ORIGINAL ARTICLE ASIAN JOURNAL OF MEDICAL SCIENCES

Comparative study of dexamethasone versus dexmedetomidine as adjuvants to 0.25% bupivacaine in transversus abdominis plane block for post-operative analgesia in lower segment cesarean section

Padma Amar Vishal[1], Srikar Madugula[2], Bhavani P[3]

[1]Professor and Head, [2]Postgraduate Resident, [3]Assistant Professor, Department of Anaesthesiology, Konaseema Institute of Medical Sciences and Research Foundation, Amalapuram, Andhra Pradesh, India

Submission: 15-03-2025 Revision: 24-04-2025 Publication: 01-06-2025

ABSTRACT

Background: Effective post-operative pain management is essential for patient comfort and recovery after a lower segment cesarean section (LSCS). **Aims and Objectives:** This study compares dexamethasone and dexmedetomidine as adjuvants to 0.25% bupivacaine in TAP block for post-operative analgesia after LSCS. The objectives are to assess analgesia duration in both groups, compare pain intensity using Visual Analog Scale (VAS) scores at multiple intervals, evaluate rescue analgesia consumption within 48 h, and analyze patient satisfaction with analgesia. **Materials and Methods:** A randomized, single-blinded study included 60 parturients (American Society of Anesthesiologists) undergoing LSCS under spinal anesthesia. They were randomized into: Group DEXA: 0.25% bupivacaine (40 mL) + 8 mg dexamethasone, Group DEXMED: 0.25% bupivacaine (40 mL) + 1 mcg/kg dexmedetomidine. Pain was assessed using VAS at 0, 2, 4, 6, 12, 18, 24, 36, and 48 h. Total analgesia duration, rescue analgesic use, and patient satisfaction were recorded. Statistical analysis used SPSS 2021 ($P<0.05$ significant). **Results:** Analgesic duration was significantly longer in DEXMED (24.39 ± 4.14 h) vs. DEXA (15.43 ± 2.81 h, $P=0.0001$). VAS scores were significantly lower in DEXMED at 6, 12, 18, 24, and 36 h ($P<0.0001$). Rescue analgesia use was lower in DEXMED ($P=0.0001$). Patient satisfaction was slightly higher in DEXMED ($P=0.337$). **Conclusion:** Dexmedetomidine provides prolonged analgesia, lower pain scores, and reduced analgesic consumption, making it a superior adjuvant to bupivacaine in TAP block for LSCS pain management.

Key words: Post-operative analgesia; Transversus abdominis plane block; Dexamethasone; dexmedetomidine; Cesarean section; Bupivacaine; Regional anesthesia

Access this article online

Website: https://ajmsjournal.info/index.php/AJMS/index

DOI: 10.71152/ajms.v16i6.4523

E-ISSN: 2091-0576

P-ISSN: 2467-9100

INTRODUCTION

Effective post-operative pain management is crucial in improving patient recovery and comfort after a lower segment cesarean section (LSCS). Inadequate pain control may lead to increased maternal stress, delayed ambulation, prolonged hospital stays, and impaired bonding with the newborn.[1,2] Regional anesthesia techniques, particularly the transversus abdominis plane (TAP) block, have gained attention as effective strategies for post-operative analgesia in LSCS. TAP block, when combined with local anesthetics, reduces

Address for Correspondence:
Dr. Srikar Madugula, Postgraduate Resident, Department of Anaesthesiology, Konaseema Institute of Medical Sciences and Research Foundation, Amalapuram, Andhra Pradesh, India. **Mobile:** +91-7816052842. **E-mail:** sreekarmadugula1997@gmail.com

opioid consumption and provides prolonged pain relief with minimal systemic side effects.[3,4]

Bupivacaine, a long-acting amide local anesthetic, is widely used in TAP blocks for post-operative analgesia.[5] However, to extend its analgesic duration and enhance efficacy, adjuvants such as dexamethasone and dexmedetomidine are often co-administered.[6] Dexamethasone, a corticosteroid, is known for its anti-inflammatory and prolonged analgesic effects.[7] Meanwhile, dexmedetomidine, a selective α2-adrenergic agonist, provides sedation, analgesia, and opioid-sparing effects by modulating pain pathways.

The existing studies[8,9] comparing dexamethasone and dexmedetomidine as adjuvants to local anesthetics in TAP blocks have provided valuable insights into their efficacy for post-operative analgesia in various surgical procedures. However, despite their widespread use, a comprehensive analysis of their comparative effectiveness in the context of LSCS remains limited. While several studies, such as those by Singla et al.,[8] and Sobhy et al.,[9] have evaluated these drugs in TAP blocks for different abdominal surgeries, there is a need for further study to determine the optimal adjuvant for LSCS, where patient-specific factors and surgical nuances may influence analgesic requirements. This study aims to bridge this gap, offering a clearer understanding of the comparative analgesic efficacy of dexamethasone and dexmedetomidine as adjuvants to bupivacaine in TAP blocks for LSCS.

This study aims to compare the effects of dexamethasone and dexmedetomidine as adjuvants to 0.25% Bupivacaine in TAP Block for post-operative analgesia in patients undergoing LSCS.

The primary objective is to evaluate the duration of analgesia provided by each adjuvant, as assessed through Visual Analog Scale (VAS) scores at various post-operative intervals. Additionally, the study will measure the amount of rescue analgesia required within the first 48 h after surgery. Patient satisfaction regarding the pain relief provided will also be evaluated, to assess the overall efficacy of Dexamethasone and Dexmedetomidine as adjuncts in post-operative pain management.

Aims and objectives

- This study aims to compare the effects of dexamethasone and dexmedetomidine as adjuvants to 0.25% Bupivacaine in TAP Block for post-operative analgesia in patients undergoing LSCS.
- The primary objective is to evaluate the duration of analgesia provided by each adjuvant, as assessed through Visual Analog Scale (VAS) scores at various post-operative intervals. Additionally, the study will measure the amount of rescue analgesia required within the first 48 h after surgery. Patient satisfaction regarding the pain relief provided will also be evaluated, to assess the overall efficacy of Dexamethasone and Dexmedetomidine as adjuncts in post-operative pain management.

MATERIALS AND METHODS

This study was designed as a prospective, randomized, single-blinded trial conducted at the Konaseema Institute of Medical Sciences and Research Foundation (KIMS and RF), Amalapuram, and Ramachandrapuram Area Hospital, Andhra Pradesh, India, from April 2024 to August 2024.

Sample size calculation

Considering the caseload in the hospital and the feasibility use, a convenient sampling was done to include 60 patients for the present study.

Inclusion criteria

Patients aged 18–40 years with American Society of Anesthesiologists physical status I-II undergoing elective LSCS via the Pfannenstiel incision under spinal anesthesia. Patients willing to provide informed consent were recruited for the present study.

Exclusion criteria

History of opioid use, hypersensitivity to drugs used in the study, or local anaesthetic allergy. Significant renal, cardiovascular, or hepatic disorders. Contraindications to regional anaesthesia (e.g., coagulopathy, infection at the injection site).

Participants were randomly assigned into two groups (n=30 each) using computer-generated random numbers. The study was single-blinded, where the patients were unaware of group allocation.

All patients received subarachnoid anesthesia with 0.5% hyperbaric bupivacaine. After surgery, an ultrasound-guided TAP block was performed bilaterally under sterile conditions using a linear probe ultrasound and a 22G Quincke needle. Patients were allocated into two groups:

Group DEXA (n=30): Received 0.25% bupivacaine (40 mL)+8 mg dexamethasone (2 mL) (21 mL injected per side).

Group DEXMED (n=30): Received 0.25% bupivacaine (40 mL)+1 mcg/kg dexmedetomidine (diluted to 2 mL) (21 mL injected per side).

Outcome measures

Primary outcomes

Duration of postoperative analgesia, defined as the time from TAP block administration to the patient's first request for analgesia.

Post-operative pain intensity was assessed using the VAS at 0, 2, 4, 6, 12, 18, 24, 36, and 48 h.

Secondary outcomes

Total rescue analgesic consumption (diclofenac) over 48 h.

Patient satisfaction is recorded on a five-point scale (1–5).

Rescue analgesia

Post-operative analgesia was managed with intravenous diclofenac (75 mg) as needed if VAS ≥4. The total number of doses required within 48 h was recorded.

Statistical analysis

Data were entered into Microsoft Excel and analyzed using SPSS Version 2021. Quantitative variables (e.g., pain scores, duration of analgesia) were presented as mean±standard deviation and compared using an independent t-test. Qualitative variables (e.g., patient satisfaction) were analyzed using the Chi-square test. A $P<0.05$ was considered statistically significant.

Ethical considerations

Ethical clearance was obtained from the Institutional Ethics Committee (IEC/PR/2021), Konaseema Institute of Medical Sciences and Research Foundation (KIMS and RF), Amalapuram, and informed written consent was obtained from all participants. Participants could withdraw anytime without consequences.

RESULTS

The demographic parameters, including age, weight, height, and Body mass index (BMI), were comparable between the two groups, with no statistically significant differences except for BMI, which was slightly higher in the DEXMED group (26.823±3.4704) than in the DEXA group (25.683±3.0278, P=0.034) (Table 1).

Table 1: Demographic data

Parameters	DEXA group (Mean±SD)	DEXMED group (Mean±SD)	P-values
Age (years)	24.633±2.5391	24.80±3.960	0.847
Weight (kg)	62.967±7.2277	63.73±6.220	0.661
Height (cm)	157.433±3.3081	155.57±3.360	0.661
BMI	25.683±3.0278	26.823±3.4704	0.034

BMI: Body mass index

Post-operative pain was assessed using the VAS at multiple time points. At 2 h postoperatively, both groups reported a VAS score of 0, indicating effective pain relief. At 4 h, there was no significant difference in pain scores between the groups (P=0.656). However, from 6 h postoperatively onward, the DEXMED group exhibited significantly lower pain scores compared to the DEXA group. At 6 h, the VAS score was significantly lower in the DEXMED group (0.4±1.522) than in the DEXA group (2±0.9097, P=0.0001). Similar trends were observed at 12, 18, 24, and 36 h postoperatively, with statistically significant differences favoring dexmedetomidine (Table 2). By 48 h, the VAS scores in both groups returned to 0, indicating complete resolution of pain.

The total number of rescue analgesia doses required within 48 h was significantly lower in the DEXMED group (1±0.947) compared to the DEXA group (2.2±0.4842, P=0.0001) (Table 3).

No rescue analgesia was required in either group during the first 2–4 h postoperatively. At 6 h, both groups required

Table 2: Post-operative pain scores (VAS)

Time (hours)	DEXA group (Mean±SD)	DEXMED group (Mean±SD)	P-values
2	0	0	-
4	0.67±0.3651	0.13±0.730	0.656
6	2±0.9097	0.4±1.522	0.0001
12	2.533±1.4794	0.4±1.522	0.0001
18	7.667±1.1842	1.27±1.701	0.0001
24	6.4±0.9685	2.73±2.599	0.0001
36	1.867±0.7303	3.8±2.592	0.0001
48	0	0	-

VAS: Visual Analog Scale

Table 3: Rescue analgesia requirement

Time post-operative (hours)	DEXA group (Mean±SD)	DEXMED group (Mean±SD)	P-values
2	0	0	-
4	0	0	-
6	0.33±0.1826	0.3±0.183	1
12	0.1±0.3051	0.7±0.365	0.033
18	1.033±0.1826	0.07±0.254	0.0001
24	1±0	0.27±0.450	0.0001
36	0	0.60±0.498	0.0001
48	0	0	-

Table 4: Total duration of block and analgesia requirements

Parameters	DEXA group (Mean±SD)	DEXMED group (Mean±SD)	P-values
Total duration of block (hours)	15.432±2.809	24.386±4.136	0.0001
No. of rescue analgesics doses (48 h)	2.2±0.4842	1±0.947	0.0001

Table 5: Comparison of patient satisfaction scores

Parameters	DEXA group (Mean±SD)	DEXMED group (Mean±SD)	P-values
Patient satisfaction score	3.7±0.7497	3.87±0.571	0.337

similar doses (P=1). However, at 12 h, the DEXMED group required significantly fewer doses (0.7±0.365 vs. 0.1±0.3051, P=0.033). The most significant difference was noted at 18 and 24 h, where the DEXA group required a higher number of doses compared to the DEXMED group (P<0.0001). By 36 h, the DEXMED group still required minimal analgesia, whereas the DEXA group required none.

The total duration of the analgesic effect was significantly prolonged in the DEXMED group, with an average duration of 24.386±4.136 h compared to 15.432±2.809 h in the DEXA group (P=0.0001) (Table 4). This extended analgesic effect is consistent with the observed lower VAS scores and reduced need for rescue analgesia in the DEXMED group.

Patient satisfaction was assessed using a five-point scale, with higher scores indicating greater satisfaction. Both groups reported high satisfaction levels, with the DEXMED group scoring slightly higher (3.87±0.571) than the DEXA group (3.7±0.7497), although this difference was not statistically significant (P=0.337) (Table 5).

DISCUSSION

Effective post-operative pain management is crucial for enhanced recovery following LSCS. This study compared dexamethasone and dexmedetomidine as adjuvants to 0.25% bupivacaine in ultrasound-guided TAP block and demonstrated that dexmedetomidine provided superior and prolonged analgesia.

The primary outcome – the duration of analgesia – was significantly longer in the DEXMED group (24.39±4.14 h) compared to the DEXA group (15.43±2.81 h, P=0.0001). This prolonged effect is attributed to dexmedetomidine's α2-adrenergic agonist activity, which enhances the antinociceptive effects of local anesthetics by reducing neuronal excitability and increasing hyperpolarization at pain pathways (Madangopal et al.,[10] 2020).

Pain scores (VAS) were significantly lower in the DEXMED group at 6, 12, 18, 24, and 36 h (P<0.0001) compared to the DEXA group, consistent with prior studies demonstrating that dexmedetomidine prolongs the duration of nerve blocks and reduces pain intensity more effectively than corticosteroids (Sinha et al.,[11] 2023; Urfalı et al.,[12] 2024).

The DEXMED group required significantly fewer doses of rescue analgesia (P=0.0001), reinforcing its superior analgesic efficacy. The opioid-sparing effect of dexmedetomidine is well-documented, as it acts on central α2 receptors to enhance analgesia and reduce systemic analgesic requirements (Alsultan,[13] 2024). Studies have reported that dexmedetomidine reduces post-operative opioid use, making it a valuable alternative to dexamethasone (Garg et al.,[14] 2021).

Patient satisfaction was slightly higher in the DEXMED group (3.87±0.571) compared to the DEXA group (3.7±0.7497), though not statistically significant (P=0.337). Higher satisfaction in the DEXMED group is likely due to prolonged pain relief, reduced need for additional analgesia, and better overall comfort.

The findings of this study align with previous research showing that dexmedetomidine is superior to dexamethasone as an adjuvant in regional anesthesia. Studies comparing dexmedetomidine with dexamethasone in nerve blocks have reported longer analgesic duration, lower pain scores, and reduced post-operative analgesic consumption with dexmedetomidine (Gao et al[15]., 2019; Urfalı et al[10]., 2024). However, dexamethasone, while effective, primarily acts through anti-inflammatory mechanisms, and its analgesic duration is generally shorter.

Limitations of the study

The anesthetist was aware of group allocation, which may introduce bias. A larger population could strengthen the generalizability of findings. The study focused on 48-h post-operative pain outcomes, and longer follow-up would provide insight into extended analgesic effects.

CONCLUSION

Dexmedetomidine group exhibited a significantly longer duration of analgesia, lower VAS scores at multiple post-operative intervals, and reduced rescue analgesia consumption compared to the dexamethasone group. Although patient satisfaction was slightly higher in the dexmedetomidine group, the difference was not statistically significant.

ACKNOWLEDGMENT

The authors would like to extend their sincere gratitude to the staff of the Department of Anaesthesiology at Konaseema Institute of Medical Sciences and Research Foundation for

their valuable support and cooperation throughout the study. Their dedication and professionalism were instrumental in the successful completion of this research.

REFERENCES

1. Jain N, Rathee R, Jain K, Garg DK, Patodi V and Khare A. Post-operative analgesic efficacy of 0.25% ropivacaine with dexmedetomidine versus dexamethasone as an adjuvant in bilateral superficial cervical plexus block for thyroidectomy under general anaesthesia - a comparative randomized clinical study. Indian J Anaesth. 2023;67(3):269-276.
   https://doi.org/10.4103/ija.ija-272-22
2. Abu El Hassan SH, Wahsh EA, Mousa AM, Ibrahim AR and Mohammed EL. Comparative study between dexmedetomidine with bupivacaine and bupivacaine alone in erector spinae plane block for postoperative pain control of posterior lumbosacral spine fixation surgeries: A randomized controlled trial. Drug Des Devel Ther. 2024;18:351-363.
   https://doi.org/10.2147/DDDT.S444485
3. Shambhavi T, Das S, Senapati LK and Padhi PP. Comparative evaluation of bupivacaine with magnesium sulphate and dexamethasone as adjuvants in ultrasound-guided transversus abdominis plane block for open unilateral inguinal hernia surgeries: A randomised controlled trial. Indian J Anaesth. 2023;67(4):370-375.
   https://doi.org/10.4103/ija.ija-1091-21
4. Kassim DY, Mahmoud HE, Fakhry DM and Mansour MA. Comparative study of dexmedetomidine versus fentanyl as adjuvants to bupivacaine in ultrasound-guided transversus abdominis plane block in patients undergoing radical cystectomy: A prospective randomised study. BMC Anesthesiol. 2022;22(1):340.
   https://doi.org/10.1186/s12871-022-01877-1
5. Mazy A, Gad M and Bedairy M. Preperitoneal postcesarean section bupivacaine analgesia: Comparison between dexamethasone and dexmedetomidine as adjuvants. Saudi J Anaesth. 2018;12(2):183-189.
   https://doi.org/10.4103/sja.SJA-450-17
6. Pan W, Liu G, Li T, Sun Q, Jiang M, Liu G, et al. Dexmedetomidine combined with ropivacaine in ultrasound-guided tranversus abdominis plane block improves postoperative analgesia and recovery following laparoscopic colectomy. Exp Ther Med. 2020;19(4):2535-2542.
   https://doi.org/10.3892/etm.2020.8508
7. Pehora C, Pearson AM, Kaushal A, Crawford MW and Johnston B. Dexamethasone as an adjuvant to peripheral nerve block. Cochrane Database Syst Rev. 2017;11(11):CD011770.
   https://doi.org/10.1002/14651858.CD011770
8. Singla N, Garg K, Jain R, Malhotra A, Singh MR and Grewal A. Analgesic efficacy of dexamethasone versus dexmedetomidine as an adjuvant to ropivacaine in ultrasound-guided transversus abdominis plane block for post-operative pain relief in caesarean section: A prospective randomised controlled study. Indian J Anaesth. 2021;65(Suppl 3):S121-S126.
   https://doi.org/10.4103/ija.IJA-228-21
9. Sobhy YS, Gadalla RR, Nofal WH, Saleh MA and bdou KM. A comparative study between the use of dexmedetomidine vs. dexamethasone as adjuvants to bupivacaine in ultrasound-guided transversus abdominis plane block for postoperative pain relief in patients undergoing lower abdominal surgeries. Anaesth pain intensive care. 2022;26(5):681-688.
   https://doi.org/10.35975/apic.v26i5.2031
10. Madangopal RM, Dang A, Aggarwal M and Kumar J. A comparative evaluation of different doses of dexmedetomidine as an adjuvant to bupivacaine in transversus abdominis plane block for postoperative analgesia in unilateral inguinal hernioplasty. J Anaesthesiol Clin Pharmacol. 2020;36(3):398-406.
    https://doi.org/10.4103/joacp.JOACP-26-19
11. Sinha J, Pokhriyal AS, Asthana V and Nautiyal R. Dexmedetomidine vs dexamethasone as an adjuvant to levobupivacaine in ultrasound-guided transversus abdominis plane block for postoperative analgesia in patients undergoing total abdominal hysterectomies. Anesth Pain Med. 2023;13(6):e142059.
    https://doi.org/10.5812/aapm-142059
12. Urfalı S, Hakimoğlu S, Turhanoğlu S and Koyuncu O. Transversus abdominis plane block following cesarean section: A prospective randomized controlled study comparing the effects on pain levels of bupivacaine, bupivacaine + dexmedetomidine, and bupivacaine + dexamethasone. J Clin Med. 2024;13(14):4270.
    https://doi.org/10.3390/jcm13144270
13. Alsultan D. Efficacy of dexmedetomidine as an adjuvant in transverse abdominal plane blocks for cesarean section pain management: A systematic review and meta-analysis. Saudi J Anaesth. 2024;18(4):545-555.
    https://doi.org/10.4103/sja.sja-306-24
14. Garg K, Bhardwaj N, Yaddanapudi S, Sen IM, Mathew PJ and Kanojia RP. Efficacy of dexmedetomidine as an adjunct to ropivacaine in transversus abdominis plane block for paediatric laparoscopic surgeries: A double-blinded randomised trial. Indian J Anaesth. 2021;65(Suppl 1):S27-S33.
    https://doi.org/10.4103/ija.IJA-1207-20
15. Gao Z, Xiao Y, Wang Q and Li Y. Comparison of dexmedetomidine and dexamethasone as adjuvant for ropivacaine in ultrasound-guided erector spinae plane block for video-assisted thoracoscopic lobectomy surgery: A randomized, double-blind, placebo-controlled trial. Ann Transl Med. 2019;7(22):668.
    https://doi.org/10.21037/atm.2019.10.74

Authors' Contributions:
PAV- Concept and design of the study, results interpretation, review of literature and preparing first draft of manuscript. Statistical analysis and interpretation, revision of manuscript; **SM**- Concept and design of the study, results interpretation, review of literature and preparing first draft of manuscript, revision of manuscript; **BP**- Review of literature and preparing first draft of manuscript. Statistical analysis and interpretation.

Work Attributed to:
Konaseema Institute of Medical Sciences and Research Foundation, Amalapuram, Andhra Pradesh, India.

Orcid ID:
Padma Amar Vishal - https://orcid.org/0009-0008-5976-5565
Srikar Madugula - https://orcid.org/0009-0006-5554-3143
Bhavani P - https://orcid.org/0009-0006-7985-3648

Source of Support: Nil, **Conflicts of Interest:** None declared.