



Evaluate the Feasibility of Surgical Transversus Abdominis Plane Block for Postoperative Analgesia After Cesarean Section

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Abstract

Background Transversus abdominis plane (TAP) block is a fascial plane block providing postoperative analgesia after lower abdominal surgeries including Cesarean section. Conventionally, it is administered under ultrasound guidance or by blind technique. We studied a novel transperitoneal surgical TAP block for providing safe and effective analgesia after Cesarean section through transverse incision.

Methods A hundred patients who fulfilled the inclusion criteria were included in the study after obtaining informed written consent. They were randomized in two groups: Group A with surgical TAP block and Group B without TAP block as control. Surgical TAP block was administered by transperitoneal route before the closure of peritoneum with 0.25% bupivacaine (dose adjusted with weight of the patient), and visual analogue score was assessed by a blind assessor. Time for rescue analgesia was noted and analyzed with the ‘two independent sample *t* test.’

Results The duration of postoperative analgesia in hours was significantly longer in the TAP block group compared with the control group (5.14 ± 1.63 vs 2.61 ± 0.89 , $p < 0.001$). There was no reported complication of the surgical technique or any adverse effect of the used drug.

Conclusion Surgical TAP block via the transperitoneal route is a safe, easy and effective mode of providing postoperative analgesia after Cesarean section. This technique does not need any costly specialist equipment, overcomes the technical limitations of ultrasound-guided TAP block and can be used in obese patients also. It has almost no side effects, and the technique can be easily mastered.

Keywords Transversus abdominis plane block · Cesarean section · Bupivacaine · Rescue analgesia

Background

The transversus abdominis plane (TAP) block is an established and effective mode for providing postoperative analgesia after lower abdominal surgeries including Cesarean section. The transversus abdominis plane is a fascial plane between the internal oblique and transversus abdominis muscle containing the nerves arising from the anterior rami of T10 to L1 (intercostal, subcostal, iliohypogastric and ilioinguinal). Pain after Cesarean has essentially two components: somatic (due to abdominal wall incision) and visceral (from the uterus). A substantial component of pain experienced by the patient is derived from abdominal wall incision, and TAP block is said to provide analgesia by blocking somatic component of pain [1].

Conventionally, the TAP block was performed by a blind technique subcutaneously by inserting a needle into the skin over the lumbar triangle of Petit. A two ‘pop’

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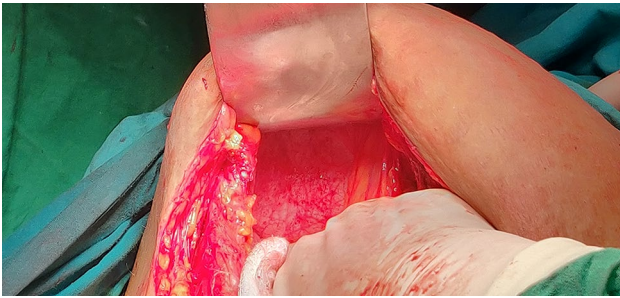


Fig. 1 Depicting the landmark for needle puncture

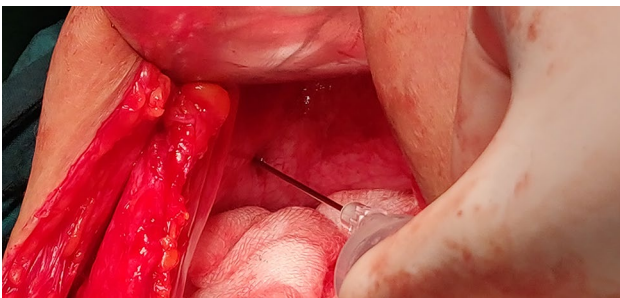


Fig. 2 Depicting the needle puncture

technique is employed, the needle passes through the external oblique and then penetrates the internal oblique to enter the transversus abdominis plane. Injection of a local anesthetic solution in this plane will act on the nerve bundles in this plane and provide analgesia. This blind TAP block is now replaced by ultrasound-guided TAP block in which the needle placement is confirmed under vision. The ultrasound TAP block is time-consuming, requires a good resolution ultrasonography machine, requires training and has a limited role in obese patients.

The surgical TAP block technique is described by Owen et al. [2] which has several advantages over the blind and ultrasound-guided techniques. We followed this technique with a few modifications. After achieving hemostasis at the uterine incision closure, the anterior abdominal wall was elevated with a Deaver retractor (Fig. 1). A sponge was inserted in the paracolic gutter to pack the bowels away. The lateral border of the rectus sheath was palpated indirectly locating the inferior epigastric vessels. A blunted spinal needle 22G was inserted under vision until there was an appreciable loss of resistance ‘pop’ (Fig. 2). After careful aspiration (to avoid accidental intravascular injection), 0.25% bupivacaine was injected in a dose calculated as 0.25 ml/kg; any signs of toxicity were noted. The surgeon now moves to the other side of the table to administer the contralateral block. The under-vision placement of the needle ensures that there is no inadvertent damage

to viscera, and this technique can be easily performed in obese patients also.

Hence, this study was undertaken to assess the feasibility of surgical TAP block in postoperative analgesia after Cesarean section.

Materials and Methods

After obtaining institutional ethics committee approval, 100 patients requiring lower segment Cesarean section were included in this prospective double-blind study. Informed written consent was obtained from all patients.

Patients were excluded from the study if they had American Society of Anaesthesiologists (ASA) status III and above, known allergy to the drug used, thrombocytopenia, requiring general anesthesia, local infection at the site of injection and if vertical abdominal incision was required. Patients with height < 150 cm and > 180 cm were excluded as they require a different dosage of drug for spinal anesthesia.

Randomization of the patients was done with random envelopes mentioning the group of study. The patients were blinded to the allocation. Group A received TAP block with 0.25% of bupivacaine in a dose of 0.25 ml/kg. Group B served as a control with no TAP block. No postoperative analgesia was given for both the groups. Postoperative pain was assessed by a blinded observer, and visual analogue score (VAS) (0 = no pain and 10 = worst possible pain) was observed every hourly till 24 h post Cesarean section. Rescue analgesia was administered on demand and at VAS 3; 75 mg of diclofenac sodium aqueous was administered intramuscularly. The two independent sample ‘*t* test’ was used for statistical analysis.

There was no anticipated major risk except a small theoretical chance of any hematoma formation at the site of injection. To remove any bias, 2 cc of 0.5% bupivacaine heavy was the fixed dose for spinal anesthesia [3, 4] for patients whose height was between 150 and 180 cm. A team of three obstetricians was trained for administration of the TAP block in Group A patients. Patients who required any additional analgesia during the closure of abdomen were excluded from the study. Administration of TAP block before abdominal closure provides an overlap between the receding action of spinal bupivacaine and the peak of anesthetic action of bupivacaine in the abdominal plane. Both groups did not receive any other analgesia both during and after the surgery. A blinded observer for postoperative pain assessment reduced the bias and ensured the double blinding.

Results

A hundred patients were recruited in the study, 50 received surgical TAP block and 50 served as control.

Both the groups were comparable with the patient characteristics of height, weight and BMI (Table 1).

The BMI prior to Cesarean section depicts the comparable body habitus between the two groups. The mean height of the patients in both the groups was 155–156 cm, and hence, the fixed-dose spinal anesthesia with 2 cc of 5% bupivacaine was adequate.

The duration of postoperative analgesia in hours was longer in the TAP block group (5.14 ± 1.63) versus the control group (2.61 ± 0.89). Two independent sample *t* test was used for statistical analysis (Table 2) and the difference was significant ($p < 0.001$).

There was a theoretical small risk of surgical site hematoma formation during the study; however, no such complication was observed in the study group. There was no observed side effect of the drug bupivacaine.

The patients in the study group were found to be more comfortable for 4–7 h during the postoperative period and had improved breastfeeding experience as per the feedback received from these mother at time of discharge from hospital.

Discussion

TAP block has a definite role in multimodal analgesia following Cesarean section [2, 5]. The conventional blind TAP block technique has paved the way for the more appropriate ultrasound-guided TAP block [6]. TAP blocks are known to provide postoperative analgesia comparable to that provided by intrathecal diamorphine after Cesarean section [2]. TAP block reduces the somatic component of postoperative pain and hence has better analgesic effect.

The surgical TAP block has been found to be effective in prolonging the time required for rescue analgesia as compared to the study group. The transversus abdominis plane has poor vascularity, and hence, the action of the drug is prolonged. There were no side effects and no complications during the study.

Table 1 Profile of both groups

Characteristic	Mean \pm SD		P value
	Group A TAP block (n = 50)	Group B control (n = 50)	
Height (cm)	156.47 ± 3.98	155.78 ± 3.91	0.380
Weight (kg)	69.69 ± 11.77	66.47 ± 9.62	0.137
BMI	28.46 ± 4.75	27.35 ± 3.52	0.187

Table 2 Duration of analgesia

	Mean \pm SD		P value
	Group A TAP block (n = 50)	Group B control (n = 50)	
Duration of postoperative analgesia (h)	5.14 ± 1.63	2.61 ± 0.89	$p < 0.001$

There was a technical difficulty in one patient where the uterus was plastered to the anterior abdominal wall due to previous Cesarean delivery. The surgical TAP block could not be performed in this patient. This may be considered as a limitation for this technique and study.

The more established technique of ultrasound-guided TAP requires significant training, costly machinery and has documented limitation in obese patients [7, 8]. The ultrasound-guided TAP block is more used by the anesthesiologists, whereas the surgical TAP block is surgeon oriented. There are bound to be legal issues with the use of ultrasound machine in obstetrics with filling of necessary forms and requisitions especially in India.

The novel surgical technique that we studied has opened a new avenue for the obstetrician for postoperative analgesia. Surgical asepsis is easily maintained, and there is no risk of damage to abdominal viscera and inferior epigastric vessels. Surgical TAP block can facilitate earlier mobilization of the women and hence reduce the risk of thromboembolic events [9]. Effective postoperative analgesia is going to facilitate early breastfeeding and mother–baby bonding [10]. The routine feedback of the postpartum women at the time of discharge from the hospital revealed that the patients in the TAP block group had early ambulation and early breastfeeding experience. Also worthwhile is to mention that none of the women required any opioid analgesics as a rescue medication.

The surgical TAP block is economically feasible as cost of spinal needle, syringe and 0.25% bupivacaine add to less than 400 rupees. The surgical TAP block can be used effectively in women who undergo Cesarean section under general anesthesia [8]. These patients were excluded in the present study to avoid bias due to drugs used for general anesthesia.

The limitations of this study is not comparing the duration of Cesarean section in both the groups. Increase in the duration of Cesarean section will result in increase in the overlap of anesthetic action of spinal bupivacaine and TAP block. Prolonged Cesarean section require additional intravenous anesthesia, and these patients were excluded from the study and thereby reducing the selection bias. The study of pain and VAS as a marker of postoperative comfort of the patient is also a minor limitation of the study. Use of comfort scoring systems in the postoperative assessment would make the results more convincing. Fixation of spinal anesthesia dose based on height can be a limitation, as this dosing schedule is contested in the literature [11].

This technique of surgical TAP block can be used effectively for other abdominal surgeries including hysterectomy and laparotomy. Conventionally, epidural catheters are placed for almost all hysterectomy and laparotomy,

but surgical TAP block can have a definite role in patients where epidural blocks are contraindicated. TAP block has found to be effective for analgesia after laparoscopy also [12, 13].

Use of surgical TAP block as a part of multimodal analgesia with parenteral analgesics is the need of hour. Multimodal analgesia reduces the dose requirement and the side effects of supplemental analgesics [5, 14].

The surgical TAP block technique should be propagated to penetrate all levels of health care including rural settings where easy access to ultrasound for TAP block may not be possible. The authors have currently undertaken research to study the increase in duration of analgesia with the surgical TAP block by using drugs like ropivacaine and using additives like dexmedetomidine [15] and dexamethasone [16] to bupivacaine. The authors propose more extensive use of surgical TAP block during Cesarean section as a part of multimodal analgesia by obstetricians.

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Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical Approval The study was approved by the Institutional Ethics Committee.

Informed Consent Informed written consent was obtained from all patients for being included in the study.

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