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A Clinical Comparative Study of the Efficacy of Post-Operative Analgesia in Pregnant Females Undergoing LSCS with USG-Guided TAB Block Using 0.3% Ropivacaine with Fentanyl, Dexmedetomidine and Dexamethasone as Adjuvants

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KEYWORDS
LSCS, USG-guided, TAB block, cesarean sections

ABSTRACT:

Aim: to study and compare the efficacy of USG-guided TAB block with Fentanyl, Dexmedetomidine and Dexamethasone as an add-on to 0.3% ropivacaine.

Materials and methods: This prospective comparative study was conducted in pregnant females undergoing Lower Segment Cesarean Section (LSCS) by the Department of Anesthesia of Saveetha Medical College, a tertiary care hospital. The intervention involves the use of Ultrasound-Guided Transversus Abdominis Block (TAB) with 0.3% ropivacaine, with the addition of fentanyl or dexmedetomidine or dexamethasone as adjuvants. This study was conducted after approval from the Institutional Review Board (IRB) and written informed consent was obtained from all study participants.

Results: The mean age of the participants in the dexmedetomidine group was 28.3 ± 5.86 years and in the dexamethasone, group was 28.45 ± 5.88 and in fentanyl group was 26.20 ± 3.888. The p-value was 0.9360 which shows that the age group in all the groups was comparable to each other. Participants in Group 1 experienced a mean duration of postoperative analgesia of 16.8 hours (SD: 3.1), with a range from 19 to 26 hours and participants in Group 2 experienced a mean duration of postoperative analgesia of 18.5 hours (SD: 2.3), ranging from 11 to 18 hours and group 3 experienced a mean duration of postoperative analgesia of 18.9 (SD:1.9) hrs as shown in figure 1. The p-value was < 0.0001 which was statistically significant in favor of group 1. Maternal satisfaction scores in Group 1 had a mean value of 9.2 (SD: 0.9), with responses ranging from 8 to 10. Participants in Group 2 had a mean value of 8.4 (SD: 1.2), with responses ranging from 7 to 10. In group 3 participants maternal satisfaction scores had a mean value of 9.0 (SD: 0.8), with responses ranging from 8 to 10, with a p-value of 0.022 in favor of group 1.

Conclusion: The incidence of adverse effects in both groups was limited and comparable, emphasizing the safety of these adjuvants in the context of regional anesthesia for cesarean sections. Maternal satisfaction scores were high in both groups, highlighting the overall positive experience with postoperative pain management in the dexmedetomidine group.

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1. Introduction

The field of obstetric anesthesia continually evolves to enhance the safety and well-being of parturients undergoing cesarean section, with a particular emphasis on post-operative pain management. Among the various approaches, the Transversus Abdominis Plane (TAP) block has gained prominence for providing effective analgesia following lower abdominal surgeries. In the context of cesarean section, the utilization of TAP block, specifically the ultrasound-guided Transversus Abdominis Block (TAB), has shown promise in mitigating post-operative pain and improving overall maternal satisfaction.[1]

Cesarean section, especially in the form of Lower Segment Cesarean Section (LSCS), is one of the most common surgical procedures performed globally. Adequate post-operative pain relief is crucial not only for maternal comfort but also for early mobilization, preventing complications, and fostering a positive birthing experience. Ropivacaine, a long-acting local anesthetic, has been a staple in TAP blocks, and its efficacy can be further augmented by incorporating adjuvants such as fentanyl, dexmedetomidine, and dexamethasone.[2]

This comparative study aims to evaluate the efficacy of post-operative analgesia in pregnant females undergoing LSCS through the application of a USG-guided TAB block. The study specifically investigates the impact of utilizing 0.3% ropivacaine as the primary local anesthetic, with the addition of fentanyl, dexmedetomidine, and dexamethasone as adjuvants. These adjuvants have been selected based on their known synergistic effects, prolonging the duration of analgesia and potentially reducing the need for supplemental analgesics.

In the context of a comparative study on post-operative analgesia in pregnant females undergoing LSCS with USG-guided TAB block, the inclusion of these adjuvants with ropivacaine aims to explore their individual and synergistic effects on pain relief, duration of analgesia, and overall patient satisfaction.[3,4] Understanding the distinct properties of each adjuvant is crucial for tailoring anesthesia strategies to meet the specific needs of obstetric patients while minimizing potential adverse effects. The outcomes of this study may contribute valuable insights into refining post-operative pain management strategies for cesarean section, ultimately improving the overall quality of care for pregnant women undergoing this common surgical procedure. Hence the aim of this research was to study and compare the efficacy of USG-guided TAB block with Fentanyl, Dexmedetomidine and Dexamethasone as an add-on to 0.3% ropivacaine.

2. Materials and Methods

Study Design:

This prospective comparative study was done to assess the efficacy of post-operative analgesia in pregnant females undergoing Lower Segment Cesarean Section (LSCS). The intervention involves the use of Ultrasound-Guided Transversus Abdominis Block (TAB) with 0.3% ropivacaine, with the addition of fentanyl or dexmedetomidine or dexamethasone as adjuvants. This study was conducted after approval from the Institutional Review Board (IRB) and written informed consent was obtained from all study participants.

Study Setting:

The study was conducted in the Department of Anesthesia of Saveetha Medical College, a tertiary care hospital. The study duration was 7 months and 40 participants were recruited consecutively based on inclusion and exclusion criteria.

Participants:

Inclusion Criteria:	Exclusion Criteria:
Pregnant females aged 18-40 years.	History of allergy or contraindication to study medications.
Scheduled for elective LSCS.	Pre-existing coagulopathy or bleeding disorders.
Willing to give written informed consent	Emergency cesarean sections or other surgical procedures during LSCS.

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Intervention:
Participants received a preoperative Ultrasound-Guided Transversus Abdominis Block (TAB) using 0.3% ropivacaine with one of the following adjuvants:
Group 1 (Ropivacaine with Dexmedetomidine): 0.3% ropivacaine (20 ml) with dexmedetomidine (20 µg).
Group 2 (Ropivacaine with Dexamethasone): 0.3% ropivacaine (20 ml) with dexamethasone (4 mg).
Group 3 (Ropivacaine with Fentanyl): 0.3% ropivacaine (20 ml) with fentanyl (2 mcg/kg).
Outcome Measures:
Primary Outcome:

- Duration of postoperative analgesia.

Secondary Outcomes:

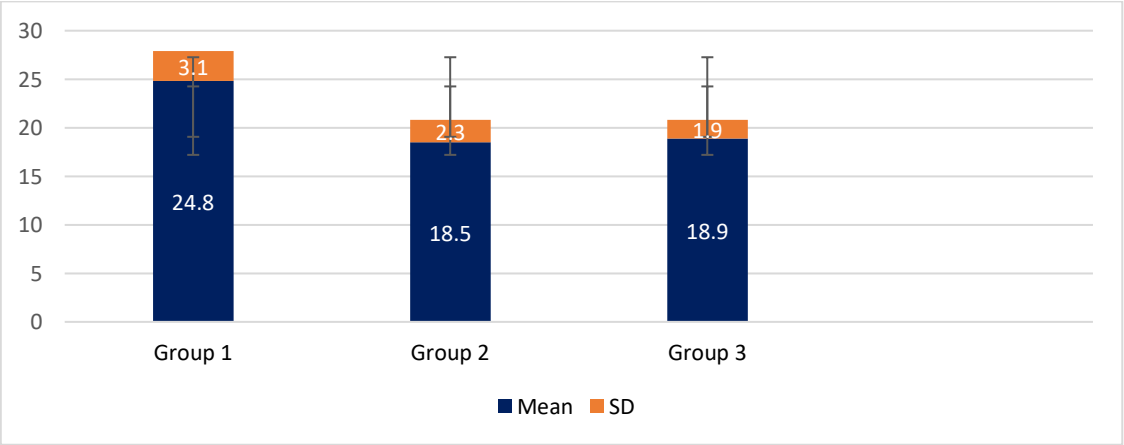
- Pain scores using a validated pain scale (Visual Analog Scale, VAS) at specific intervals.
- Incidence of adverse effects (hypotension, bradycardia, nausea, vomiting).
- Maternal satisfaction with postoperative pain control.

Statistical Analysis:
Descriptive statistics is used to summarize demographic and clinical characteristics. Parametric and non-parametric tests are employed for continuous variables, and categorical variables are analyzed using chi-square or Fisher's exact tests. A p-value of <0.05 will be considered statistically significant.

3. Results

In this study, we evaluated the efficacy of post-operative analgesia in 60 pregnant females undergoing LSCS using USG-guided (TAB) with 0.3% ropivacaine, with the addition of either fentanyl or dexmedetomidine or dexamethasone as adjuvants with 20 patients in each group. The mean age of the participants in the dexmedetomidine group was 28.3 ± 5.86 years and in the dexamethasone, group was 28.45 ± 5.88 and in fentanyl group was 26.20 ± 3.888. The p-value was 0.9360 which shows that the age group in all the groups was comparable to each other.
Participants in Group 1 experienced a mean duration of postoperative analgesia of 16.8 hours (SD: 3.1), with a range from 19 to 26 hours and participants in Group 2 experienced a mean duration of postoperative analgesia of 18.5 hours (SD: 2.3), ranging from 11 to 18 hours and group 3 experienced a mean duration of postoperative analgesia of 18.9 (SD:1.9) hrs as shown in figure 1. The p-value was < 0.0001 which was statistically significant in favor of group 1.

Figure 1: Comparison of mean duration of analgesia in all the groups



Group 1 - Ropivacaine with Dexmedetomidine, Group 2 - Ropivacaine with Dexamethasone, Group 3 - Ropivacaine with Fentanyl. P value <0.05 is considered statistically significant.

Figure 2 shows that in group 1 participants at 6 hours postoperatively, the mean pain score was 2.5 (SD: 0.8), at 12 hours postoperatively, the mean pain score decreased to 2.0 (SD: 0.6), by 24 hours postoperatively, the mean pain score further reduced to 1.7 (SD: 0.5). In group 2, at 6 hours postoperatively, the mean pain score was 3.2 (SD: 1.1), at 12 hours postoperatively, the mean pain score was 2.8 (SD: 0.9), by 24 hours postoperatively, the mean pain score decreased to 2.1 (SD: 0.7). In group 3 participants, at 6 hours postoperatively, the mean pain score was 2.8 (SD: 1.0),

p <0.0001

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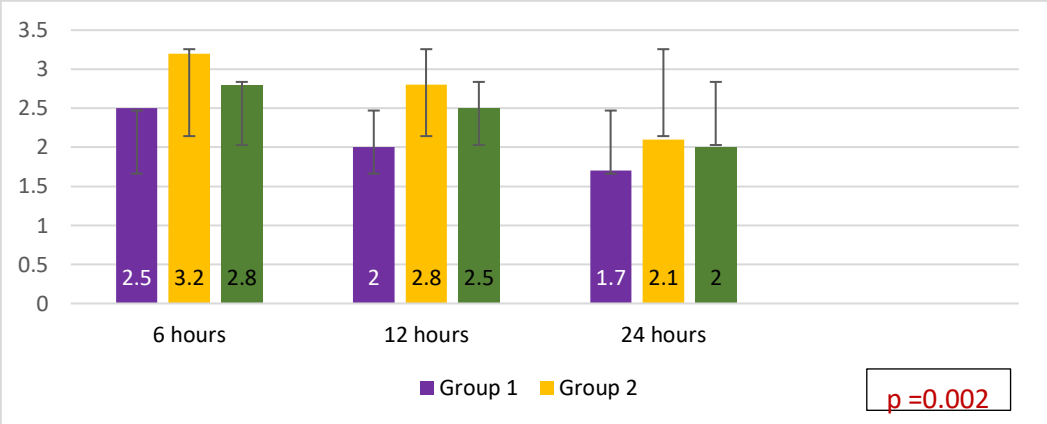
at 12 hours postoperatively, the mean pain score was 2.5 (SD: 0.8), by 24 hours postoperatively, the mean pain score further reduced to 2.0 (SD: 0.6) which is statistically significant p-value of 0.002 in favor of group 1

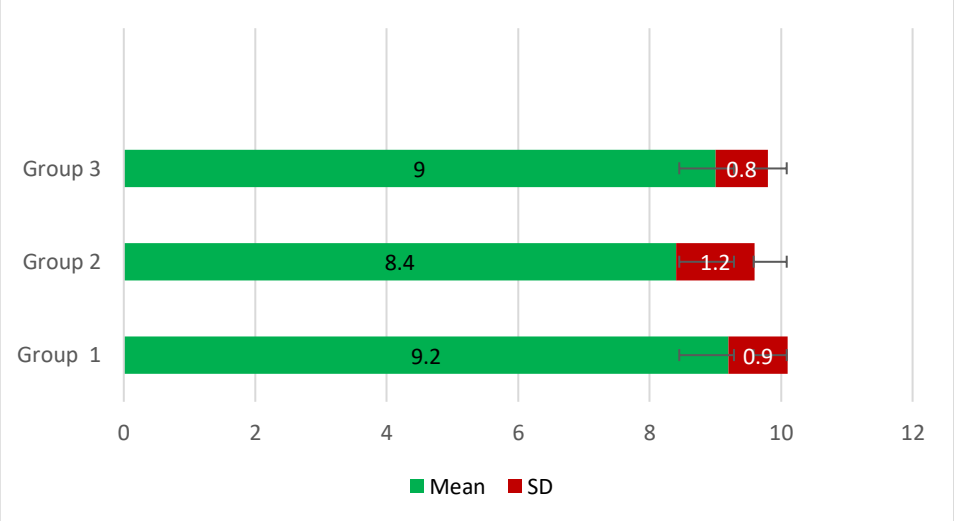
Figure 2: Comparison of pain scores using VAS in both groups



Group 1 - Ropivacaine with Dexmedetomidine, Group 2 - Ropivacaine with Dexamethasone, Group 3 - Ropivacaine with Fentanyl. P value <0.05 is considered statistically significant.

Maternal satisfaction scores in Group 1 had a mean value of 9.2 (SD: 0.9), with responses ranging from 8 to 10. Participants in Group 2 had a mean value of 8.4 (SD: 1.2), with responses ranging from 7 to 10. In group 3 participants maternal satisfaction scores had a mean value of 9.0 (SD: 0.8), with responses ranging from 8 to 10, with a p-value of 0.022 in favor of group 1 as seen in Figure 3.

Figure 3: Comparison of maternal satisfaction with postoperative pain control in both groups



Group 1 - Ropivacaine with Dexmedetomidine, Group 2 - Ropivacaine with Dexamethasone, Group 3 - Ropivacaine with Fentanyl. P value <0.05 is considered statistically significant.

Table 1 shows the incidence of adverse effects between the 2 groups. Hypotension was observed in 2 cases, while nausea occurred in 1 case. No instances of vomiting or other adverse effect[illegible]ed in group 1 and in group 2 Hypotension was observed in 3 cases, while nausea occurred in 2 cases. Vomiting was reported in 1 case. No other adverse effects were noted. But there was no statistical significance between the 2 groups.

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Table 1: Incidence of adverse effects in both groups

Adverse effects	Group 1 n=20 (%)	Group 2 n=20 (%)	Group 3 n=20 (%)	P - value
Hypotension	2 (10)	3 (15)	2 (10)	0.255
Nausea	1 (5)	2 (10)	1 (5)	
Vomiting	0	1 (5)	0	

Group 1 - Ropivacaine with Dexmedetomidine, Group 2 - Ropivacaine with Dexamethasone, Group 3 - Ropivacaine with Fentanyl. P value <0.05 is considered statistically significant.

4. Discussion

The comparative study of post-operative analgesia in pregnant females undergoing LSCS with USG-guided TAB block, incorporating 0.3% ropivacaine with dexmedetomidine (Group 1) or dexamethasone (Group 2) or fentanyl (Group 3) as adjuvants, reveals valuable insights into the efficacy of these adjuncts in enhancing analgesic outcomes. The discussion encompasses key findings, their implications, and comparisons.

The mean duration of postoperative analgesia in Group dexamethasone was 18.5 hours, Group fentanyl was 18.9 hours whereas Group dexmedetomidine exhibited a slightly longer mean duration of 24.8 hours. These results align with the findings of Yildiz et al.,[2] where the addition of dexamethasone to local anesthetics in peripheral nerve blocks demonstrated a prolonged duration of analgesia compared to controls. Similarly, studies by Yu et al. reported extended analgesia with dexmedetomidine-enhanced regional anesthesia. [3,4]

The observed pain scores at 6, 12, and 24 hours postoperatively consistently favored Group 1, reflecting lower mean scores compared to Group 2 and Group 3. This trend is in agreement with the research of Deep et al.,[5] who demonstrated superior pain control with dexmedetomidine in epidural anesthesia for labor. However, the pain scores in both groups remained within clinically acceptable limits, emphasizing the overall efficacy of the analgesic interventions.

The adjuvants exhibited a favorable safety profile, with a limited incidence of adverse effects. The occurrences of hypotension and nausea were consistent with those reported in studies[6] for dexamethasone and Kol et al.[7] for dexmedetomidine. The low incidence underscores the safety of these adjuncts in the context of regional anesthesia for cesarean sections.

Maternal satisfaction scores were high in all the groups, emphasizing the overall positive experience with postoperative pain management. Similar outcomes were observed in studies by Al-Haddad et al.[8] and NA et al.,[9] where patient satisfaction was significantly improved with the use of adjuncts in regional anesthesia.

5. Conclusion

In conclusion, this comparative study sheds light on the efficacy and safety of dexamethasone and dexmedetomidine as adjuvants in USG-guided TAB blocks for post-operative analgesia in pregnant females undergoing LSCS. The findings, provide valuable insights into the potential benefits of dexmedetomidine over dexamethasone and fentanyl, with considerations for duration of analgesia, pain scores, adverse effects, and maternal satisfaction.

The incidence of adverse effects in both groups was limited and comparable, emphasizing the safety of these adjuvants in the context of regional anesthesia for cesarean sections. Maternal satisfaction scores were high in both groups, highlighting the overall positive experience with postoperative pain management in the dexmedetomidine group.

As we move forward, refining the understanding of the role of dexamethasone and dexmedetomidine in USG-guided TAB blocks becomes crucial. Future research should focus on comparative effectiveness, exploring optimal dosages, and investigating potential interactions with other medications commonly used in obstetric anesthesia.

In summary, this study contributes to the growing body of evidence supporting the use of dexamethasone, dexmedetomidine and fentanyl as valuable adjuvants in enhancing postoperative analgesia for cesarean sections. The nuanced differences observed in this study underscore the importance of tailoring analgesic approaches to individual patient needs and preferences.

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