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ANALGESIC EFFICACY AND SAFETY OF ULTRASOUND GUIDED ERECTOR SPINAE PLANE(ESP) BLOCK AFTER CAESAREAN SECTION - A PROSPECTIVE RANDOMIZED CONTROLLED STUDY.

Anaesthesiology

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ABSTRACT

Introduction: Erector spinae plane(ESP) block is interfacial plane block providing an effective analgesia after caesarean section. We aimed to assess the efficacy of USG guided ESP block in terms of time for first rescue analgesia in first 24 hours post-operatively. **Material &Methods:** Total 60 parturients (ASA I or II) scheduled for elective cesarean section under spinal anesthesia were randomly allocated into two equal groups by sealed envelope method , Group B(ESPB) or Group C(No block).At the end of Surgery, Group B patients received USG-guided ESPB at T9 vertebrae level with 30 ml(15ml each side) Levobupivacaine 0.25%. Control group patients did not receive block. The visual analogue scale (VAS) score for pain at several postoperative time points, the cumulative requirement of analgesic over first 24hour, time to first rescue analgesic requirement were evaluated. **Results:** Time to first rescue analgesia was prolonged significantly in the group B (22.53hrs± 2.40) ($p<0.0001$) compared to Control group (7 hrs±1.36) ($p<0.0001$). VAS for pain were significantly lower in Group B. The total consumption of Inj. Diclofenac Sodium in 24hrs was significantly lower in the Group B (77.5±13.69) ($p<0.0001$) compared to Control group (202.5mg±34.95) ($p<0.0001$) **Conclusion:** USG guided EPS block reduced the need of additional analgesic during 1st 24 hr after cesarean section, decrease the severity of pain and prolong the demand for rescue analgesia during postoperative period.

KEYWORDS

Erector Spinae Plane Block, Cesarean Section, Analgesia

INTRODUCTION

A major surgical procedure like a caesarean section entails significant post-operative pain, which can range from moderate to severe.(1–3) If this pain is not adequately managed, it can cause morbidity, interfere with breastfeeding and the mother's ability to bond with her baby, as well as put her at risk for thromboembolism due to her immobility. To encourage early ambulation, newborn care, and the avoidance of post-operative morbidity, it is crucial to provide good post-operative analgesia. (4)

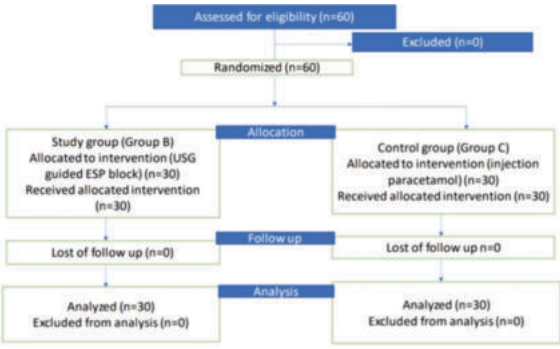
The pain of a caesarean section has two components: somatic (due to the incision in the abdominal wall) and visceral (from the uterus). The abdominal wall incision causes a significant amount of pain for patients. Nonsteroidal anti-inflammatory drugs alone may not be enough to treat post caesarean section pain. Although systemic or neuraxial opioids are effective in the treatment of post-operative pain, they are associated with a number of side effects such as nausea, vomiting, pruritus, constipation, and respiratory depression. Currently For post-Caesarean pain relief, multimodal analgesic techniques such as abdominal nerve blocks and truncal blocks with parenteral analgesics are becoming more popular**.** (5)

A novel interfacial plane block, USG guided Erector spinae plane (ESP) block, has recently been described as an effective post-operative analgesia technique in a variety of surgeries. ESP block 1st described by Forero et al for analgesia in Thoracic neuropathic pain at T5 Transvers process. (6) The drug is deposited in the musculofacial plane between the erector spinae muscle and the transverse process, blocking the ventral and dorsal branches of the spinal nerves as well as the communicating branches.(7) In an ESP block, the LA extends cephalad and caudally, achieving a paravertebral spread of three and four vertebral levels cranially and caudally respectively, allowing for extensive somatic and visceral analgesia. TAP blockade, on the other hand, provides only somatic analgesia with no visceral blockade. (3)

USG guided ESP block is superior to paravertebral block because it is a simple, safe, and straightforward technique with superficial anatomical landmarks. Because the paravertebral block is anatomically close to the pleura and the central neuraaxial system, the chances of complications are higher than with the ESP block.(7) (8)

Because there are so few clinical trials evaluating the efficacy of this block in post operative pain after Caesarean delivery, we decided to conduct this research to determine the effectiveness of USG guided ESP block in caesarean section. Therefore, we hypothesise that ESP block will lower the requirement for further analgesics during the first 24 hours following a caesarean section, lessen the intensity of pain, and prolong the need for rescue analgesia during the postoperative period when administered as part of multimodal analgesia.

MATERIAL AND METHODS



The current study, titled "Analgesic Efficacy and Safety of Ultrasound Guided Erector Spinae Plane Block after Cesarean Section - A Prospective Randomized Controlled Study," was conducted from April 2021 to October 2021 at the Department of Anaesthesiology, Government Medical College and S.S.G. Hospital, Vadodara. The Hospital Ethical Committee approved the study protocol for this prospective randomised controlled trial. This study is approved by Institutional Ethics Committee for Biomedical and Health Research (IECBHR). The reference number is IECBHR/52-2021. The CTRI

number is 2021/05/033746. It was a prospective randomized (sealed envelope method) controlled double blind study of 60 ASA I or II patients undergoing elective or emergency caesarean section under spinal anaesthesia. The observed data is presented as mean + SD. To determine the difference in results between two groups, all quantitative data was analysed using paired and unpaired student t tests, and qualitative data was analysed using the chi-square test.

Patients who are undergoing caesarean section were eligible for enrollment if they met the following criteria:

Inclusion Criteria:

1)Singleton, full-term pregnancy 2)ASA Physical condition, I or II. 3)Scheduled for elective LSCS under spinal anaesthesia.

Exclusion Criteria:

1)Patients' refusal and inability to comprehend the study protocol. 2)Spinal anaesthesia contraindication. 3)Severe PIH 4)Patients with impaired renal and liver function, uncontrolled diabetes, severe cardiovascular and respiratory disease. 5)Allergies to any of the study drugs 6)Infection, trauma, scar, or sinuses at the site of the blockage 7)BMI > 35 kg/m2 8)If the patient is put under general anaesthesia at any point during the operation.

The current study included 60 patients (30 per group) in order to achieve a mean difference in time of first rescue analgesic effect of 3 hours with 3.5 SD at 95% confidence and 80% power. The above assumption was derived from a pilot study of 16 patients. Preoperative evaluation of the parturients was done using routine tests such as haemoglobin, blood urea, and serum creatinine. Random blood sugar, bleeding time, and clotting time tests were performed as needed. If necessary, a special investigation into the specific case was conducted. Informed & Written consent was obtained for anaesthesia and ESP block. During the pre-operative evaluation, patients were counselled and informed about the nature of the procedure, the study, and the VAS score before providing written consent.All patients were divided into two groups using the sealed envelope method.

1)Group B: ESP block with 30 ml inj. 0.25% Levobupivacaine [15 mL on each side]

2)Group C: no block (control group)

Anaesthesia machine, resuscitation drugs, airway equipment and suction apparatus were checked before the procedure. A good venous access was established using an 18G IV cannula, and all patients were preloaded with 10ml/kg of ringer's lactate solution prior to induction. Patients were placed supine on the operating table, with a left lateral tilt and a multipara monitor attached. All the baseline parameters including noninvasive blood pressure (NIBP), electrocardiography (ECG), heart rate, and Spo2 were observed and recorded before induction. All parturients were given injection ondansetron 0.08mg/kg IV and injection ranitidine 0.5-1mg/kg IV. All patients were given spinal anaesthesia in the left lateral position with 2 ml of 0.5% heavy bupivacaine under strict aseptic and antiseptic precautions. At the conclusion of surgery, Group C patients were given a 100ml infusion of paracetamol.

Figure:1

At the conclusion of surgery in the operation room, the study group B received USG guided ESP block. All baseline parameters including non-invasive blood pressure (NIBP), electrocardiography (ECG), heart rate and Spo2 were observed and recorded.The patient was in the lateral decubitus position, and a broadband linear array ultrasound probe (8 to 14 Hz frequency) was used. A linear ultrasound transducer probe was placed at the mid vertebral line in the sagittal plane under all aseptic and antiseptic precautions at the level of T9.[figure :1] The transducer probe was moved 3-4cm laterally from the midline to visualise back muscles, including the trapezius above, rhomboid major in the middle, and erector spinae in the bottom, as well as the transverse process . [figure:2]

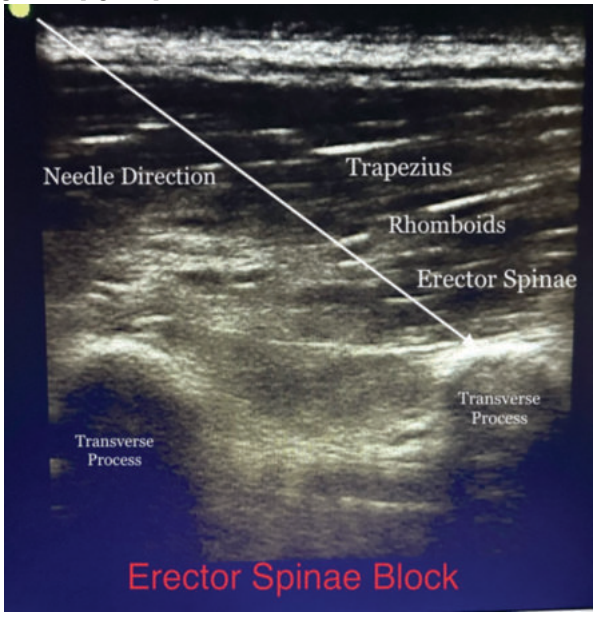


Figure:2

The 22G bevel needle was inserted from cranial to caudal, in plane with the US transducer, towards the TP until it touched the TP, crossing all three muscles. The needle was then gently withdrawn, and hydrodissection of the plane was achieved by injecting 2 ml of normal saline and lifting the erector spinae muscle. Thereafter, 15 ml of 0.25% Levobupivacaine was injected. The same procedure is performed on the contralateral transverse process.[figure:3]

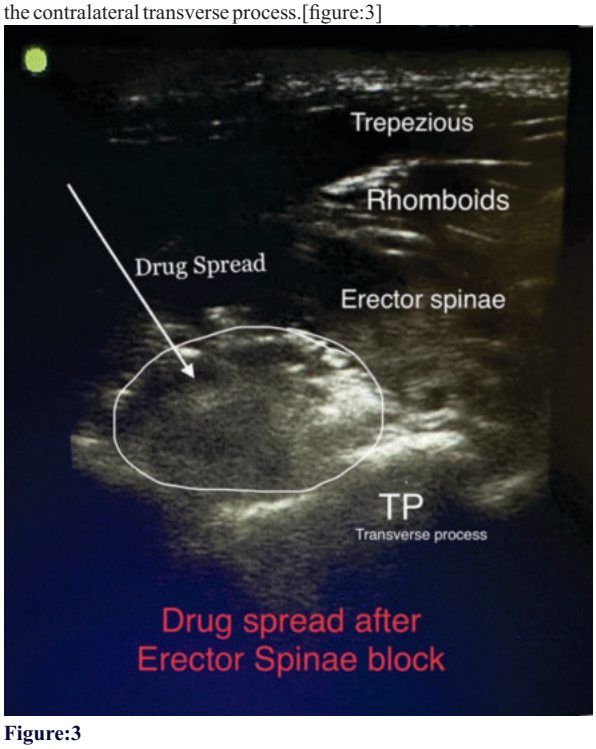


Figure:3

The post-operative pain relief was evaluated using a 10-point visual

analogue scale (VAS), which is the most widely employed technique for assessing the intensity and relief of acute pain. Both groups were evaluated for VAS score at 2,4,6,8,12,18, and 24 hours after surgery. When the VAS score exceeds 4, it is time to start the analgesic. When the VAS score was greater than 4, rescue analgesia was administered in the form of Inj. Diaclofenac aq.75 mg I.V. The total analgesic requirement over the first 24 hours, vital parameters such as pulse rate [PR], systolic blood pressure [SBP], diastolic blood pressure [DBP], oxygen saturation [SPO2] at baseline, during procedure, at 15,30,45,60 mins, and at 2,4,6,8,12,18,24 hour. We also observed complications such as Bradycardia, Hypotension, and Tachycardia, as well as local anaesthetic toxicity, accidental intravascular injection, and hematoma formation at the injection site.

OBSERVATION AND RESULTS

In our study of 60 patients (30 patients each group),we observed that both groups were comparable in terms of age, weight, height, and ASA physical status ($p > 0.05$; statistically insignificant) (Table 1). At 2 hours, the mean VAS score in both groups was 0. It had no statistical significance. As a result, at 6,8,12,18 hours after ESP block, the VAS score in group B was 4. There is no need for rescue analgesia. VAS score > 4 in group C at 8, 12, 18, and 24 hours. Furthermore, except for the second hour, the VAS score in group C was significantly higher than in group B at all time intervals. (Table 2) The time it took for the first rescue analgesic dose to be administered was significantly longer in group B than in group C. Group B had a time of 22.53+2.40 hours and Group C had a time of 7+1.36 hours. ($p < 0.001$)(Table 3). The mean cumulative diclofenac Aq. requirement in group C was significantly higher than in group B. In group B, the total dose of diclofenac required in 24 hours was 77.5± 13.69 mg, while in group C it was 202.5± 34.95 mg. ($p < 0.001$) (Table 4) There was no statistically significant difference in the mean pulse rate, SBP,DBP, and SPO2 between the two groups when comparing intragroup and intergroup data. ($p>0.05$). There were no complications among the patients in Group B or Group C.

Table 1: Demographic Data

TIME	AT REST	AT REST	P value
2 hr	0	0	>0.05
4 hr	0	2.3± 0.46	>0.05
6 hr	0	3.5±1.1	>0.05
8 hr	0.46± 0.86	4.13 ± 1.56	<0.001
12 hr	2.23 ±0.43	4.33 ± 1.68	<0.001
18 hr	2.93 ± 0.73	4.96 ± 1.86	<0.001
24 hr	4.2 ± 0.96	5.7 ± 2.00	<0.001

Table 2: VAS Scores

Parameter	Group B	Group C	Intergroup p value
Number of patients	30	30	>0.05
Age (years) (Mean ± SD)	25.46+3.82	25.1+3.05	>0.05
Weight (kg) (Mean ± SD)	55.73+5.55	55.33+6.01	>0.05
Height(cm) (Mean + SD)	153.46+3.07	153.4+3.55	>0.05
ASA I	13 (43.33%)	18 (60.00%)	>0.05
ASAII	17 (56.67%)	12 (40.00%)	>0.05

Table 3 – Time To First Rescue Analgesia (In Hour) (Mean + SD)

ESP Block	GROUP C	P value
77.5 ± 13.69	202.5 ± 34.95	<0.001

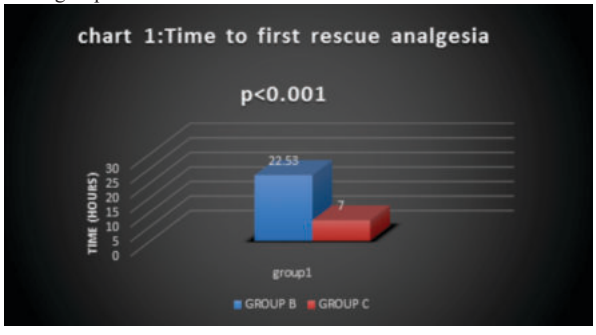
Table 4 – Cumulative Diclofenac Aq. Requirement After 24 hour (In Mg) (Mean + SD)

ESP Block	GROUP C	P value
22.53±2.40	7 ± 1.36	<0.001

DISCUSSION

Pain has a wide range of effects on the body, and poorly controlled post-operative pain can have deleterious physiologic and psychological consequences, potentially increasing morbidity. High doses of opioid anesthetic agents can blunt endocrine and metabolic responses following surgery and are associated with dizziness, nausea, vomiting, constipation, and respiratory depression.(9–11)Multimodal analgesia techniques, including regional analgesia, have become commonplace. The selection of analgesic combinations should be based not only on their analgesic efficacy but also on their side effect profile. As a result, even if an analgesic regimen provides better pain relief, it may not be clinically beneficial if it is also associated with more adverse events.(10) Nonsteroidal anti-inflammatory drugs may not be enough to treat post caesarean section pain. Opioids, whether systemic or neuraxial, are effective for treating post-operative pain, but they have a number of side effects.(9) Local anaesthetic infiltration is also used to relieve pain, but it is not efficient for long-term analgesia. For these patients, multimodal analgesia techniques combining abdominal field block with parenteral analgesia becoming increasingly popular.(12)Forero et al. recently described ultrasound-guided ESPB at the 5th thoracic vertebra as a successful unilateral complete sensory blockade, effectively spreading local anaesthetic from C7-T1 to T8.(6)Because the erector spinae muscle extends throughout the lumbar region, a lower-level ESPB can also provide abdominal analgesia.(13)Ivanusic et al. conducted a cadaveric study to look into the mechanism of action of erector spinae blockage. (14)When 20 cc of fluid were injected at the T7 TP, a cadaver model showed that it spread to the level of the C7-T 2 vertebra levels cranially and the L2-3 vertebra levels caudally. (3)

In this block, the drug is deposited in the musculofacial plane and it spreads craniocaudally , allowing for substantial somatic and visceral analgesia. (15)TAP blockage provides just somatic analgesia and no visceral blockade. (3,16)So the erector spinae is made up of muscles and tendons that go across the cervical, thoracic, and lumbar regions, it provides analgesia during shoulder arthroscopy , Thoracic surgeries such as breast surgery, costal fracture, and thorcoscopic lobectomy at the T4-T5 level, Upper abdominal surgeries such as bariatric surgery, laproscopic cholecystectomy, ventral hernia repair at the T7-T8 level, Lower abdominal surgeries such as LSCS, abdominal hystrectomy at the T9-T10 level, and Hip& Femur surgeries at the L2-L3 level. (17)Because of its safer pharmacological profile, levobupivacaine has been utilised more frequently in clinical anaesthetic practise in recent years. Levobupivacaine's minimal cardiovascular and neurological toxicity has prompted us to use it as a local anaesthetic in this study. (18)According to Tulgar et al., in three patients having various types of abdominal surgery, the analgesic impact of an ESP block lasted for 17, 16, and 13 hours.Additionally, Hamed et al discovered that an ESP block's analgesic impact lasted for 12 hours in patients having abdominal hysterectomy.(19)In their study, Malavat et al. described the possible analgesic benefit of ESP block. Among these are: It is a safe and reliable substitute for any other form of pain management because it includes the ultrasonic target, which is represented by a transverse process that is readily visible, and injection sites in the musculofascial plane, which is distant from the pleura, neuroaxis, and major vascular structures.(3)We chose the USG-guided procedure to avoid complications that are more likely with the blind method. Furthermore, it provides real-time vision of the needle tip and relevant anatomical structures, enhancing the margin of safety and decreasing the risks of failure.. first rescue analgesic dose to be administered in Group B had a time of 22.53+2.40 hours and Group C had a time of 7+1.36 hours. Our results are in consonance with Mohamed Ahmed Hamed et al 2020,(17) Our results are similar to this study (GRAPH-2). In terms of mean pulse rate, mean systolic blood pressure, mean diastolic blood pressure, and SPO2, both groups were comparable. There was no significant difference in hemodynamic monitoring between the two groups. We found no complications such as bradycardia, hypotension, tachycardia, or local anaesthetic toxicity in either group.



CONCLUSION

USG guided EPS block reduced the need of additional analgesic during 1st 24 hrs after cesarean section, decrease the severity of pain and prolong the demand for rescue analgesia during postoperative period.

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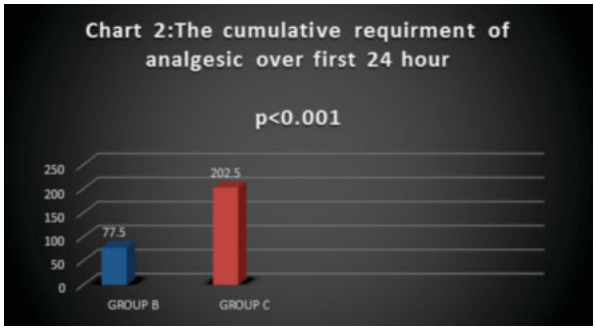
Conflict Of Interest : none



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