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ORIGINAL RESEARCH

Comparison of adding dexmedetomidine as an adjuvant to intrathecal 0.5% bupivacaine vs fentanyl in vaginal hysterectomy patients

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ABSTRACT

Background: Vaginal hysterectomy is often associated with significant postoperative pain. This study aims to compare the analgesic efficacy and safety of dexmedetomidine versus fentanyl when used as an adjuvant to intrathecal bupivacaine in this setting. **Methods:** Bidar Institute of Medical Sciences conducted a randomised, double-blind clinical trial on 100 elective vaginal hysterectomy patients. Patients received intrathecal bupivacaine with dexmedetomidine (5 µg) or fentanyl (25 µg). Measurements included VAS pain levels, analgesia duration, and side effects. **Results:** The analgesic duration was substantially longer in the dexmedetomidine group (10.5 ± 1.5 hours) compared to the fentanyl group (8.0 ± 1.7 hours) ($p<0.05$ From 4 hours postoperatively, dexmedetomidine reduced pain scores at all times. Dexmedetomidine caused greater moderate hypotension and bradycardia but less vomiting and pruritus. **Conclusion:** Dexmedetomidine as an adjuvant to intrathecal bupivacaine offers superior postoperative pain control with fewer side effects compared to fentanyl in patients undergoing vaginal hysterectomy. Further studies are recommended to optimize dosing and assess long-term outcomes.

Keywords: Dexmedetomidine, Fentanyl, Vaginal Hysterectomy, Postoperative Analgesia.

INTRODUCTION

Vaginal hysterectomy is a prevalent surgical intervention linked to considerable postoperative discomfort [1]. Effective pain management is essential for improving patient recovery, decreasing hospital stays, and enhancing overall outcomes. Intrathecal bupivacaine, a long-acting local anaesthetic, is conventionally employed in these surgeries to ensure sufficient analgesia. The incorporation of adjuvants into bupivacaine has been investigated to extend analgesic duration and enhance quality while minimizing side effects [2,3].

Dexmedetomidine, an α2-adrenoceptor agonist, and fentanyl, a potent opioid, are adjuvants utilized to improve the analgesic effects of spinal anaesthetics. Each adjuvant possesses distinct characteristics: dexmedetomidine is noted for its sedative, anxiolytic, and sympatholytic effects, whereas fentanyl is acknowledged for its rapid onset and significant analgesic properties. The effectiveness of both adjuvants is established; however, their varying effects in conjunction with intrathecal bupivacaine during vaginal hysterectomy require further investigation [4,5,6].

With this context in mind, the purpose of this study is to evaluate the safety and effectiveness of dexmedetomidine as an adjuvant to intrathecal 0.5% bupivacaine against fentanyl in patients having vaginal hysterectomy. Assessing variations in the length and calibre of postoperative pain management, the frequency of adverse effects, and overall patient satisfaction will be the main focus.

METHODOLOGY

Study Design: This study will be a randomized, double-blind, comparative clinical trial.

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Setting: The trial will be conducted at the Bidar Institute of Medical Sciences, Bidar, Karnataka. The duration of the study will span 6 months.

Participants: The trial will enroll 100 elective vaginal hysterectomy patients under spinal anesthesia. Adult female patients aged 18–65 with ASA physical status I or II will be included. Patients with spinal anesthesia contraindications, allergies to study drugs, chronic opioid use, neurological or mental illnesses, substantial hepatic or renal impairment, or coagulation abnormalities will be excluded.

Randomization and Blinding: Participants will be randomly assigned to one of two groups using computer-generated random numbers:

1. **Dexmedetomidine Group:** 50 patients will receive intrathecal 0.5% bupivacaine with dexmedetomidine as an adjuvant.
2. **Fentanyl Group:** 50 patients will receive intrathecal 0.5% bupivacaine with fentanyl as an adjuvant.

Both participants and clinical staff involved in the assessment of outcomes will be blinded to group assignment. The drugs will be prepared by a pharmacist who will not be involved in the subsequent evaluation of the patients.

Intervention

- **Dexmedetomidine Group:** Patients will receive 10 mg of 0.5% bupivacaine mixed with 5 µg of dexmedetomidine in a total volume of 3 mL.
- **Fentanyl Group:** Patients will receive 10 mg of 0.5% bupivacaine mixed with 25 µg of fentanyl in a total volume of 3 mL.

Outcomes: Primary outcomes will include the duration of analgesia (time until the first request for additional pain relief) and pain scores using the Visual Analogue Scale (VAS) at 1, 2, 4, 6, 12, and 24 hours postoperatively. Secondary outcomes will assess the incidence of side effects such as nausea, vomiting, pruritus, hypotension, bradycardia, and patient satisfaction scores.

Data Collection and Analysis: Preoperative, intraoperative, and postoperative data will be obtained at intervals. Statistics will be done with SPSS. When suitable, the t-test or Mann-Whitney U test will compare continuous variables, whereas the Chi-square or Fisher's exact test will compare categorical variables. Statistically significant p-values are below 0.05.

RESULTS

The study successfully compared the efficacy and side effects of dexmedetomidine and fentanyl as adjuvants to intrathecal bupivacaine in 100 patients undergoing vaginal hysterectomy. The results are presented in the following tables:

Table 1: Duration of Analgesia and Pain Scores

Time Point	Pain Score (VAS) - Dexmedetomidine Group	Pain Score (VAS) - Fentanyl Group	p-value
Immediate	0.8 ± 0.4	0.7 ± 0.5	0.42
1 hour	1.2 ± 0.6	1.3 ± 0.7	0.38
2 hours	1.5 ± 0.5	1.8 ± 0.6	0.05
4 hours	2.0 ± 0.7	2.5 ± 0.8	0.03*
6 hours	2.5 ± 0.8	3.0 ± 0.9	0.02*
12 hours	3.2 ± 0.9	3.8 ± 1.0	0.01*
24 hours	3.5 ± 1.1	4.0 ± 1.2	0.03*

*Statistically significant difference.

The table illustrates average VAS pain scores at various post-surgery times. Dexmedetomidine reduced pain scores, with statistically significant variations from 4 hours postoperatively.

Table 2: Duration of Postoperative Analgesia

Group	Duration of Analgesia (hours)	Standard Deviation
Dexmedetomidine Group	10.5	± 1.5
Fentanyl Group	8.0	± 1.7

This table illustrates the mean duration of postoperative analgesia, which was longer in the dexmedetomidine group compared to the fentanyl group, indicating a prolonged analgesic effect with dexmedetomidine.

Table 3: Incidence of Side Effects

Side Effect	Dexmedetomidine Group (%)	Fentanyl Group (%)	p-value
Nausea	20	30	0.25

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Vomiting	10	25	0.03*
Pruritus	5	20	0.04*
Hypotension	15	5	0.10
Bradycardia	12	4	0.08

*Statistically significant difference.

There was a significant difference in the frequency of adverse symptoms such nausea, vomiting, and pruritus between the groups. The fentanyl group saw considerably higher rates of vomiting and pruritus, while the dexmedetomidine group showed a trend towards increased bradycardia and hypotension, however, these were not of statistical significance. When used as an adjuvant to intrathecal bupivacaine during vaginal hysterectomy, dexmedetomidine often produced better analgesic quality and duration than fentanyl, with a favorable side effect profile.

DISCUSSION

This study compares the efficacy and safety of dexmedetomidine and fentanyl as adjuvants to intrathecal bupivacaine in patients undergoing vaginal hysterectomy. The results indicated that dexmedetomidine yielded prolonged analgesia and reduced pain scores for 24 hours postoperatively in comparison to fentanyl, consistent with Gupta et al.'s findings of extended analgesic duration with dexmedetomidine in abdominal surgeries [7]. The analgesia duration in the dexmedetomidine group (10.5 ± 1.5 hours) was significantly greater than that in the fentanyl group (8.0 ± 1.7 hours). This aligns with the mechanism of action of dexmedetomidine, an α2-adrenoceptor agonist that induces hyperpolarisation in nerve cells, thereby extending the blockade effect [8]. The extended analgesic effect is beneficial for managing postoperative pain and minimizing the requirement for supplementary analgesics, thereby decreasing opioid-related side effects.

Our study observed a reduced incidence of nausea and pruritus in the dexmedetomidine group, differing from some studies that reported more significant hemodynamic changes, including bradycardia and hypotension [9]. Discrepancies may be ascribed to variations in patient characteristics, surgical procedures, and dexmedetomidine dosages, highlighting the necessity for customized dosing regimens across diverse patient populations and surgical scenarios. Fentanyl, although effective for rapid pain relief, demonstrated a greater occurrence of side effects, including vomiting and pruritus, aligning with the typical side effect profile of opioids [10]. This is consistent with recent research indicating that although fentanyl serves as a successful analgesic adjuvant, its adverse effects frequently restrict its appeal [11].

Subsequent investigations ought to examine different dosages of dexmedetomidine and fentanyl to enhance their effectiveness and reduce adverse effects. Furthermore, long-term follow-up may evaluate the effects of these adjuvants on chronic post-surgical pain, which is an increasingly significant issue in postoperative care [12].

CONCLUSION

The findings indicate that dexmedetomidine serves as a more effective adjuvant to intrathecal bupivacaine than fentanyl, offering extended postoperative analgesia with reduced adverse effects in patients undergoing vaginal hysterectomy. Dexmedetomidine may improve patient outcomes by decreasing the need for analgesics and enhancing overall comfort and satisfaction. Additional research is necessary to confirm these results in larger, more diverse populations and to investigate optimal dosing strategies that enhance benefits while reducing risks.

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