Section: Anaesthesiology

Original Research Article

EFFECT OF DEXAMETHASONE AS AN ADJUVANT TO LEVOBUPIVACAINE IN ULTRASOUND-GUIDED TRANSVERSUS ABDOMINIS PLANE BLOCK FOR POSTOPERATIVE ANALGESIA AFTER LOWER SEGMENT CAESAREAN SECTION

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ABSTRACT

Background: Lower segment caesarean section is one of the most commonly performed obstetric surgical procedure. Ultarsound-guided (USG) transversus abdominis plane (TAP) block is an effective component of multimodal analgesia. The present study aimed to evaluate the effect of dexamethasone as an adjuvant to levo-bupivacaine on the duration and quality of analgesia in TAP block following LSCS. **Materials and Methods:** This prospective, randomised study was conducted on 84 ASA physical status II parturients undergoing elective LSCS under spinal anaesthesia. Patients were randomised into two groups. Group SL received 20 ml of 0.25% levobupivacaine with 1 ml normal saline, while Group DL received 20 ml of 0.25% levobupivacaine with 1 ml (4 mg) dexamethasone bilaterally in ultrasound-guided TAP block. The primary outcome was the time at which first rescue analgesia was administered. Secondary outcomes included total analgesic consumption in 24 hours, visual analog scale (VAS) score, incidence of postoperative nausea and vomiting, and adverse effects. **Result:** The time to first rescue analgesia was significantly prolonged in Group DL as compared to Group SL ($P < 0.001$). Total postoperative paracetamol consumption was significantly lower in Group DL ($P < 0.001$). VAS scores for pain were significantly lower in Group DL at 6, 8,10 and 12 hours postoperatively. Incidence of nausea and vomiting was lower in the dexamethasone group. No other procedure or drug related complications were observed. **Conclusion:** Addition of dexamethasone to levobupivacaine in ultrasound-guided TAP block significantly prolongs postoperative analgesia and reduces opioid requirement after LSCS.

INTRODUCTION

Lower segment caesarean section (LSCS) is one of the most commonly performed obstetric surgical procedures worldwide. Effective postoperative pain management after LSCS is an essential component of perioperative care. Adequate analgesia not only improves maternal comfort but also facilitates early ambulation, promotes successful breastfeeding, and enhances maternal–neonatal bonding. Inadequately treated postoperative pain may delay recovery, increase the risk of thromboembolic episodes, prolong hospital stay, and adversely affect maternal satisfaction after childbirth. Regional anaesthesia techniques have become an important component of multimodal analgesia during perioperative care. Among these techniques, the transversus abdominis plane (TAP) block has emerged as an effective method for postoperative pain relief following abdominal surgeries, including caesarean delivery. The TAP block involves the deposition of local anaesthetic in the fascial plane between the internal oblique and transversus abdominis muscles, thereby blocking the thoracolumbar nerves (T7–L1) that supply the anterior abdominal wall. Several studies and systematic reviews have demonstrated that TAP block significantly reduces postoperative pain and opioid requirements following caesarean section.[1-3] With the introduction of ultrasound guidance, the TAP block has become safer and more reliable because real-time visualisation of anatomical structures allows accurate needle placement and appropriate spread of the local anaesthetic.[4]

Various local anaesthetic agents have been used in TAP blocks. Levobupivacaine is widely used local anaesthetic in regional anaesthesia due to its safety

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profile, particularly with regard to cardiovascular and central nervous system toxicity. Studies evaluating levobupivacaine in TAP block have demonstrated effective postoperative analgesia following caesarean section; however, the duration of analgesia provided by local anaesthetics alone may still be limited.[5,6] Therefore, several pharmacological adjuvants such as fentanyl, morphine and dexamethasone have been investigated to prolong the duration and improve the quality of analgesia. Addition of dexamethasone to local anaesthetic solutions in peripheral nerve blocks and fascial plane blocks has prolonged the duration of analgesia, reduced postoperative analgesic consumption, and decreased the incidence of postoperative nausea and vomiting.[7-10]

Despite growing evidence regarding the benefits of dexamethasone in TAP block, limited data are available regarding its use specifically in combination with levobupivacaine for postoperative analgesia following caesarean section. Therefore, the present study was undertaken to evaluate the effect of adding dexamethasone to levobupivacaine in ultrasound-guided TAP block on the duration and quality of postoperative analgesia in patients undergoing lower segment caesarean section.

MATERIALS AND METHODS

After obtaining approval from the Institutional Ethics Committee, this prospective, randomised, double blinded study was carried out in the Department of Anaesthesiology of a tertiary care teaching hospital. Informed written consent was obtained from all patients after explaining the study variables, potential benefits, and possible risks. All TAP blocks were performed according to ethical standards and institutional research protocols. A total of 84 parturients aged ≥18 years with American Society of Anesthesiologists (ASA) physical status II, scheduled for elective LSCS under spinal anaesthesia were enrolled in the study. Patients who refused to participate, those undergoing emergency LSCS, or those with known hypersensitivity to levobupivacaine or dexamethasone were excluded. Patients with contraindications to regional anaesthesia such as infection at the injection site, coagulation disorders, chronic pain syndromes, and history of severe postoperative nausea and vomiting were also excluded from the study. Patients were randomly allocated into two groups using computer-generated random numbers. Allocation was concealed with sealed opaque envelopes prepared by an independent anaesthesiologist not involved in patient management or data collection. Patients were also blinded to the group allocation to minimise bias during postoperative pain assessment.

84 patients were divided into two groups of 42 each with Group SL receiving 20 ml of 0.25% levobupivacaine with 1 ml normal saline and Group DL receiving 20 ml of 0.25% levobupivacaine combined with 1 ml (4 mg) dexamethasone on each side with USG TAP block. All patients were evaluated preoperatively with detailed history, physical examination, and necessary laboratory investigations. After arrival in operation theatre, ASA monitroing was attached and 10 ml/kg fluid was administered coloaded with a wide bore cannula. All patients received spinal anaesthesia in the left lateral position using 2ml of 0.5% hyperbaric bupivacaine. After completion of surgery, bilateral USG TAP block was performed under strict aseptic precautions. A high-frequency linear ultrasound probe was placed in the mid-axillary line between the iliac crest and costal margin to identify the muscle layers and needle inserted by In-plane approach. The study drug was deposited between the internal oblique and transversus abdominis muscles. 1 g Intravenous paracetamol was administered as rescue analgesic, upon patient request or when VAS exceeded 4. Postoperative pain was assessed using the visual analogue scale (VAS) for both somatic and visceral pain at 2, 4, 6, 8, 10, 12 and 24 hours following surgery. The incidence of nausea, vomiting, and any adverse events was also recorded. The primary objective of the study was the time at which first rescue analgesia was administered. Secondary objective comprised of total analgesic consumption within 24 hours, VAS scores at different postoperative intervals, incidence of postoperative nausea and vomiting, and occurrence of any adverse effects. Data were entered and analysed using PSPP software. Continuous variables were expressed as mean ± standard deviation and compared using unpaired Student's t-test. Categorical variables were analysed using Chi-square test or Fisher's exact test where appropriate. A p value of less than 0.05 was considered statistically significant.

RESULTS

A total of 84 patients were enrolled and analysed, with 42 patients in each group [Figure 1].

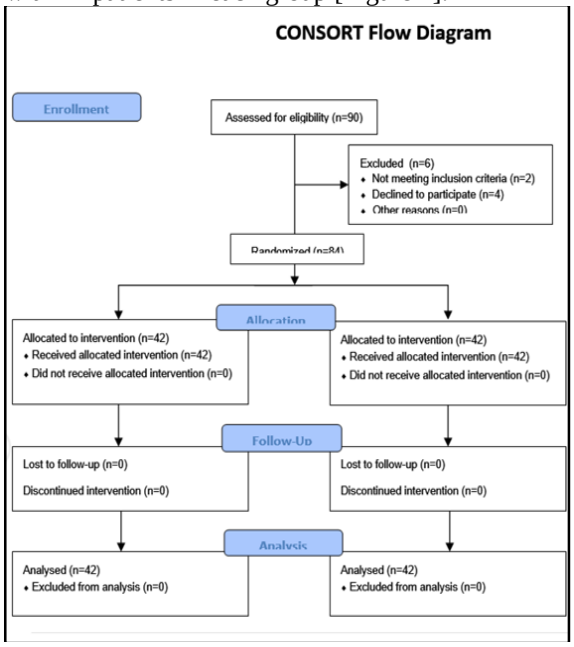

Figure 1: CONSORT diagram

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Demographic variables including age, weight, height, body mass index, ASA physical status, duration of surgery, and haematological baseline parameters were comparable between Group SL and Group DL [Table 1].

The primary outcome, time to first rescue analgesia, was significantly prolonged in Group DL compared to Group SL ($p < 0.001$) [Table 2]. Patients receiving dexamethasone as an adjuvant to levobupivacaine required their first dose of rescue analgesia substantially later than those receiving levobupivacaine alone. Total postoperative paracetamol consumption during the first 24 hours was significantly lower in Group DL compared with Group SL ($p < 0.001$) [Table 2].

VAS scores were comparable between groups during the early postoperative period i.e. Hr 1 and 2 However, at 4, 6, 8, 10, 12, and 24 hours postoperatively, VAS scores were significantly lower in Group DL compared with Group SL [Table 3]. The incidence of postoperative nausea was lower in Group DL, particularly at later postoperative time intervals [Table 4]. No episodes of vomiting were recorded in either group. Zero procedure related complications or adverse drug reactions were observed during the study period.

Table 1: Demographic Characteristics

S. No.	Variable	Group SL (n = 42)	Group DL (n = 42)	p value
1	Age (years)	28.7 ± 3.1	29.3 ± 2.9	0.34
2	Weight (kg)	65.1 ± 5.3	63.4 ± 6.9	0.19
3	Height (cm)	157.0 ± 2.9	158 ± 3.1	0.11
4	BMI (kg/m²)	24.3 ± 2.6	23.9 ± 1.9	0.40
5	Duration of surgery (min)	51.7 ± 5.3	50 ± 6.1	0.16

Values expressed as mean ± Standard deviation. $p < 0.05$ considered statistically significant.

Table 2: Comparison of analgesic outcomes in both the groups

S. No.	Variable	Group SL (n = 42)	Group DL (n = 42)	p value
1	Time to first rescue analgesia (hr)	8.7 ± 1.8	12.2 ± 2.7	<0.001
2	Total Paracetamol consumption (mg/24 h)	911.6 ± 50.8	730.5 ± 61.3	<0.001

Values expressed as mean ± Standard deviation. $p < 0.05$ considered statistically significant.

Table 3: Comparison of VAS score in both the groups

S. No.	Time Interval	Group SL(n=42)	Group DL(n=42)	p value
1	2 hr	6.0 ± 0.9	6.0 ± 0.1	1.00
2	4 hr	14 ± 1.4	13.1 ± 1.1	0.001
3	6 hr	28 ± 2.7	24.9 ± 1.8	<0.001
4	8 hr	51.3 ± 3.9	38.1 ± 4.3	<0.001
5	10 hr	55.3 ± 4.6	48.2 ± 3.4	<0.001
6	12 hr	65.0 ± 5.1	45.7 ± 3.9	<0.001
7	24 hr	63.1 ± 2.3	41.3 ± 1.9	<0.001

Values expressed as mean ± Standard deviation. $p < 0.05$ considered statistically significant.

Table 4: Incidence of postoperative nausea and vomiting in both the groups

S. No.	Side effects	Time Interval	Group SL (42) n (%)	Group DL (42) n (%)
1	Nausea	2 hr	0 (0)	0 (0)
		4 hr	2 (4.4)	1 (2.2)
		6 hr	0(0)	0(0)
		8 hr	13 (28.9)	3 (6.7)
		10 hr	0(0)	0(0)
		12 hr	10 (22.2)	2 (4.4)
		24 hr	6 (13.3)	1 (2.2)
2	Vomiting	All hrs	0 (0)	0 (0)

Chi square test $X2 = 0.594$, $p=0.90$.

DISCUSSION

The present study demonstrates that the addition of dexamethasone to levobupivacaine in USG TAP block significantly prolongs the duration of postoperative analgesia and reduces analgesic consumption in patients undergoing lower segment caesarean section.

Postoperative pain following LSCS has both somatic and visceral components, which are inadequately addressed by systemic analgesics alone. TAP block has emerged as an effective regional analgesic technique for lower abdominal surgeries by

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providing targeted blockade of thoracolumbar nerves supplying the anterior abdominal wall.[11,17] The use of ultrasound guidance improves block accuracy and safety, contributing to reliable analgesic outcomes.[17]

In the present study, the time to first rescue analgesia was significantly longer in the dexamethasone group. Similar findings have been reported by Akkaya et al., who demonstrated prolonged analgesia when dexamethasone was added to levobupivacaine in TAP block for caesarean section.1 Meta-analyses have consistently shown that dexamethasone, when used as an adjuvant to local anaesthetics, prolongs the duration of analgesia in peripheral nerve and fascial plane blocks.[2,4,15]

Levobupivacaine was chosen in this study due to its favourable safety profile and long duration of action. Previous studies have shown that levobupivacaine provides effective postoperative analgesia in TAP block for lower abdominal surgeries.[14] The addition of dexamethasone further enhances this effect, as observed in both TAP block and other regional anaesthesia techniques.[5-7,10]

Reduced acetaminophen consumption in the postoperative period is consistent with earlier studies demonstrating decreased analgesic requirements when dexamethasone is used as an adjuvant in regional blocks.[3,6,9] This reduction in intravenous analgesics may have contributed to the lower incidence of postoperative nausea observed in the dexamethasone group, as supported by previous literature.[8,16]

The improved VAS scores for both somatic and visceral pain at later postoperative intervals indicate sustained analgesic benefit of dexamethasone beyond the duration of spinal anaesthesia. The analgesic mechanism of dexamethasone is not fully understood; however, proposed mechanisms include suppression of inflammatory mediators, inhibition of ectopic neuronal discharge, and direct modulation of nociceptive C-fiber activity.[6,20] Systemic absorption of dexamethasone may also contribute to its analgesic and antiemetic effects.[13,18]

No procedure related complications or adverse effects were observed in this study. Previous systematic reviews have shown that a single perineural dose of dexamethasone is not associated with significant neurotoxicity or systemic adverse effect albeit it may prove beneficial.[13,15,18] The use of ultrasound guidance further enhances the safety profile of TAP block by allowing real-time visualisation of needle placement and local anaesthetic spread.[17,19]

The present study has certain limitations. Postoperatively, pain assessment was limited to the first 24 hours only, and long-term outcomes such as maternal satisfaction and neonatal effects were not evaluated. Future studies with longer follow-up and larger sample sizes may help further establish the role of dexamethasone as an adjuvant in TAP block for obstetric surgeries.

CONCLUSION

Addition of dexamethasone to 0.25% levobupivacaine in USG TAP block significantly prolongs postoperative analgesia, decreases analgesic requirement, and improves pain control after LSCS without increasing adverse effects.

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