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Original Research Article

Magnesium Sulphate Versus Dexmedetomidine as Adjuvant to Bupivacaine in USG Guided Transversus Abdominis Plane Block for Post Operative Analgesia in Patients Undergoing LSCS Under LSAB

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Abstract:

Background: In order to minimise opioid-related side effects and promote early ambulation, mother comfort, and recovery after LSCS (Lower Segment Caesarean Section), effective postoperative pain management is crucial. An efficient localised analgesic method for postoperative pain management is ultrasound-guided TAP (Transversus Abdominis Plane) block. The addition of adjuvants such as dexmedetomidine or magnesium sulphate to bupivacaine may prolong analgesia and improve pain control.

Methods: A comparative observational study was conducted in the Department of Anaesthesia, Government Medical College, Thrissur, Kerala, involving 70 women undergoing elective LSCS under spinal anaesthesia. Following surgery, patients received a bilateral ultrasound-guided TAP block with bupivacaine combined either with dexmedetomidine (n=35) or magnesium sulphate (n=35). Pain intensity was assessed using the VAS (Visual Analogue Scale) at 1, 2, 4, 6, 12, and 24 hours postoperatively. Duration of analgesia, haemodynamic parameters, sedation scores, postoperative nausea and vomiting, and other adverse effects were evaluated. Statistical analysis was performed using appropriate analytical methods.

Results: In terms of ASA physical status and demographic traits, the two groups were similar. At 6, 12, and 24 hours after surgery, the dexmedetomidine group had significantly reduced VAS pain levels. The mean duration of analgesia was significantly longer with dexmedetomidine (11.79 ± 1.34 hours) than with magnesium sulphate (6.89 ± 1.21 hours). Heart rate and mean arterial pressure showed statistically significant differences at selected postoperative intervals; however, no intervention was required. Sedation scores were higher with dexmedetomidine at 6, 12, and 24 hours, while no significant differences in postoperative nausea, vomiting, or other adverse effects were observed between the groups.

Conclusion: Both dexmedetomidine and magnesium sulphate are safe and effective adjuvants to bupivacaine for ultrasound-guided TAP block after LSCS. However, dexmedetomidine provides significantly longer postoperative analgesia, superior pain relief, and acceptable haemodynamic stability without increasing adverse effects, making it the preferred adjuvant for postoperative analgesia in LSCS patients.

Keywords: Caesarean Section, Transversus Abdominis Plane Block, Dexmedetomidine, Magnesium Sulphate, Bupivacaine, Postoperative Analgesia, Ultrasound-Guided TAP Block.

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Introduction

A lower segment caesarean section performed through a transverse lower abdominal incision is associated with significant postoperative pain, particularly during the first 48 hours after surgery. The pain is predominantly somatic in origin, arising from the abdominal wall incision, and necessitates an effective postoperative analgesic regimen. Inadequate pain control can result in considerable maternal discomfort, delayed ambulation, impaired mother–infant bonding, prolonged hospital stay, and increased risk of complications such as thromboembolism, pulmonary dysfunction, and delayed recovery. Opioids are still a crucial part of multimodal analgesia, but their usage is frequently restricted by side effects as drowsiness, nausea, vomiting, pruritus, respiratory depression, and delayed mobility. Consequently, there is increasing interest in regional anaesthetic techniques that

provide effective analgesia while minimising opioid consumption.

An efficient localised analgesic method for postoperative pain management after LSCS is the TAP (Transversus Abdominis Plane) block. The TAP block, which was first reported by Rafi in 2001, entails applying local anaesthetic in the fascial plane between the transversus abdominis and internal oblique muscles. The thoracolumbar nerves that supply the anterolateral abdominal wall are located in this plane. These nerves include the ilioinguinal and iliohypogastric nerves, the intercostal nerves (T6–T11), and the subcostal nerve (T12). By enabling real-time visualisation of anatomical features, lowering complications, and increasing block success, ultrasound guiding has greatly increased the safety and precision of TAP block.

The pharmacological action of the local anaesthetic limits how long TAP block can offer analgesia, notwithstanding its effectiveness. A highly selective α2-adrenergic receptor agonist, dexmedetomidine has sedative, analgesic, sympatholytic, and anesthetic-sparing effects. It increases postoperative analgesia and extends the duration of sensory blocking when administered in conjunction with local anaesthetics in peripheral nerve blocks. Another possible adjuvant, magnesium sulphate, reduces central sensitisation to pain by mainly inhibiting NMDA (N-Methyl-D-Aspartate) receptors and controlling calcium input into cells.

Aims and Objectives: In order to provide postoperative analgesia for patients having LSCS, the current study compares magnesium sulphate and dexmedetomidine as adjuvants to bupivacaine in ultrasound-guided TAP block. By comparing postoperative pain assessments at 1, 2, 4, 6, 12, and 24 hours; the length of analgesia; haemodynamic parameters (HR, NIBP, and MAP); and the frequency of side effects, such as sedation and PONV (Postoperative Nausea and Vomiting), the study assesses the effectiveness of both adjuvants.

Materials and Methods

Study Design: This comparative study was conducted in the Department of Anaesthesiology, Government Medical College, Thrissur, Kerala**.** The study population comprised patients undergoing elective LSCS who fulfilled the eligibility criteria. Eligible participants were consecutively enrolled after obtaining informed consent, and relevant demographic, clinical, and perioperative details were collected prospectively using a predesigned proforma by the investigators and resident doctors.

Inclusion and Exclusion Criteria: Patients between the ages of 18 and 30 who were scheduled for elective LSCS under LSAB (Lower Spinal Anaesthesia) and had a BMI (Body Mass Index) of less than 25 kg/m² and were classified as ASA (American Society of Anaesthesiologists) physical status I were included in the study. They also gave written informed consent to participate. Patients who declined to participate, had a known allergy to local anaesthetics, were younger than 18 or older than 30, had ASA physical status II or higher, or had clinical contraindications to neuraxial (spinal) anaesthesia were all eliminated.

Sample Size Calculation: Sample size (n) was calculated using formula:

$$N = (Z\alpha+Z\beta)2\ (S12+S22)$$

$$d2$$

Where,

Zα: 1.96 (significant level α)

Zβ :0.84 (significant level β)

S1: Standard deviation of first group (Magnesium sulphate group)

S2: Standard deviation of second group (Dexmedetomidine group)

As per statistical calculation minimum sample size was 64. So took a sample size of 70 with 35 samples in each group.

Data Collection Procedure: Eligible ASA I patients scheduled for elective LSCS had pre-anesthetic examination and were told about the VAS following Institutional Ethics Committee permission and written informed consent. All patients received standard preoperative preparation and underwent LSCS under spinal anaesthesia with intrathecal 0.5% bupivacaine. Following surgery, when the sensory block regressed to the T8 level, an ultrasound-guided bilateral TAP block was administered. Thirty-five patients received dexmedetomidine (0.5 µg/kg) and thirty-five received magnesium sulphate (20 mg/kg) as adjuvants to 20 mL of 0.5% bupivacaine. Patient details and outcome measures were recorded using a predesigned proforma. The time to first rescue analgesia, VAS pain scores at 1, 2, 4, 6, 12, and 24 hours, haemodynamic parameters (heart rate, non-invasive blood pressure, and mean arterial pressure), and adverse effects like sedation (measured using the Observer's Assessment of Alertness/Sedation [OAA/S] scale) and postoperative nausea and vomiting (graded using a four-point scale). When the VAS score was higher than 4, rescue analgesia with intravenous tramadol 1 mg/kg was given.

Statistical Analysis: Statistical analysis of the study data and clinical outcomes was performed using the latest version of IBM SPSS Statistics software. Appropriate statistical tests were applied based on the type and distribution of the data. A p-value of less than 0.05 was considered statistically significant.

Results

Table 1: Baseline Demographic Characteristics of the Study Population (n=70)

Variable	Dexmedetomidine (n=35)	Magnesium Sulphate (n=35)	P value
Age (years)	24.31 ± 2.34	24.86 ± 2.55	0.356
Height	Comparable	Comparable	NS
Weight	Comparable	Comparable	NS
ASA Grade	Comparable	Comparable	NS

The baseline demographic data for both research groups are shown in Table 1. There were no statistically significant differences (p>0.05) between the two groups in terms of age, height, weight, and ASA physical status. This suggests sufficient baseline homogeneity prior to TAP block treatment.

Table 2: Comparison of Postoperative VAS Pain Scores

Time	Dexmedetomidine	Magnesium Sulphate	P value
1 hour	0.14 ± 0.36	0.17 ± 0.38	0.747
2 hours	0.14 ± 0.36	0.17 ± 0.38	0.747
4 hours	1.14 ± 0.36	1.26 ± 0.44	0.238
6 hours	2.46 ± 0.56	3.29 ± 0.67	<0.001*
12 hours	3.54 ± 0.61	4.57 ± 0.65	<0.001*
24 hours	4.71 ± 0.57	5.03 ± 0.51	<0.001*
*Significant			

The VAS is used to quantify postoperative pain intensity, as shown in Table 2. For the first four hours following surgery, pain levels were similar. At 6, 12, and 24 hours, the dexmedetomidine group showed significantly lower VAS values, indicating better postoperative analgesia.

Table 3: Duration of Analgesia (Time to First Rescue Analgesia)

Variable	Dexmedetomidine	Magnesium Sulphate	P value
Duration of analgesia (hours)	11.79 ± 1.34	6.89 ± 1.21	<0.001*

Table 3 compares the duration of postoperative analgesia between the two groups. Patients receiving dexmedetomidine experienced a significantly longer pain-free period before requiring rescue analgesia than those receiving magnesium sulphate, indicating prolonged analgesic efficacy.

Table 4: Comparison of Hemodynamic Parameters

A. Heart Rate			
Time	**Dexmedetomidine**	**Magnesium Sulphate**	**P value**
1 hour	81.00 ± 8.89	80.29 ± 10.37	0.758
2 hours	78.11 ± 8.70	79.49 ± 10.16	0.546
4 hours	72.29 ± 7.26	79.29 ± 9.50	0.001*
6 hours	67.89 ± 5.23	79.00 ± 9.80	<0.001*
12 hours	76.46 ± 6.63	80.23 ± 9.11	0.052
24 hours	84.54 ± 8.63	82.63 ± 10.36	0.404
B. Mean Arterial Pressure (MAP)			
Time	**Dexmedetomidine**	**Magnesium Sulphate**	**P value**
1 hour	79.40 ± 8.14	81.74 ± 4.92	0.149
2 hours	78.71 ± 8.10	81.74 ± 4.98	0.103
4 hours	78.23 ± 6.94	83.03 ± 5.59	0.002*
6 hours	79.74 ± 7.27	85.26 ± 4.76	<0.001*
12 hours	84.51 ± 7.06	87.34 ± 4.39	0.048*
24 hours	87.37 ± 6.60	89.11 ± 4.54	0.202

Table 4 compares postoperative hemodynamic parameters between both study groups. Heart rate was significantly lower in the dexmedetomidine group at 4 and 6 hours, while MAP showed significant reductions at 4, 6, and 12 hours. Despite these differences, all measurements remained within physiological limits and no intervention was required.

Table 5: Postoperative Sedation Score Comparison

Time	Significant Difference	P value
1 hour	No	--
2 hours	No	--
4 hours	No	0.235
6 hours	Yes	0.011*
12 hours	Yes	<0.001*
24 hours	Yes	0.046*

Table 5 summarizes postoperative sedation scores. Sedation levels were similar during the early postoperative period but differed significantly at 6, 12, and 24 hours. Dexmedetomidine produced greater postoperative sedation without clinically significant respiratory or cardiovascular compromise.

Table 6: Incidence of Postoperative Nausea and Vomiting (PONV)

PONV	Dexmedetomidine (n=35)	Magnesium Sulphate (n=35)
None	33 (94.3%)	32 (91.4%)
Mild	2 (5.7%)	3 (8.6%)
Chi-square = 0.643; P = 0.215		

Table 6 demonstrates the frequency of postoperative nausea and vomiting among study participants. Mild PONV occurred infrequently in both groups, with no statistically significant difference between dexmedetomidine and magnesium sulphate, suggesting comparable safety profiles.

Discussion

In this study, ultrasound-guided TAP block was used for postoperative analgesia in 70 ASA I parturients undergoing elective LSCS under spinal anaesthesia. Patients were divided into two equal groups (n = 35 each) at random. Group M got magnesium sulphate (20 mg/kg; maximum dose 1 g) as an adjuvant to 20 mL of 0.5% bupivacaine, while Group D received dexmedetomidine (0.5 μg/kg).

Both groups' demographic traits were similar. The dexmedetomidine group's mean age was 24.314 ± 2.336 years, whereas the magnesium sulphate group's was 24.857 ± 2.545 years. There was no statistically significant difference between the two groups, suggesting that they were well matched. The VAS was used to measure postoperative discomfort. Patients receiving dexmedetomidine demonstrated consistently lower pain scores throughout the observation period compared with those receiving magnesium sulphate. Statistically significant differences were observed at 6 hours (2.457 ± 0.561 vs. 3.268 ± 0.667), 12 hours (3.543 ± 0.611 vs. 4.571 ± 0.654), and 24 hours (4.714 ± 0.572 vs. 5.029 ± 0.514) in the dexmedetomidine and magnesium sulphate groups, respectively. However, VAS scores at 1, 2 and 4 hours were comparable between the groups. These findings indicate superior postoperative analgesia with dexmedetomidine throughout the assessment period. Similar observations were reported by Parameswari RA et al.,[1] who demonstrated improved postoperative analgesia with dexmedetomidine as an adjuvant to bupivacaine in TAP block, and by Qian H et al.,[2] in a randomized controlled trial evaluating ropivacaine with dexmedetomidine in TAP block.

In comparison to the magnesium sulphate group (6.886 ± 1.213 hours), the mean time to first rescue analgesia was substantially longer in the dexmedetomidine group (11.876 ± 1.335 hours) ($p<0.05$). These results are consistent with those of Mahesh Kumar et al.,[3] who found that the dexmedetomidine group experienced analgesia for a considerably longer period of time (390.17 minutes) than the magnesium sulphate group (199.27 minutes; $p<0.001$). Similarly, Vani et al.,[4] found that dexmedetomidine considerably increased the mean duration of analgesia (430.9 ± 33.08 minutes) in comparison to ordinary ropivacaine (204.7 ± 20.61 minutes) ($p<0.05$). Additionally, Kavitha Jain et al.,[5] found that when dexmedetomidine was administered as an adjuvant to hyperbaric bupivacaine, the duration of analgesia was substantially longer (348.26 ± 22.35 minutes) than magnesium sulphate (268.01 ± 11.31 minutes) ($p<0.001$). On the other hand, Ding et al.,[6] found that dexmedetomidine did not significantly improve the quality or duration of TAP block when used as an adjuvant to ropivacaine in ultrasound-guided dual TAP block after gastrectomy.

A highly selective α2-adrenergic receptor agonist with sedative and analgesic effects is dexmedetomidine. Its exact analgesic mechanism is still unclear, but it is thought to be complex. Peripherally, α2 agonists block nerve fibre action potentials independently of α2 receptors and reduce norepinephrine release. At the central level, they enhance analgesia by activating α2-adrenoceptors in the locus coeruleus and blocking the release of substance P in the nociceptive pathway in the dorsal root ganglion.[7] On the other hand, NMDA receptor blockage and physiological calcium

antagonism are the main causes of magnesium sulphate's antinociceptive effects. [7]

The superior analgesic profile observed with dexmedetomidine in the present study may be explained by its peripheral and central mechanisms of action. In addition to producing centrally mediated analgesia, dexmedetomidine causes local vasoconstriction around the injection site, which prolongs the duration of action of the local anaesthetic by delaying systemic absorption. Furthermore, it directly inhibits peripheral nerve conduction by suppressing compound action potentials, leading to enhanced and prolonged regional analgesia.[8] These mechanisms may explain the prolonged duration and improved quality of postoperative analgesia observed in the dexmedetomidine group.

Evaluation of haemodynamic parameters demonstrated statistically significant differences between the two groups. Mean heart rate at 6 hours was significantly lower in the dexmedetomidine group (67.886 ± 5.234 beats/min) compared with the magnesium sulphate group (79.000 ± 9.795 beats/min). Similarly, MAP (Mean Arterial Pressure) was significantly lower in the dexmedetomidine group at 4 hours (78.229 ± 6.937 vs. 83.029 ± 5.586 mmHg), 6 hours (79.743 ± 7.265 vs. 85.257 ± 4.761 mmHg), and 12 hours (84.514 ± 7.060 vs. 87.343 ± 4.392 mmHg). Systolic and diastolic blood pressure values were also consistently lower in the dexmedetomidine group throughout the observation period. Importantly, all haemodynamic parameters remained within normal physiological limits, and none of the patients developed clinically significant hypotension requiring intervention. These findings are consistent with those reported by Alka Shah et al. [9] and Deepika Shukla et al. [10]

Adverse effects were rare and similar in both groups. There was no statistically significant correlation between the study medications and PONV, which affected 2 out of 35 patients in the dexmedetomidine group and 3 out of 35 patients in the magnesium sulphate group. Similar findings were reported by Ravi Prakash et al, [11] and Rawadaa et al., [12] who also observed no significant increase in adverse effects with either adjuvant.

The present study utilized 20 mL of 0.5% bupivacaine for TAP block, comparable to the study by Lee et al.,[13] similarly used 0.5% bupivacaine with epinephrine while comparing magnesium sulphate and normal saline in interscalene block. The magnesium sulphate dose employed in the present study (20 mg/kg; maximum 1 g) was comparable to that used by Madhu Velayudhan et al. [14] Additionally**,** Farnad Imani et al.,[15] used 500 mg magnesium sulphate as an adjuvant to ropivacaine in ultrasound-guided TAP block. Several other studies have safely employed magnesium sulphate in peripheral nerve blocks at similar or even higher doses without neurological complications.[13]

The OAA/S (Observer's Assessment of Alertness/Sedation) scale was used to assess postoperative sedation.[16] The study medication and sedation scores at 6, 12, and 24 hours showed a strong correlation ($p<0.05$) according to chi-square analysis. The dexmedetomidine group's sedation scores were lower than those of the magnesium sulphate group, suggesting that dexmedetomidine had more sedative effects. On the other hand, Madhu Velayudhan et al.,[14] observed that all study participants had an OAA/S score of 5 during the first 24 hours.

The safety of both adjuvants during lactation has also been reported in the literature. Although limited data suggest that dexmedetomidine is excreted into breast milk, the drug becomes undetectable within 24 hours after infusion. Owing to its low breast milk concentration and poor oral bioavailability, dexmedetomidine is unlikely to produce adverse effects in breastfed infants.[17] Similarly, intravenous magnesium sulphate results in only a slight increase in breast milk magnesium concentration, and because oral absorption by the infant is minimal, maternal magnesium therapy is not expected to adversely affect breastfed infants.[18]

The findings of the present study demonstrate that dexmedetomidine is a superior adjuvant to bupivacaine compared with magnesium sulphate for ultrasound-guided TAP block in patients undergoing elective LSCS. Dexmedetomidine provided significantly lower postoperative pain scores, prolonged duration of analgesia, delayed requirement for rescue analgesia, stable haemodynamic parameters, and an acceptable safety profile without increasing postoperative complications.

Conclusion

In patients undergoing lower segment caesarean section under spinal anaesthesia, dexmedetomidine was found to be significantly more effective than magnesium sulphate ($MgSO_4$) in extending the duration of postoperative analgesia when used as an adjuvant to bupivacaine in an ultrasound-guided TAP block. Throughout the trial, both groups' haemodynamic parameters remained constant, and no notable side effects were noted. We conclude that magnesium sulphate and dexmedetomidine are both safe and efficient adjuvants to bupivacaine for TAP block, with little adverse effects. However, dexmedetomidine is the preferred adjuvant because it provides a significantly longer duration of postoperative analgesia while maintaining

acceptable hemodynamic stability and a favorable safety profile.

References

1. Ramya Parameswari A, Udayakumar P. Comparison of efficacy of bupivacaine with dexmedetomidine versus bupivacaine alone for transversus abdominis plane block for post-operative analgesia in patients undergoing elective caesarean section. J Obstet Gynaecol India 2018;68:98-103.
2. Qian H, Zhang Q, Zhu P, et al. Ultrasound-guided transversus abdominis plane block using ropivacaine and dexmedetomidine in patients undergoing caesarian sections to relieve post-operative analgesia: a randomized controlled clinical trial. Exp Ther Med 2020;20(2):1163-8.
3. Mahala MK, Sunar RC. Comparison of analgesic effects of intrathecal dexmedetomidine versus magnesium sulphate as adjuvants to 0.75% isobaric ropivacaine in infraumblical surgeries. IJSR 2020;9(4).
4. Venu VK, Shah A, Surendran S. Comparison of intrathecal 0.75% isobaric ropivacaine and 0.75% isobaric ropivacaine with dexmedetomidine, for below umbilical surgeries in adults. JMSCR 2019;7(9):266-76.
5. Jain K, Sethi SK, Jain R. Comparison of efficacy of intrathecal dexmedetomidine and magnesium sulfate as an adjuvant to 0.5% hyperbaric bupivacaine in patients undergoing infraumbilical surgeries under spinal anesthesia. J NTR Univ Health Sci 2020;9:116-23.
6. Ding W, Li W, Zeng X, et al. Effect of adding dexmedetomidine to ropivacaine on ultrasound-guided dual transversus abdominis plane block after gastrectomy. J Gastrointest Surg 2017;21:936-46.
7. AbdAlali SA, Gamal FM, Amar SAA, et al. Clinical Comparative study between Magnesium sulphate versus Rocuronium versus Dexmedetomidine as adjuvants for local anaesthetic in peribulbar block for eye surgeries. The Egyptian Journal of Hospital Medicine 2018;73(8):7204-10.
8. Elyazed MMA, Mogahed MM. Comparison of Magnesium Sulfate and Dexmedetomidine as an Adjuvant to 0.5% Ropivacaine in Infraclavicular Brachial Plexus Block. Anesth Essays Res 2018;12(1):109-15.
9. Shah A, Patel I, Gandhi R. Haemodynamic effects of intrathecal dexmedetomidine added to ropivacaine intraoperatively and for postoperative analgesia. Int J Basic Clin Pharmacol 2013;2:26-9.
10. Shukla D, Verma A, Agarwal A, et al. Comparative study of intrathecal dexmedetomidine with intrathecal magnesium sulfate used as adjuvants to bupivacaine. J Anaesthesiol Clin Pharmacol 2011;27(4):495-9.
11. Tyagi A, Prakash R. Comparative evaluation of intrathecal dexmedetomidine and magnesium sulphate as adjuvants to bupivacaine for lower limb surgeries. Journal of Evidence Based Medicine and Health Care 2019;6(32):2176-80.
12. Eloraby RM, Awad AA, Hashim RH. Effects of intrathecal dexmedetomidine vs intrathecal magnesium sulfate as adjuvants in spinal anesthesia. The Scientific Journal of Al-Azhar Medical Faculty, Girls 2019;3(3):760.
13. Lee AR, Yi HW, Chung IS, et al. Magnesium added to bupivacaine prolongs the duration of analgesia after interscalene nerve block. Can J Anaesth 2012;59:21-7.
14. Velayudhan M, Pothen DS. Magnesium sulphate versus dexmedetomidine as adjuvant to bupivacaine in open Transversus abdominis plane block for LSCS. Paripex Indian Journal of Research 2016;5(9).
15. Imani F, Rahimzadeh P, Faiz HR, et al. An evaluation of the adding magnesium sulfate to ropivacaine on ultrasound-guided transverse abdominis plane block after abdominal hysterectomy. Anesthesiology and Pain Medicine 2018;8(4).
16. Mehta Y, Sharma J, Gupta MK, et al, eds. Textbook of critical care including trauma and emergency care. Jaypee Brothers Medical Publishers (P) Ltd. 2015.
17. Drugs and Lactation Database (LactMed R) [Internet]. Dexmedetomidine. Bethesda (MD): National Institute of Child Health and Human Development 2006.
18. Drugs and Lactation Database (LactMed R) [Internet]. Magnesium Sulfate. Bethesda (MD): National Institute of Child Health and Human Development 2006.