nevertheless, achieving optimal postoperative analgesia remains a key challenge for improving overall surgical outcomes [3].

Hyperbaric bupivacaine, a commonly utilized local anesthetic for spinal anesthesia, provides analgesia for a relatively limited period of approximately two to three hours. Despite its widespread use, there is limited research evaluating the postoperative analgesic effects of intrathecal dexmedetomidine [4-6].

Fentanyl is the most frequently used short-acting opioid administered intrathecally alongside local anesthetics. It acts synergistically with local anesthetics to enhance both intraoperative and postoperative analgesia [7]. Studies have reported that intrathecal doses of fentanyl ranging from 10 to 25 micrograms can extend postoperative analgesia by roughly 180–240 minutes [8]. However, intrathecal opioids are associated with side effects, including pruritus, urinary retention, nausea, vomiting, and respiratory depression [9-10]. Fentanyl remains the predominant short-acting opioid in

intrathecal injections, improving analgesic outcomes while sharing these potential adverse effects [7-10].

Dexmedetomidine (Dex), a newer selective α2-adrenergic agonist, is increasingly used as an intrathecal adjuvant due to its potent analgesic, sympatholytic, and sedative properties [11-12]. Compared to clonidine, Dex exhibits approximately eightfold higher selectivity for α2-adrenergic receptors (α2-AR), providing sedative and analgesic effects at both supraspinal and spinal sites, along with antinociceptive action against somatic and visceral pain. Importantly, Dex minimally crosses the placenta (maternal/fetal index 0.77), supporting its safety in cesarean deliveries [13]. Several studies have shown that intrathecal Dex can prolong the duration of analgesia and reduce opioid-related side effects [11-12-14]. Its high specificity and favorable pharmacodynamic profile allow it to provide effective spinal sedation while maintaining stable hemodynamics without causing respiratory compromise [15]. Clinical investigations using doses of 3, 5, 10, and 15 µg have demonstrated dose-dependent prolongation of analgesia, with bradycardia and hypotension reported as potential adverse effects at higher doses [16-17].

Although clonidine and dexmedetomidine have been widely investigated as adjuvants to spinal local anesthetics, data in obstetric populations remain limited due to the complexities of obstetric anesthesia [18]. Furthermore, relatively few studies have specifically assessed the postoperative analgesic efficacy of intrathecal dexmedetomidine (4-6). This study aimed to compare the postoperative analgesic efficacy, safety, and patient satisfaction of intrathecal dexmedetomidine versus fentanyl in patients undergoing perianal surgery.

Objective

- To compare the postoperative analgesic efficacy, safety, and patient satisfaction of intrathecal dexmedetomidine versus fentanyl in perianal surgeries.

METHODOLOGY & MATERIALS

This quasi-experimental study was conducted at the Departments of Anaesthesia, Analgesia and Intensive Care Medicine, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh, from October 2021 to September 2022. A total of 64 patients scheduled for perianal surgery were enrolled, selected based on predefined inclusion and exclusion criteria. Patients were allocated into two groups to compare the postoperative analgesic efficacy, safety, and patient satisfaction of intrathecal dexmedetomidine versus fentanyl.

Inclusion Criteria:

- Age 40–60 years of either sex
- Surgery duration less than 60 minutes
- ASA physical status I or II
- Scheduled for uncomplicated hemorrhoidectomy or anal fistula surgery

Exclusion Criteria:

- Patient refusal to participate
- Age below 40 years or above 60 years
- Pregnancy
- Local infection at the back
- History of spine surgery, heart block, cardiac conduction defects, arrhythmias, coagulopathy, mental or neurological disturbances
- Hypersensitivity to local anesthetics, dexmedetomidine, or fentanyl
- Intake of analgesic medication within the previous 24 hours
- Current use of alpha-adrenergic antagonists, calcium channel blockers, ACE inhibitors/blockers, beta-blockers, anti-arrhythmics, or anticoagulants

Based on Morgan's table, 64 patients were enrolled and allocated alternately into two groups (Group A, n = 32; Group B, n = 32), receiving intrathecal hyperbaric bupivacaine 7.5 mg with either fentanyl 15 µg (Group A) or dexmedetomidine 5 µg (Group B). Spinal puncture was performed at L4/L5 under aseptic conditions, with 2 mL of 1% lidocaine for local infiltration, followed by intrathecal injection of study drugs and a 10-minute seated period. Sensory block was assessed using the pinprick method, and motor block using the Bromage scale, with durations recorded. Hemodynamic parameters, including heart rate, systolic and diastolic blood pressure, were monitored throughout. Postoperative pain was measured using the Visual Analog Scale, and duration of analgesia was defined as the time from injection completion to first request for rescue analgesic. Adverse effects and patient satisfaction were recorded. Data were entered into structured forms and analyzed using SPSS version 23.0, with continuous variables expressed as mean ± SD, categorical variables as frequencies and percentages, using unpaired t-test and Chi-square test, with $p < 0.05$ considered statistically significant. Ethical approval was obtained, confidentiality maintained, and informed consent was secured from all participants.

RESULTS

Table 1: Age Distribution of the Study Participants (n = 64)

Age (years)	Group A (n=32)	Group B (n=32)	Total & Percentage	Mean ± SD	p-value
40–49	21 (65.6%)	20 (62.5%)	41 (64.0%)	45.3 ± 8.5	0.797
50–60	11 (34.3%)	12 (37.5%)	23 (35.9%)		

The majority of patients were aged 40–49 years (41 patients, 64.0%), followed by those aged 50–60 years (23 patients, 35.9%), with a mean age of 45.3 ± 8.5 years. There was no statistically significant difference between Group A and Group B regarding age (p = 0.797).

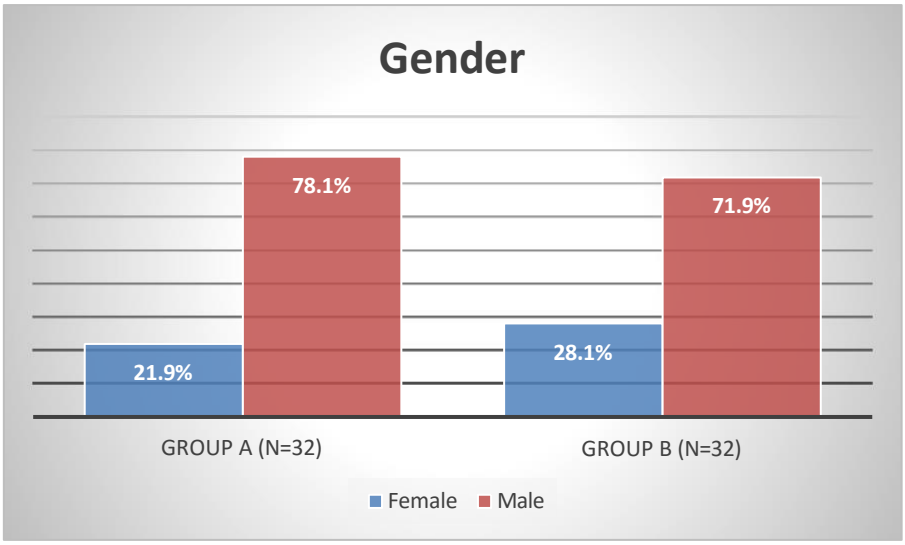

Figure 1: Gender Distribution of the Study Participants (n = 64)

Males predominated in both groups (48 patients, 75.0%) compared to females (16 patients, 25.0%). In Group A, 25 patients (78.1%) were male and 7 (21.9%) were female, while in Group B, 23 patients (71.9%) were male and 9 (28.1%) were female. There was no statistically significant difference between groups (p = 0.567).

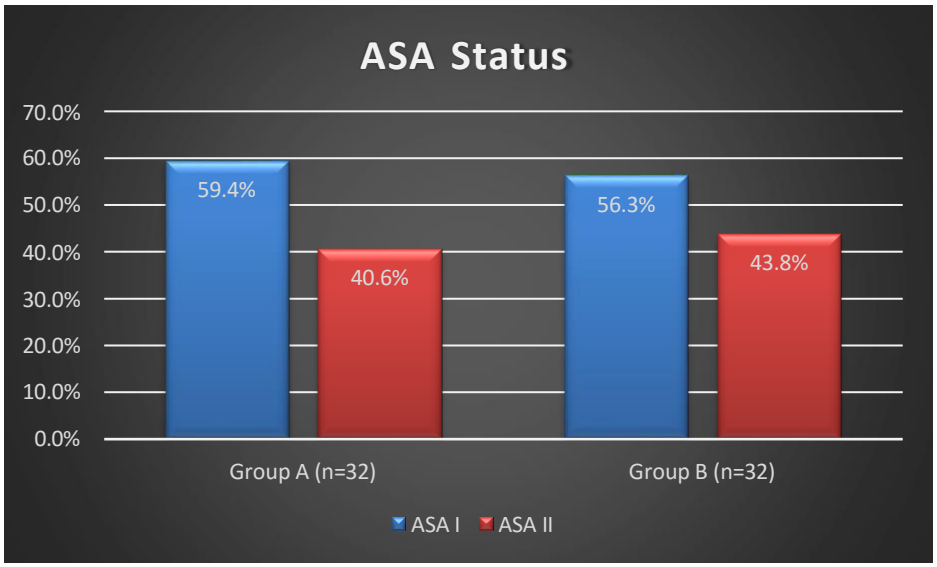

Figure 2: ASA Physical Status of the Study Participants (n = 64)

Most patients were classified as ASA I (37 patients, 57.8%), with the remainder ASA II (27 patients, 42.2%). In Group A, 19 patients (59.4%) were ASA I and 13 (40.6%) ASA II; in Group B, 18 patients (56.3%) were ASA I and 14 (43.8%) ASA II. There was no statistically significant difference between groups (p = 0.803).

Table 2: Mean Duration of Sensory and Motor Block After Intrathecal Administration (n = 64)

Block Type	Group A (Mean Duration, min)	Group B (Mean Duration, min)
Sensory	205.6	292.1
Motor	126.5	162.5

Sensory block lasted longer in Group B (292.1 min) compared to Group A (205.6 min), while motor block duration was also longer in Group B (162.5 min) than in Group A (126.5 min).

Table 3: Postoperative Pain Intensity (VAS Scores) at Different Time Points (n = 64)

Time	Group A Mean ± SD	Group B Mean ± SD	p-value
At PACU	1.25 ± 1.0	1.0 ± 1.1	0.345
2 hr	2.5 ± 1.1	1.5 ± 1.1	0.0005
4 hr	3.75 ± 1.1	2.75 ± 1.1	0.0005
6 hr	2.0 ± 1.1	1.0 ± 0.7	0.033

Pain intensity measured using the Visual Analog Scale (VAS) was similar in both groups at PACU (Group A: 1.25 ± 1.0; Group B: 1.0 ± 1.1; p = 0.345). At 2, 4, and 6 hours postoperatively, Group B had significantly lower pain intensity (2 hr: 1.5 ± 1.1 vs 2.5 ± 1.1, p = 0.0005; 4 hr: 2.75 ± 1.1 vs 3.75 ± 1.1, p = 0.0005; 6 hr: 1.0 ± 0.7 vs 2.0 ± 1.1, p = 0.033).

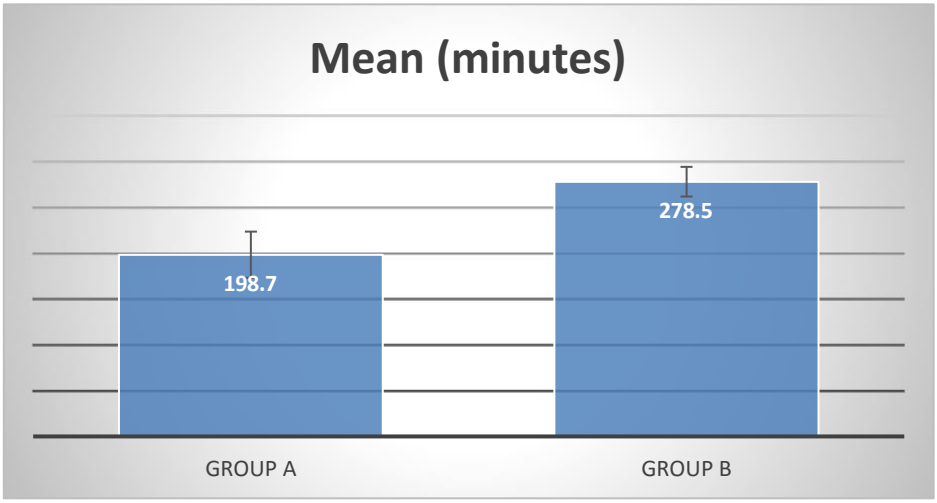

Figure 3: Mean Duration of Analgesia in Minutes (n = 64)

Group B patients had a longer duration of analgesia (278.5 ± 16.2 min) compared to Group A (198.7 ± 25.2 min), indicating a prolonged analgesic effect in the dexmedetomidine group.

Table 4: Incidence of Adverse Effects (n = 64)

Complication	Group A (n=32)	Group B (n=32)
Hypersensitivity/Rash	0 (0%)	0 (0%)
Hypotension	2 (6.3%)	0 (0%)
Shivering	0 (0%)	0 (0%)
Hypoxia	0 (0%)	0 (0%)
Nausea/Vomiting	5 (15.6%)	8 (25.0%)
Cardiovascular Collapse	0 (0%)	0 (0%)
Pruritus	4 (12.5%)	0 (0%)

Adverse effects were generally mild. In Group A, hypotension occurred in 2 patients (6.3%) and pruritus in 4 patients (12.5%), while nausea/vomiting occurred in 5 patients (15.6%). In Group B, nausea/vomiting occurred in 8 patients (25.0%), with no other adverse effects reported.

Table 5: Patient Satisfaction Following Intrathecal Analgesia (n = 64)

Satisfaction Grade (Likert Scale)	Group A (n=32)	Group B (n=32)	p-value
Very Dissatisfied (1)	0 (0%)	0 (0%)	
Dissatisfied (2)	0 (0%)	0 (0%)	
Neutral (3)	8 (25.0%)	9 (28.1%)	
Satisfied (4)	11 (34.4%)	5 (15.6%)	
Very Satisfied (5)	13 (40.6%)	18 (56.3%)	
Mean ± SD	4.53 ± 0.5	4.58 ± 0.5	0.869

Most patients were satisfied or very satisfied in both groups. Mean satisfaction scores were comparable between groups (4.53 ± 0.5 vs 4.58 ± 0.5; p = 0.869).

DISCUSSION

Postoperative pain after perianal surgery can significantly affect recovery and patient comfort. This study demonstrates that intrathecal dexmedetomidine provides longer analgesia, lower pain scores, and extended sensory and motor block compared to fentanyl, with similar safety and patient satisfaction. These findings support dexmedetomidine as an effective intrathecal adjuvant to optimize postoperative pain management.

In the present study, most participants were aged 40–49 years (41 patients, 64.0%), followed by 50–60 years (23 patients, 35.9%), with an overall mean age of 45.3 ± 8.5 years. There was no statistically significant difference in age distribution between Group A and Group B (p = 0.797), demonstrating that both study arms were demographically comparable. These findings are in agreement with Nethra *et al*. [19], who, in a randomized controlled trial involving perianal ambulatory surgeries, reported a similar adult age range (18–55 years) with no significant intergroup difference between dexmedetomidine and control groups. The similarity in age distribution across studies strengthens the homogeneity of the populations examined and suggests that age did not confound the comparative evaluation of intrathecal dexmedetomidine and fentanyl.

A clear male predominance was observed in the present study, with 75.0% of participants being male. Group A consisted of 78.1% males and 21.9% females, while Group B included 71.9% males and 28.1% females, without a statistically significant difference between the groups (p = 0.567). These observations are consistent with those of Nethra *et al*. [19], who also reported male predominance with balanced gender allocation between treatment arms in perianal ambulatory surgery. The comparable sex distribution in both studies minimizes potential gender-related bias and supports the validity of intergroup comparisons in analgesic efficacy and block characteristics.

Regarding baseline physical status, the majority of patients were classified as ASA I (57.8%), with the remaining 42.2% falling into ASA II. There was no statistically significant difference between Group A and Group B (p = 0.803), confirming that both cohorts were well matched in preoperative health status. This finding aligns with the results of Jinjil *et al*. [20], who reported comparable ASA classifications among patients undergoing hemorrhoidectomy under spinal anesthesia or perianal block. Such consistency in baseline ASA grading across groups enhances the reliability of outcome comparisons and ensures that perioperative differences are attributable to the study interventions rather than disparities in systemic health status.

Postoperative pain assessment revealed that VAS scores were consistently lower in the dexmedetomidine group at 2, 4, and 6 hours, with statistically significant differences at these time points, although immediate PACU scores were similar. Specifically, Group B demonstrated lower mean pain scores at 2 hours (1.5 vs 2.5), 4 hours (2.75 vs 3.75), and 6 hours (1.0 vs 2.0), indicating superior early postoperative analgesia. These findings corroborate the systematic review and meta-analysis by Paramasivan *et al*. [22], which concluded that intrathecal dexmedetomidine significantly decreases postoperative pain scores and prolongs analgesic duration compared to other adjuvants. Similarly, Eldemrdash *et al*. [23] reported reduced VAS scores in patients receiving intrathecal dexmedetomidine versus fentanyl, particularly within the first 4–6 postoperative hours, closely mirroring the temporal pain pattern observed in this study. Collectively, these findings reinforce the role of dexmedetomidine as an effective intrathecal adjuvant for optimizing early postoperative analgesia.

Consistent with improved pain control, the mean duration of analgesia was significantly longer in Group B (278.5 ± 16.2 minutes) compared with Group A (198.7 ± 25.2 minutes), demonstrating a prolonged analgesic effect with dexmedetomidine. These results parallel the findings of Nethra *et al*. [19], who reported a significantly extended time to first rescue analgesia in patients receiving intrathecal dexmedetomidine with bupivacaine compared to control (459.8 ± 100.9 min vs 321.85 ± 95.08 min). Although the absolute durations vary between studies, the consistent directional trend—favoring dexmedetomidine—supports its efficacy in extending postoperative analgesia in perianal surgical patients.

With regard to safety, the overall incidence of adverse effects was low in both groups. No cases of hypersensitivity reactions, shivering, hypoxia, or cardiovascular collapse were observed. Hypotension was recorded in a small percentage of patients in Group A (6.3%) but was absent in Group B. Nausea and vomiting occurred in both groups, slightly higher in Group B, while pruritus was exclusively observed in Group A (12.5%). These findings are consistent with the systematic review by Sun *et al*. [24], which demonstrated a reduced incidence of pruritus with intrathecal dexmedetomidine compared to fentanyl, without a significant increase in hypotension or major hemodynamic instability, and with similar rates of nausea and vomiting between groups. Moreover, Sudheesh *et al*. [25], in their evaluation of intrathecal dexmedetomidine in perianal surgeries, reported that although minor adverse effects may occur, serious complications are uncommon. The safety profile observed in the present study therefore aligns with existing literature and supports the favorable risk–benefit ratio of dexmedetomidine as an intrathecal adjuvant.

Patient satisfaction outcomes further supported the clinical benefits observed. Satisfaction levels were high in both groups, with no reports of dissatisfaction. A greater proportion of patients in Group B reported being "very satisfied" (56.3%) compared to Group A (40.6%), although overall mean satisfaction scores were comparable (4.58 ± 0.5 vs 4.53 ± 0.5; p = 0.869). These findings are consistent with those of Jinjil *et al*. [20], who reported high satisfaction levels among patients receiving dexmedetomidine-enhanced perianal block, reflecting improved comfort and patient acceptance. Similarly, Park *et al*. [26] documented high satisfaction rates among patients undergoing hemorrhoidectomy under perianal block, with many expressing willingness to repeat the technique. The present findings therefore reinforce that effective regional anesthesia—particularly when augmented with dexmedetomidine—contributes to a positive perioperative experience and high patient acceptance in perianal surgical procedures.

Limitations of the study

The limitations of the studies were as follows:

- Assessing sensory block in the perianal region posed challenges due to privacy concerns.
- Potential for observer or personal bias in evaluation of block characteristics and responses.

CONCLUSION

This study demonstrates that intrathecal dexmedetomidine, as an adjuvant to bupivacaine in perianal surgeries, provides enhanced and prolonged postoperative analgesia with faster onset of sensory and motor block, while maintaining a favorable safety profile and high patient satisfaction compared to fentanyl. Quantitatively, dexmedetomidine resulted in longer block durations, lower pain scores in the early postoperative period, extended analgesia, and comparable mild adverse effects, supporting its efficacy and tolerability as a regional anesthetic adjuvant in perianal surgical procedures.

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