

Anterior approach of abdominal field block at linea semilunaris: A surgically assisted novel technique for postoperative analgesia in cesarean section

ABSTRACT

Context: Post Caesarean pain is described as moderate to severe. Although advances in the new analgesics techniques, no current standard exists for optimizing and managing. Taking into consideration of acute post Caesarean pain, this novel technique of surgically assisted anterior abdominal field block at linea semilunaris have proved considerable analgesic potential along with multimodal analgesia.

Aims: Although advances have been made in the understanding of the pathophysiology and in the development of new analgesics, patients still suffer from moderate-to-severe post-Cesarean pain. Taking into consideration the consequences of pain, this anterior approach to abdominal field block technique was performed to minimize acute pain experienced during post-Cesarean section.

Settings and Design: Prospective observational study design.

Materials and Methods: In the present study, a total of 120 parturients undergoing cesarean section (CS), after closure of uterine incision were included. We intraoperatively, under all asepsis, performed surgically assisted abdominal field block at linea semilunaris, by bilaterally injecting 20 mL 0.25% bupivacaine on each side, in addition to standard analgesic 100 mg diclofenac suppository. Each patient was assessed at 0, 4, 8, 12, and 24 h after surgery, by an independent observer for pain using NRS 0–10 and the time of the first demand for analgesic diclofenac paracetamol and its side effects.

Statistical Analysis Used: The entire data is statistically analyzed using Statistical Package for Social Sciences (SPSS ver. 21.0, IBM Corporation, USA) for MS Windows. The categorical variables were compared using Wilcoxon's signed-rank test.

Results: Of the total 120 patients, it is worth noting that none of the patients had severe or worst pain. The percentage of patients who did not require analgesia were (96.7%) at 4 h, (81.7%) at 8 h, (77.5%) at 12 h, and (90.8%) at 24 h. The mean analgesic consumption of paracetamol diclofenac on 4, 8, 12, 16, and 24 h after CS was significantly less. No patient required opioid supplementation. Patient satisfaction was high and was early ambulated.

Conclusions: There is considerable potential for anterior approach abdominal field block, (linea semilunaris block) to comprise an effective component of a multimodal regimen for post-Cesarean section analgesia and is easy to perform within limited resources.

Key words: Abdominal field block; bupivacaine; Cesarean section; linea semilunaris

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Introduction

Considering the acute post Cesarean pain, this novel technique of surgically assisted anterior abdominal field block at linea semilunaris technique was performed. The aim of this study was to assess the efficacy of linea semilunaris abdominal field block for post caesarean section analgesia. The primary objective was to assess the duration of pain relief and requirement of rescue analgesia. Although advances have been made in the development of new analgesic techniques, no current standard exists for optimizing and managing post-Cesarean pain, which is described as moderate-to-severe.^[1-3] As a part of the multimodal analgesia regime, opioids having undesired side effects have created an opportunity for truncal blocks like ilioinguinal-iliohypogastric block, rectus sheath block, transversus abdominis plane [TAP], ultrasound-guided quadratus lumborum block (QLB1, QLB2, QLB3), and local anesthetic infiltration to gain momentum.^[4-9]

Taking into consideration acute post-Cesarean pain, this novel technique of surgically assisted anterior abdominal field block at linea semilunaris technique was performed. The primary objective was to assess the duration of pain relief and the requirement of rescue analgesia postoperatively.

Subjects and Methods

Following approval from the Institutional Ethics Board, and written informed consent provided by all patients for inclusion, this prospective observational study was carried out in pregnant patients ASA I and ASA II status (American Society of Anesthesiologists), posted for elective and emergency CS done under spinal anesthesia (SKNMC/Ethics/App/2018/432). The study duration was 8 months.

One hundred and twenty ($n = 120$) patients undergoing lower segment CS with Pfannenstiel incision, were given spinal anesthesia under all aseptic precautions using 2.2 mL of 0.5% bupivacaine, heavy and adequate level of anesthesia was achieved. We intraoperatively performed abdominal field block by anterior approach, after the closure of uterine incision and achieving hemostasis. After the closure of uterine incision, anterior rectus sheath was retracted cranially by the surgeon [Figure 1a]. Under all aseptic precautions, anterior approach interfascial plane block was given by an anesthesiologist using a 22G hypodermic needle attached to the 10 mL syringe [Figure 1b]. A needle was inserted at linea semilunaris above rectus muscle at 10 to 20° angulations posterior to horizontal plane, directing towards Petit triangle of iliac region and second injection towards the lumbar region at 3 o' clock on one side and 9 o' clock

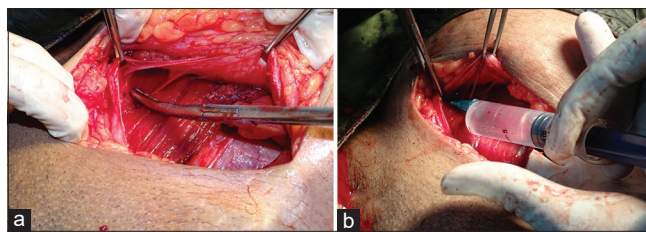


Figure 1: Anterior abdominal field block the linea semilunaris approach during the Cesarean section after the closure of uterus. (a) Surgical site anatomy showing retracted anterior rectus sheath, rectus abdominus muscle and linea semilunaris. (b) The needle tip is positioned above the rectus abdominus muscle, at linea semilunaris at which the local anesthetic is injected

position on the other side of the anterior abdominal wall, while the other hand was kept below the rectus muscle and peritoneum. A needle was inserted at linea semilunaris, from medial to lateral direction to place the tip below the anterior rectus sheath, in the myofascial plane, between the tendons of anterior abdominal muscles above and fascia transversalis and peritoneum below. In all the patients, 20 mL 0.25% bupivacaine was given either side after careful negative aspiration, with strict aseptic precautions. The surgical wound was closed. In all patients, post-Cesarean delivery, diclofenac suppository 100 mg was inserted as a routine standard postoperative analgesia.

Postoperative pain was assessed using the NRS score at 0, 2, 4, 8, 12, 16, 20, 24 h after block performance and rescue analgesic requirement post-Cesarean delivery at 0, 2, 4, 8, 12, 16, 20, 24 h was noted. All the patients were monitored for heart rate, systolic blood pressure, diastolic blood pressure, and mean blood pressure for 24 h.

Patients with NRS more than 4, were treated with injection paracetamol 1000 mg intravenously, if not relieved then with injection diclofenac sodium 75 mg, and further if not relieved then injection tramadol 100 mg intravenously as per patient's analgesic demand and severity of pain.

The sample size was determined prospectively using data from previous Cesareans performed under spinal anesthesia at our institute. Cadaveric dye injection study was done in fresh cadaver which showed the dye spread above fascia transversalis [Figure 2].

Results

Of the total of 120 patients included in this study, the mean \pm SD of the age of cases studied was 26.13 \pm 4.05 years; the minimum-maximum age range was 19–38 years. Forty percent had primi gravidity and 60% had multiparity. The distribution of mean \pm SD of weight and height was 69.24

+/- 9.12 kg and 157.49 +/- 6.44 cm, respectively. Of the 120 cases studied, 45 (37.5%) had previous LSCS, 20 (16.7%) had failure to progress, 9 PIH (7.5%), 18 twin pregnancy (15%), 69 (57.5%) had elective LSCS, and 51 (42.5%) had emergency LSCS. The distribution of mean +/-SD of heart rate, systolic BP, diastolic BP and mean BP was 87.75 +/- 12.6 per min, 123.1 +/- 11.5 mmHg, 73.7 +/- 8.9 and 90.1 +/- 8.7 mmHg, respectively.

After the action of spinal anesthesia wore off, the severity pattern of pain was assessed. All the patients reported adequate analgesia, reduced pain scores (NRS), reduced analgesic requirement, and reported early ambulation. Around 96% of the patients experienced no pain in the immediate postoperative hour after the effect of spinal anesthesia wore off (NRS = 0). Only 3.3% had mild pain with NRS of between 1 and 3 [Figure 3].

Even at the fourth postoperative hour, 34.2% of the cases had no pain (NRS = 0) but 62.5% showed mild pain with NRS of 1 to 3. Moderate pain was experienced by 1.7%, 3.3%, 15.8%, and 22.5% of the cases (NRS 4–6) at 2, 4, 8, and 12 postoperative hours, respectively. It is worth noting that none of the patients had severe or worst pain [Figure 4].

A total of 120 patients were included in the study, post-Cesarean delivery diclofenac suppository 100 mg was inserted as a routine standard postoperative analgesia. Rescue analgesia was given (NRS more than 4), with injection paracetamol and injection diclofenac, as per patient demand and those with severe pain were treated with injection tramadol.

Thus, percentage of patients not requiring analgesia at 0 h was (100%), at 4 h (96.7%) at 8 h (81.7%), and at 12 h (77.5%).

The mean analgesic consumption of paracetamol diclofenac on 4, 8, 12, 16, and 24 h after CS was significantly less. No patient in our study group had severe pain and required opioid supplementation. Patient satisfaction was high and was early ambulated [Figure 4].

Discussion

There has been a dramatic rise of CS in the past two decades making it the most commonly performed surgical procedure worldwide.^[1] The most recent American College of Obstetricians and Gynecologists (ACOG) committee's opinion on optimizing postpartum care published in 2016 cited pain as a considerable challenge for postpartum women. However, no current standard exists for optimizing

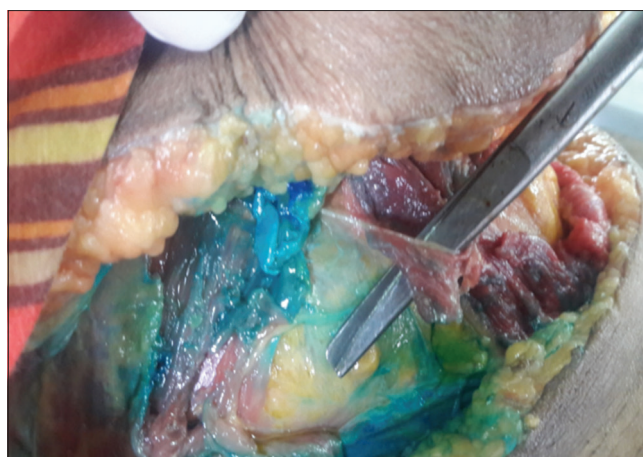


Figure 2: Cadaveric dye injection study in fresh cadaver showing dye spread above fascia transversalis

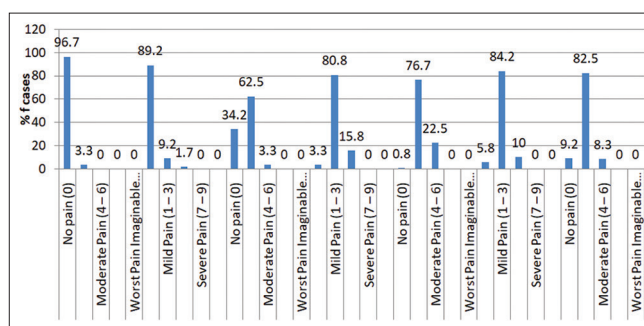


Figure 3: Distribution of NRS scoring (pain score). The distribution of intensity of pain scale (NRS) at 2 h, 4 h, 8 h, 12 h, 16 h, and 24 h has been compared with the intensity of pain at 0 h using Wilcoxon's signed-rank test. Pain score was mild-to-moderate from 4 h till 24 h but no patients had severe unbearable pain within 24 h

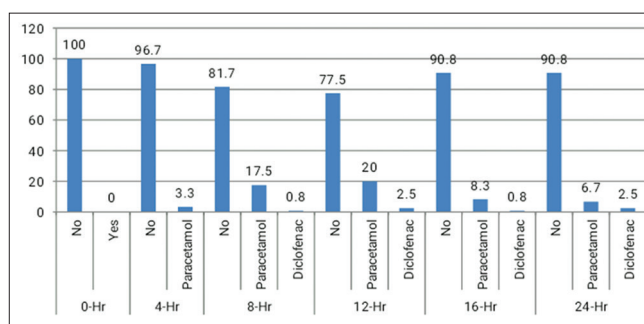


Figure 4: Distribution of analgesic required. The distribution of analgesic requirements at 4 h, 8 h, 12 h, 16 h, and 24 h has been compared with the analgesic requirement at 0 h using Wilcoxon's signed-rank test. Patients having an NRS score of more than 4 were treated with injection paracetamol 1 gm intravenous, injection diclofenac sodium 75 mg intravenous as per pain severity of the patients. No patient had severe pain NRS (more than 6) that required injection tramadol or fentanyl as rescue analgesia

and managing post-Cesarean pain which is described as moderate-to-severe by most patients.^[2] Although advances have been made in understanding the pathophysiology of post-Cesarean pain and the development of new analgesics and delivery techniques, many patients still suffer from

moderate-to-severe pain.^[3] The analgesic regimen should provide safe, effective analgesia, with minimal side effects for the mother and baby. As a part of the multimodal analgesia regime, opioids used via intravenous, epidural, and intrathecal routes are associated with undesired side effects and created an opportunity for truncal blocks. Pain after CS is challenging and has two components: somatosensory pain originating from the cutaneous, subcutaneous, and muscular layers of the incision site and viscera-peritoneal inflammatory pain of viscera and deeper peritoneal layers.^[9] Moreover, intraoperative repeated traction will induce muscle spasm that adds to the intensity of postoperative pain.

The trauma of managing pain following CS can be difficult. Regional nerve block techniques such as epidural analgesia, landmark-based, and USG-guided TAP block, quadratus lumborum block, ilioinguinal and iliohypogastric nerve blocks, and local infiltration, have offered effective and promising results.^[4-9] Also, they reduce the need for supplemental analgesia.^[10] The analgesic regime should be effective, safe, and devoid of side effects. Over the recent years, there has been growing interest in regional nerve block techniques with promising results in efficacy as they reduce supplemental analgesic requirements, thereby reducing incidence of drug-related side effects.^[11-13] TAP block and various types of QL blocks are relatively new abdominal nerve blocks, recently introduced with excellent efficacy in various abdominal surgeries including CS.^[10-17]

The rectus sheath is the durable, resilient fibrous compartment containing both the rectus abdominis muscle and the pyramidalis muscle. The fascial coverings of the external oblique, internal oblique, and the transverses abdominis muscles comprise the rectus sheath. The arcuate line is an area of demarcation, residing at one-third distance between the umbilicus and the pubis, a gradual transition zone where the fibers of the posterior sheath disappear. Below the arcuate line, the anterior sheath is comprised of all the three fascial layers of the lateral abdominal wall musculature, leaving only transversalis fascia covering the posterior aspect of the rectus abdominis muscle and the pyramidalis muscle.^[18]

In our novel approach, for patients undergoing CS under spinal anesthesia, anterior abdominal field block was offered by injecting the local anesthetic drug with the needle insertion point at linea semilunaris below the arcuate line, being anterior to the rectus muscle. All patients were supplemented with 100 mg diclofenac suppository. This demonstrated effective analgesia, reduced severity of pain at rest and movement, delayed demand of first postoperative analgesia and reduced requirement of analgesics in the first 24 h after

surgery. The proposed mechanism of action may be due to the spread of the analgesic drug in the interfascial plane between internal oblique and transversus abdominis muscle, involving iliohypogastric and ilioinguinal nerves, or the spread along fascia transversalis posteriorly towards quadratus lumborum muscle as it was seen in three cadaveric dye study. Blockade of A-delta and C fibers in fascia, the muscle, and parietal peritoneum are responsible for intense nature of analgesia.

Moreover, we did not encounter any block related complications in any patient and our sample size was enough to assess the safety. There were some limitations to this study that needs discussion. First, we employed surgical assistance and open landmark technique for performing the block that needs strict aseptic precautions by the anesthesiologist. Second, ultrasound guidance can be employed to locate the needle and improve certainty and safety.^[19] However, ultrasound guidance for regional anesthesia has not been conclusively demonstrated to improve safety.^[20] Third, there was no control group against which efficacy of analgesia by our technique was compared.

The merit of our technique is that safety was provided as it was done under vision and putting one hand below the rectus muscle and peritoneum which avoided bowel puncture. Various TAP blocks can provide somatic analgesia while quadratus lumborum block can provide somatic as well as visceral analgesia of both anterior abdominal block but it requires expertise and technical skill.

This study observed the analgesic benefit of the anterior interfascial plane block when employed with standard postoperative analgesia after CS under spinal anesthesia. Interfascial plane block, anterior approach of abdominal field block given intraoperatively offers excellent analgesia, due to the spread of local analgesics in various directions. Predominant somatic pain was very well relieved by anterior interfascial plane block and visceral pain at its worst did not appear to be prominent and was relieved by paracetamol and diclofenac. Patient satisfaction was high. In our opinion, the anterior interfascial plane block was effective in providing analgesia with substantial reduction in NRS score as evidenced by fewer requirements of analgesics during 24 h post-Cesarean section when used as adjunctive to standard analgesia. It has been proved to have potentials to become an important tool in managing postoperative pain in CS patients in view of easy and safe technique.

Conclusions

There is a considerable potential for anterior approach abdominal field block, (Linea semilunaris block) to comprise

an effective component of a multimodal regimen for post-Caesarean section analgesia and is easy to perform.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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