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RESEARCH ARTICLE
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ULTRASOUND-GUIDED TRANSVERSE ABDOMINIS PLANE BLOCK WITH ROPIVACAINE OR ROPIVACAINE WITH DEXAMETHASONE FOR POSTOPERATIVE ANALGESIA IN PATIENTS UNDERGOING LOWER SEGMENT CAESAREAN SECTION

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ABSTRACT

BACKGROUND AND AIM: LSCS is the most commonly performed surgery all over the world. [1] Multimodal analgesia in the form of parenteral NSAIDs, patient-controlled analgesia with opioids, epidural analgesia, wound infiltration and peripheral nerve blocks have been tried over several decades. [2] More recently, ultrasound-guided TAP block has been described with promises of better localization and deposition of the local anaesthetic with improved accuracy. Thus, in the current study, we assess the efficacy of 0.2% ropivacaine with or without dexamethasone used as an adjuvant in USG-guided TAP block in providing postoperative analgesia in LSCS patients.

METHOD: A prospective, randomised, double-blinded study was conducted in our tertiary care hospital on sixty pregnant patients of ASA-2 posted for LSCS under spinal anaesthesia. The study population was divided into 2 groups of 30 patients each. They received a USG-guided TAP block; Group A with 20 ml of 0.2% ropivacaine alone and Group B with 20 ml of 0.2% ropivacaine with dexamethasone 4mg on each side at the end of the surgery. Tramadol 100 mg was administered intravenously in case of NRS $\geq$ 3 and the time to first rescue analgesia was noted. Patient satisfaction scores and complications like intravascular injection, local anaesthesia systemic toxicity, haematoma at the injection site, paresthesia, nausea, vomiting, hypotension and bradycardia were also recorded if any.

RESULTS: The time to first rescue analgesia in group A was 15.21 ± 5.26hrs and in group B was 22.82 ± 4.75hrs which was statistically significant. No block-related complications were noted.

CONCLUSION: We conclude that the addition of dexamethasone to ropivacaine in the TAP block for LSCS significantly prolongs the duration of postoperative analgesia.

KEYWORDS: Dexamethasone; lower segment caesarian section; postoperative analgesia; ropivacaine; TAP block; ultrasound.

INTRODUCTION

Lower segment cesarean section (LSCS) is one of the most commonly performed surgery. [1] The incidence of this has dramatically increased during the past decade due to varied reasons; maternal request being one among them. Besides the emotional and humane reasons, the pain has a strong bearing on the postoperative recovery and long-term well-being of these patients. Multimodal analgesia in the form of parenteral NSAIDs, patient-controlled analgesia with opioids, epidural analgesia, wound infiltration and peripheral nerve blocks have been tried over several decades. [2] Epidural analgesia though a good alternative for post-operative pain relief, has a risk of dural and vascular puncture [3], and difficulty in identification of the space. More recently, ultrasound-guided Transverse Abdominis Plane (TAP) block has been described with promises of better localization and deposition of the local anaesthetic with improved accuracy. [4]

Ropivacaine is an amide local anaesthetic agent that has a superior sensory block profile with reduced potential to cause toxicity. Dexamethasone as an adjuvant causes early onset and prolongs the duration of analgesia without any unwanted effects. Thus, we hypothesized that adding dexamethasone as an adjuvant to ropivacaine in a USG-guided TAP block would prolong the duration of postoperative analgesia without any side effects and help facilitate mothers in newborn care. Our primary objective was to assess the time to first rescue analgesia requirement and the secondary objective was to assess the cumulative consumption of analgesia in 24 hours, patient satisfaction score (PSS), Ramsay sedation scores (RSS) and side effects if any.

METHODOLOGY:

After obtaining Institutional ethical committee approval (Reference no: EC 144) and clinical trial registration (CTRI No: CTRI/2021/03/032153), a prospective randomized , double-blinded study was conducted on sixty pregnant patients of the American Society of Anaesthesiologists physical status 2 who were posted for LSCS under spinal anaesthesia. Patient refusal, infection at the block site, neurological deficit in lower limbs, and patients with altered coagulation status were excluded from the study.

All patients underwent preanesthetic evaluation and optimization before surgery. They were explained the study protocol, numeric pain rating scale (NRS, 0 = no pain to 10 = worst imaginable pain) for assessment of the pain post-surgery and written informed consent was obtained. The study population were divided into 2 groups with 30 patients in each group.

Group A – patients received USG-guided bilateral TAP block with 20 ml of 0.2% ropivacaine on each side.

Group B – patients received USG-guided TAP block with 20 ml of 0.2% ropivacaine with dexamethasone 4 mg on each side.

In the study, randomization was done using a computer-generated random number table and concealment was done by sequentially numbered opaque envelopes. Both the patient and the assessor were blinded to group allocation.

All patients were pre-medicated with intravenous ranitidine 50 mg and metoclopramide 10 mg, 30 minutes before surgery. In the operating room, standard monitoring devices like pulse-oximeter (SpO_2), non-invasive blood pressure (NIBP), and electrocardiogram (ECG) were attached and baseline haemodynamic values were noted. Patients were preloaded with fluid ringer lactate at 10 ml/kg. Spinal anaesthesia was given with the patient in the left lateral position using 0.5% hyperbaric bupivacaine 1.8- 2.0 ml, using 25G Quincke's needle at L3 – L4 space. Heart rate (HR), blood pressure (systolic- SBP, diastolic- DBP, mean arterial pressure- MAP), and oxygen saturation (SpO_2) were recorded throughout the surgery. After the baby's delivery, oxytocin 10 U intravenous infusion was started. Total intraoperative blood loss was recorded and replaced with an adequate amount of balanced salt solutions. Any significant intraoperative episode of bradycardia (< 50 beats/minute) was treated with IV atropine 0.6 mg and hypotension (> 20% of the baseline) was treated with IV ephedrine 5 mg. At the end of the surgery, patients received USG-guided TAP block based on the group allocated. Under real-time ultrasound guidance, a high-frequency linear probe (13- 6 MHz) was placed perpendicular to the mid-axillary line between the iliac crest and subcostal margin; the image from top to bottom showed skin, subcutaneous fat, 3 layers of hypoechoic muscles that are external oblique, internal oblique and transverse abdominis muscles with hyperechoic fascia in between them. After local skin disinfection using topical 10% povidone-iodine, a 22 / 23 gauge spinal needle was used in a medial to lateral orientation, in-plane approach to allow visualization of the full length of the needle throughout the procedure. After confirming that the needle had perforated the transversalis fascia and careful aspiration to rule out intravascular placement, a total of 20 mL of the anaesthetic solution containing 0.2% ropivacaine with or without dexamethasone based on the group allocated was injected slowly over a period of 2–3 minutes with intermittent aspirations and the adequacy of the deposition of local anaesthetic confirmed by the ultrasound device. The same procedure was performed on the opposite side.

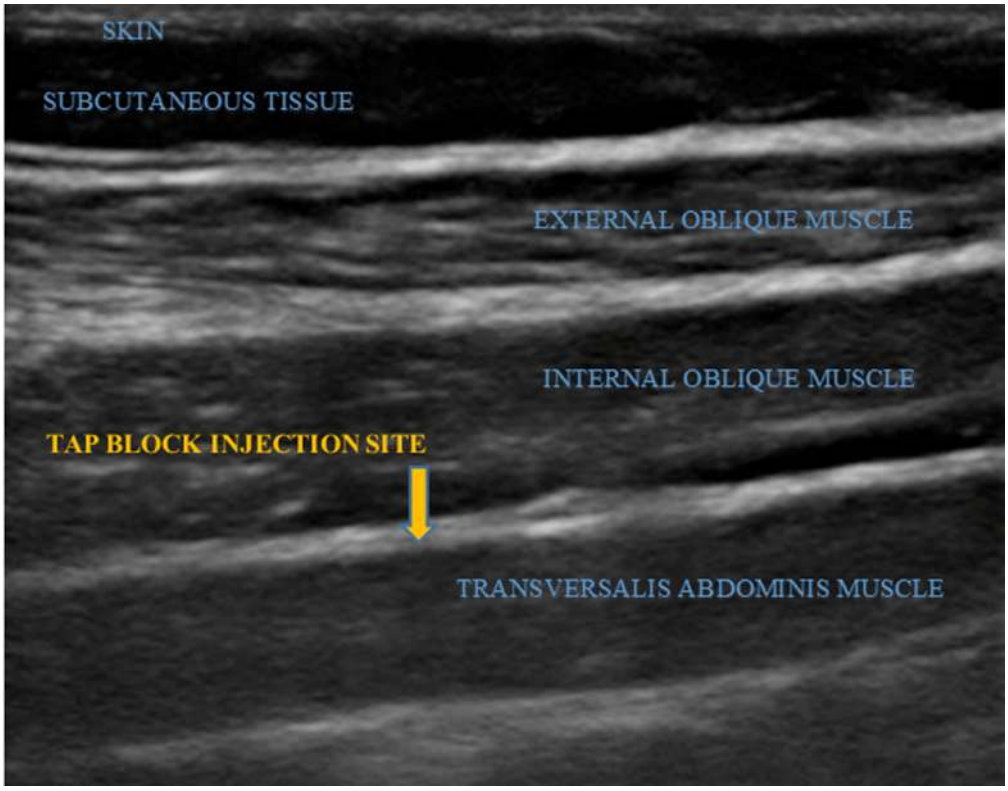

Figure 1: Ultrasonographic anatomy of Transversalis Abdominis Plane (TAP) block

All patients received a diclofenac suppository of 100 mg per rectum at the end of the surgery. Patients were shifted to the post-anaesthetic care unit and haemodynamics monitored. The time to first postoperative rescue analgesia as evidenced by NRS ≥ 3 was noted and rescue analgesia in the form

of tramadol 100 mg was administered intravenously. Considering, time 'zero' as to when the TAP block was given; post-operative analgesia was assessed at 2, 4, 6, 10, 12 and 24 hours at rest and on movement after performing the block, and cumulative analgesia request was recorded at 24 hours after the surgery. Sedation levels using Ramsay sedation score and patient satisfaction scores (1- Bad, 2- Moderate, 3- Good, 4- Excellent) were noted. Complications like intravascular injection, local anaesthesia systemic toxicity, haematoma at the injection site, paresthesia, nausea, vomiting, hypotension and bradycardia if any were recorded as well.

STATISTICS:

Based on a previous study, [5] postoperative analgesia was 19.04 ± 4.13 hrs and 11.62 ± 3.80 hrs with and without dexamethasone. Using these values at a 95% confidence interval and power of 80%, a sample size of 27 was obtained in each group. To compensate for the possible dropouts and consistent results, 30 patients in each group were included in the study.

Data was analyzed using SPSS software version -22. Analyzed data presented in suitable tabular forms. Data expressed as percentages for qualitative data. For quantitative data, the mean with standard deviation was used. As a test of significance for comparing qualitative data, the chi-square test was used. An unpaired t-test was used as a test of significance for comparing quantitative data. P value < 0.05 was considered statistically significant.

RESULTS:

The demographic data of the patients in both groups were comparable and did not show any significant statistical difference.

Table 1: Demographic characteristics of the patients in both groups

	GROUP A		GROUP B		p-value
	Mean	SD	Mean	SD	
Age (years)	25.80	4.39	25.90	4.58	0.932
Weight (kg)	65.33	13.34	68.35	8.34	0.298
Previous LSCS	11		12		0.791
Rescue analgesic	15.21 ± 5.26		22.82 ± 4.75		< 0.001*

Sixty pregnant patients were included and analysed in the study. All patients had successful blocks

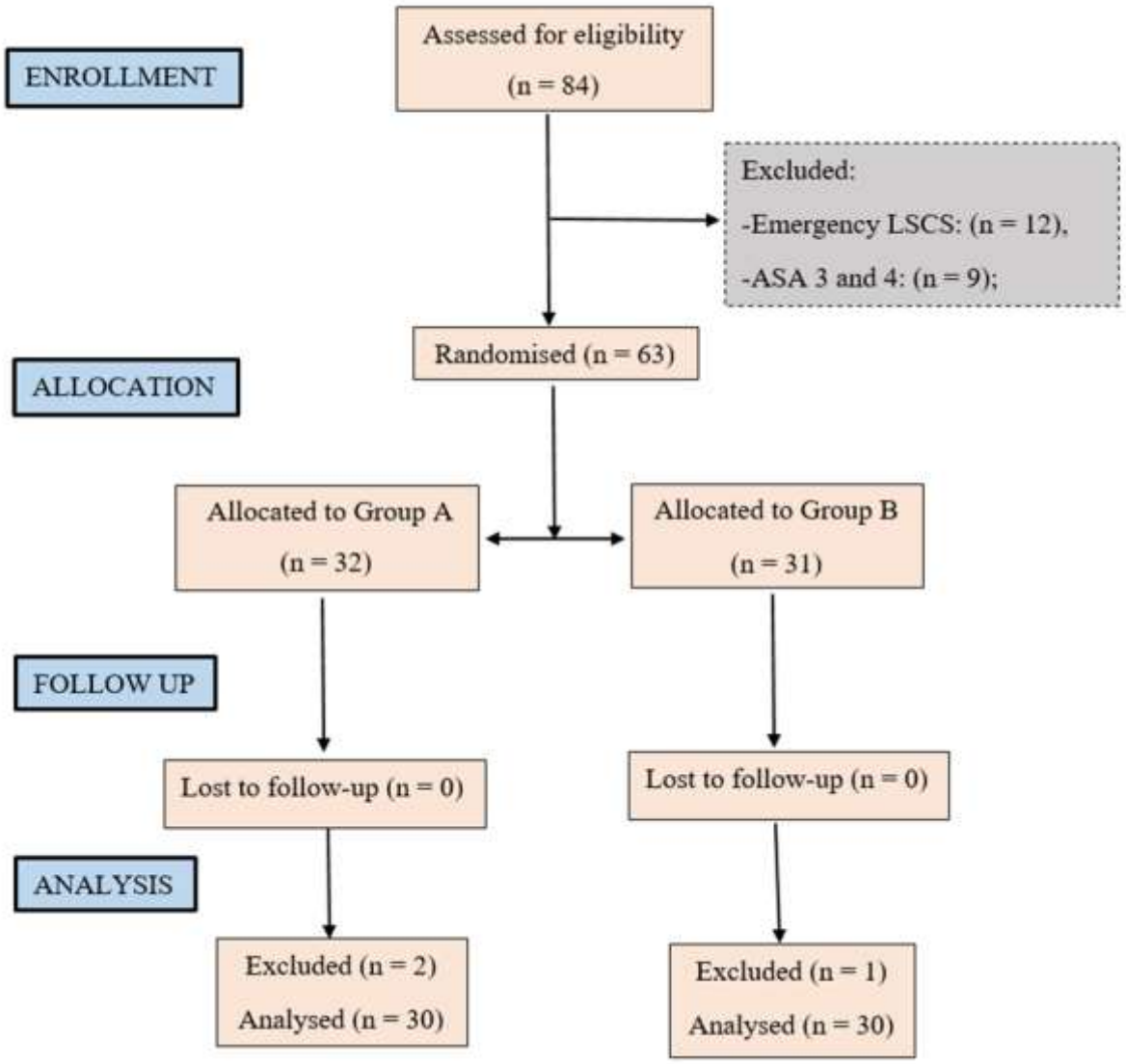

Figure 2: CONSORT flow diagram

The time to first rescue analgesic was 15.21 $\pm$ 5.26 hrs in group A and 22.82 $\pm$ 4.75 hrs in group B with a p-value of < 0.001 which was statistically significant. The average number of total doses of rescue analgesic required in group A was 1.07 $\pm$ 0.52 and in group B was 0.4 $\pm$ 0.49; None of the patients required rescue analgesia in the first 6 hours postoperatively, while 12 patients (40%) in group A and none in group B required rescue analgesic during the 6-12th hour postoperatively which was statistically significant with $p < 0.001$. 20 patients (66.7%) in group A and 12 patients (40%) in group B required rescue analgesia during the 12- 24 hours period postoperatively ($p = 0.039$). There was a significant difference in the cumulative doses of analgesic doses required in 24 hours between the two groups with p of 0.001. NRS was found to have statistical significance between the groups postoperatively, at 6 hours (95% CI: 0.595 – 1.267 in group A versus 0.516 – 0.951 in group B) with $p < 0.001$ and 8 hours (95% CI: 1.054 – 1.773 in group A versus 0.594 – 1.006 in group B) with p 0.02.

In our study, 100% of group B patients had excellent pain relief and PSS, while in group A, 15 patients (50%) experienced excellent while 14 patients (47%) had good pain relief and 1 patient (3%) had average pain relief and PSS.

Table 2: Patient satisfaction score (PSS) of patients in both groups

PSS	GROUP A		Group B		p-value
	Frequency	Percentage	Frequency	Percentage	
2 - Moderate	1	3.3 %	0	0 %	< 0.001*
3 - Good	14	46.7 %	0	0 %	
4 - Excellent	15	50.0 %	30	100 %	
Total	30	100 %	30	100 %	

Ramsay sedation scores were comparable between the groups as shown in table 3.

Table 3: Ramsay sedation score (RSS) of patients in both groups

	Group A		Group B	
	Median	95% CI	Median	95% CI
0 – 6 hrs	2	2.0 – 2.0	2	2.0 – 2.0
6 – 12 hrs	3	1.97- 2.69	3	2.89 – 3.04
12 – 24 hrs	2	1.38 – 1.88	2	1.68 – 2.06

Haemodynamic variables like HR, SBP, DBP, and MAP were comparable in both groups. No side effects were noted in patients of either group.

DISCUSSION:

Post-LSCS pain is often severe hence effective analgesia should be provided to reduce postoperative stress response and to accelerate recovery, help with early ambulation and neonatal care, and thus reduce complications like lung atelectasis and deep vein thrombosis [6]. Many studies have been done in the past describing various techniques of providing analgesia of which TAP block is safe and provides good analgesia. The beneficial effect of TAP block in post-LSCS patients is well known with studies reporting a good outcome [7,8,9] when compared to subcutaneous local infiltration [10,11] and ilioinguinal iliohypogastric nerve block.[12] Rafi was the first to describe the landmark technique of the TAP block in 2001. [13] Later in 2007, an ultrasonography-guided TAP block was described by Hebbard et al. [4] The block aims to target the spinal nerves innervating the abdominal skin, muscles, and parietal peritoneum placed in the plane between the internal oblique and transversus abdominis muscles. A cadaveric study [14] conducted in 2009 showed that USG-guided TAP block with dye showed the segmental nerves T10, T11, T12, and L1 involvement in 50%, 100%, 100%, and 93% of cases, respectively, and implied that the technique may be limited to use in lower abdominal surgeries. Therefore, the USG-guided TAP block was the technique of choice to provide analgesia to post-LSCS patients in our study.

We conducted the USG-guided TAP block in sixty pregnant patients belonging to ASA – PS 2, postoperatively. Two patients received paracetamol for fever and one received analgesics for ankle pain; they were excluded from the study.

The total duration of analgesia was prolonged in both the groups as seen in other studies when using ropivacaine for TAP block. [7,15,16,17] But group B patients had a significantly longer analgesic duration who received ropivacaine and dexamethasone with $p < 0.001$ than group A patients who received ropivacaine alone. This is consistent with the studies [18,19,20] that used dexamethasone in peripheral nerve blocks to prolong the duration of analgesia. In a similar study, the use of dexamethasone as an adjuvant resulted in a significantly prolonged duration of block for up to 22 hours. [5,18,21] NRS was significantly lower in group B patients at the 6^{th} and 8^{th} hour postoperatively whereas in a similar study [5] it was noted that NRS was significantly lower at the 8^{th}, 12^{th} and 24 hrs in patients who received dexamethasone as an adjuvant. Patients receiving dexamethasone were highly satisfied with the analgesia which was consistent with earlier studies. [15,17]

Our study documented no complications, whereas few studies [5,17] noticed nausea and convulsions as side effects probably owing to the higher concentration of local anaesthetic used. Therefore, we can

use a USG-guided bilateral TAP block with ropivacaine 0.2% and dexamethasone 4 mg for providing prolonged postoperative analgesia with less requirement of opioid analgesics, with adequate sedation and better satisfaction and stable haemodynamics with no side effects. The only limitation was that the study was conducted on post–LSCS patients with no comorbidities and the effect of the use of dexamethasone and its bearing on gestational diabetic mothers was not evaluated and hence needs further studies.

CONCLUSION:

USG-guided TAP block with ropivacaine and dexamethasone is superior in providing prolonged analgesia than ropivacaine alone in patients undergoing LSCS. It also ensures better patient satisfaction and comfort without causing any side effects.

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