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Hasnaa Gamal Khafagy
Anesthesiology, Surgical Intensive Care and Pain Management Department, Faculty of Medicine, Tanta University, Egypt

Marwa Ahmed Abogabal
Anesthesiology, Surgical Intensive Care and Pain Management Department, Faculty of Medicine, Tanta University, Egypt

Amir Abouzkry Elsayed
Anesthesiology, Surgical Intensive Care and Pain Management Department, Faculty of Medicine, Tanta University, Egypt

Hoda Alsaid Ahmed Ezz
Anesthesiology, Surgical Intensive Care and Pain Management Department, Faculty of Medicine, Tanta University, Egypt

Ayman Abd El-Maksoud Yousef
Anesthesiology, Surgical Intensive Care and Pain Management Department, Faculty of Medicine, Tanta University, Egypt

Corresponding Author:
Hasnaa Gamal Khafagy
Anesthesiology, Surgical Intensive Care and Pain Management Department, Faculty of Medicine, Tanta University, Egypt

Regional anesthesia after cesarean section

Hasnaa Gamal Khafagy, Marwa Ahmed Abogabal, Amir Abouzkry Elsayed, Hoda Alsaid Ahmed Ezz and Ayman Abd El-Maksoud Yousef

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Abstract
Effective postoperative analgesia significantly influences patient recuperation and outcomes following caesarean delivery. Multimodal analgesics is the fundamental idea for caesarean section and pain control. Ultrasonic-guided quadratus lumborum blocks (QLB) are extensively utilised for postoperative pain relief for individuals following elective caesarean sections. US-guided QLB are more effective than transversus abdominis plane (TAP) blocking for patients undergoing caesarean section. Tap blocks may serve as a rescue intervention for patients experiencing moderate to severe postoperative pain following caesarean delivery. Erector spinae plane block is relatively new in the obstetric population. Also, it gives somatic Analgesia and Possibly provides visceral analgesia.

Keywords: Cesarean section, regional anesthesia, erector spinae plane block, transversus abdominis plane, quadratus lumborum blocks

Introduction
Effective post-operative analgesia following a caesarean section (CS) is essential as it influences the specific healing needs of the parturient. Despite the introduction of novel analgesic techniques and medications for post-caesarean analgesics in the past decade, a review of the literature indicates that we remain distant from attaining the objectives of optimal post-operative analgesia [1]. Historically, prevalent techniques encompassed systemic opioid administration, including intramuscular injections, patient-controlled intravenous analgesics (PCIA), and neuraxial injections throughout regional anaesthesia [2]. Regional anaesthesia is highly recommended in non-obstetric surgical contexts as a component of multimodal analgesics approaches. Regional anaesthesia enhances analgesics and reduces postoperative opioid consumption. Furthermore, the application of regional anaesthesia may be advantageous in alleviating intense incisional pain or for those predisposed to severe acute pain [3].

Pain management after cesarean section
CS is the most commonly executed surgery in several nations, and its prevalence has risen in recent decades. Spinal anaesthesia is acknowledged as the preferred method for both emergent and elective caesarean sections. The primary drawback of spinal anaesthesia is the lack of enduring postoperative analgesics, necessitating the prescription of supplementary analgesic medications postoperatively to ensure effective and sustained pain management [4]. Puerperal individuals experiencing discomfort encounter difficulties in ambulation and may assume an antalgic posture that complicates breastfeeding. Consequently, adjunct medications may be combined with local anaesthetics to improve the efficacy of spinal anaesthesia and extend postoperative pain relief. The predominant method employed at now is the combination of local anaesthetics with opioids [4].
Insufficient management of postoperative pain may substantially raise morbidity in individuals undergoing surgery, which can result in a longer recovery and an impaired ability to resume normal daily activities. When a woman is expected to care for her infant shortly after undergoing surgical treatment, it is essential that she recovers as quickly as possible. There is a correlation between inadequate pain management after CS and an increased incidence of chronic pain and post-traumatic stress disorder, according to research that was carried out in settings with high incomes [5].

In developing nations, postoperative pain management is particularly challenging due to patients' expectations of pain, which discourage them from seeking relief, and the high patient/nurse ratio that restricts pain evaluation and administering of sufficient analgesics [5].

Regional analgesia

Regional anesthetics administers analgesic agents, typically local anaesthetics, with or with no additive, right away to the peripheral nerves. The application of regional anaesthesia diminishes the likelihood of Persistent Post-Surgical Pain (PPSP) in comparison to traditional analgesics [6].

Abdominal wall blocks

In Over the last ten years, novel abdominal truncal blocks, such as TAP and rectus sheath blockage, have gained prominence [7].

The TAP blockage delivers analgesics via the obstruction of the subcostal nerve (T_{12}), seventh through eleventh intercostal nerves (T_7-T_{11}), as well as the iliohypogastric and ilioinguinal nerves (L1-L2). It is possible to provide these blockages in the form of an infusion or as a single dose for prolonged efficacy. They may be positioned under direct visualisation utilising US imaging or laparoscopic techniques. Truncal blocks typically comprise a local anaesthesia, with or no adjuvant. Generally, morphine and fentanyl don't enhance analgesic quality but elevate side symptoms, whilst clonidine, dexamethasone, and ketamine may boost analgesic duration but are linked to adverse side effects due to systemic absorption [8].

Ultrasound identification of TAP

US-guidance is now regarded as the benchmark for peripheral nerve blockage. A linear probe is typically sufficient for the majority of TAP blockages. A convex probe is recommended for TAP blockages in significantly obese people [9, 10].

Identifying the TAP is important for executing an US-guided TAP blockage. The recommended scanning procedures are as follows [11].

- Position the transducer transversely just inferior to the xiphoid process to identify the bilateral rectus abdominis and the linea alba.
- Obliquely rotate the transducer and laterally displace it, maintaining parallelism with the costal edge. At this level, the TAP is situated between the rectus abdominis and transversus abdominis, or it may be absent in certain instances due to the transversus abdominis terminating at the lateral edge of the rectus abdominis.
- It is necessary to move the transducer laterally down the costal border till the linear semilunaris (LS) aponeurosis, which is situated laterally to the rectus abdominis, is apparent. In relation to the LS, the internal oblique (IO) and external oblique (EO) muscles are located laterally next to one another. To begin, it is necessary to recognise the three layers of the abdominal muscles, which are the TA, the IO, and the EO, organised in decreasing depths. The TA may be found below the TAP, which is located above it.
- It is necessary to do a vertical scan between the costal border and the iliac crest, after which the transducer should be shifted laterally towards the midaxillary line. In most cases, there are just three layers of muscle visible. The TA muscle and the IO muscle are the two muscles that are located between the TAP.
- When the transducer is positioned posteriorly, the IO and TA converge into a common aponeurosis that is linked to the lateral edge of the QL. This aponeurosis is recognised as the thoracolumbar fascia. Located between the IO and the TA, the TAP is related to the aponeurosis and is located in the middle of the body [12, 13].
- Blocking of the subcostal TAP. The TA is identified as the more hypoechoic muscle layer that is placed right beneath the rectus abdominis (RA). This is seen in (Figure 1 A) and is further explained in steps (1) and (2). The administration of the local anaesthesia takes place between RA and the TA, medially to of the LS. [11] (Figure 1 B).

If the TA terminates at the lateral edge of the rectus abdominis, the local anaesthetic may be administered between the TA and the IO, laterally to the LS. However, it may be more effective for injections from beneath the RA towards the lateral aspect to enhance the success rate. Shibata *et al*. proposed that lateral TAP blockades ought to be indicated solely for lower abdominal surgeries due to the restricted extent of sensory blockade [14].

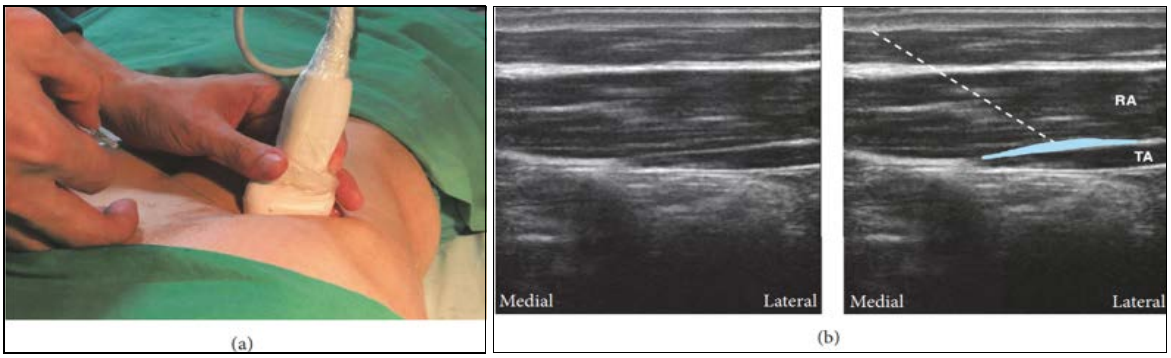

Fig 1: The transversus abdominis plane (TAP) block is performed using a subcostal technique. (a) The location of the probe and the direction of the needle). Near the xiphoid, the probe is positioned in a parallel fashion to the costal edge. It is put into the plane of the needle. b) The ultrasound pictures that match to the condition. Local anaesthetic is placed in this plane to cover the upper TAP plexus, which is located between the rectus abdominis and the transversus abdominis. The TAP is located between these two muscles. The needle's path is shown by the dashed white line. A light blue area represents the locations where the local anaesthetic was deposited. RA stands for the rectus abdominis, while TA stands for the transversus abdominis. [11]

Quadratus lumborum (QL)

The QLB was initially delineated by Blanco [15]. The QLB is presently utilised as a perioperative pain control technique for all age groups after abdominal surgery [16, 17].

The many QLBs might be regarded as US-guided modifications of the original landmark posterior TAP blockage via the triangle of Petit. The spinal nerves' ventral rami traverse the anterior surface of the QL, allowing for the possibility of the blockage to include T_7-L1 [18]. The primary mechanism that acts for the blockage is believed to be thoracic paravertebral spread. It is possible for the local anaesthetic to spread posteriorly to the transversalis fascia and into the thoracic paravertebral region because the transversalis fascia, which surrounds the TAM and the thoracic QL, is contiguous with the endothoracic fascia inside the thoracic cavity. Nevertheless, this distribution was not validated in all of the cadaveric study that was conducted. When it comes to all of the US-guided abdominal wall blockages, the QLBs probably have the most substantial potential for both visceral and somatic analgesia [19].

U.S. Following the identification of the three layers of abdominal wall muscles, the transversus aponeurosis is followed posteriorly until it is visible. This allows for the detection of the QL. The peritoneum in this area normally curves away from the muscles from the anteriorly to the posteriorly, and the retroperitoneal fat is located posterior to the peritoneum and deep to the transversalis fascia [20]. (Figure 2)

The retroperitoneal fat is located just above the iliac crest, and it becomes more noticeable as it moves closer to the iliac crest. By modifying the probe somewhat caudally into the pelvis, it is possible to better see the retroperitoneal fat as well as the tapering end of the transversus aponeurosis. In many cases, the QL is situated in the middle of the aponeurosis of the TA muscle. [20].

Fig 2: Position of the probe for the anterior QLB. Directly above the iliac crest, the convex probe had been connected in a vertical position. [21]

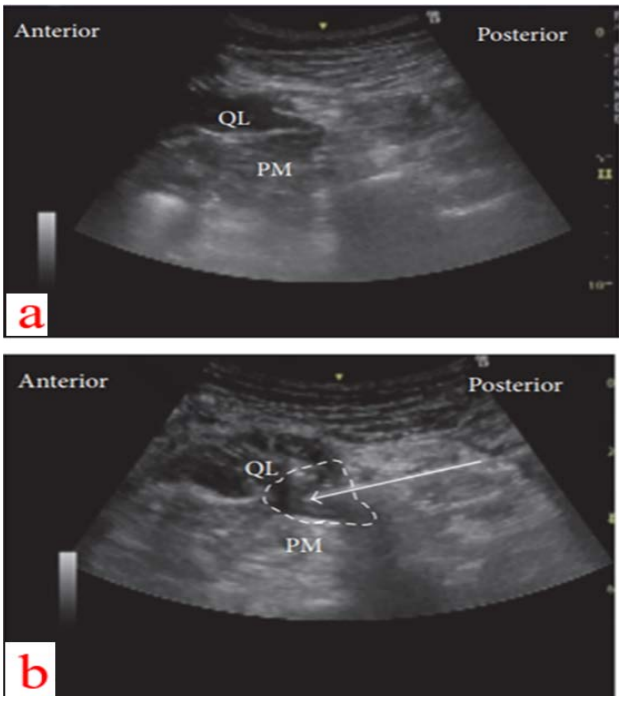

Fig 3: Ultrasonic images of the anterior QLB. (A) pre- and (B) post-injections are both included. QL is for the quadratus lumborum, PM stands for the psoas muscle, the white arrow represents the needle trajectory, and the white dotted line represents the spread of the local anaesthetic. [21]

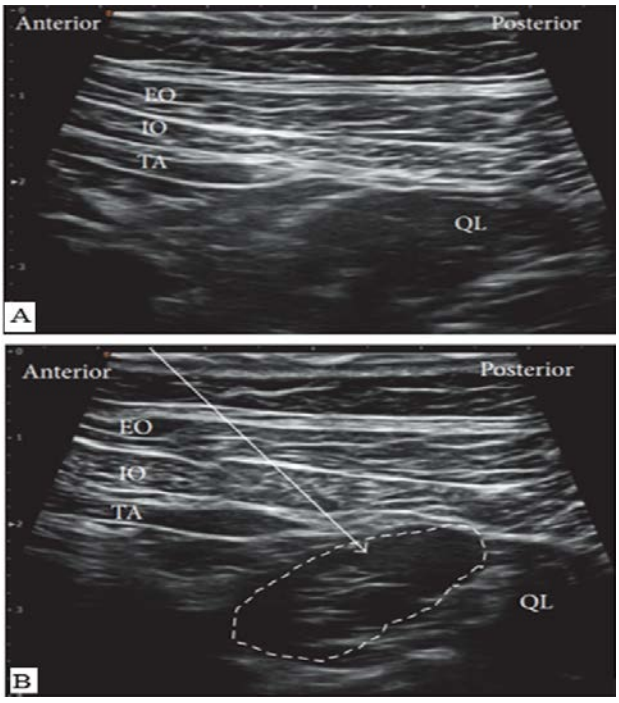

Fig 4: Lateral QLB photos obtained using ultrasonography. Both (A) pre- and (B) post-injections procedures are included. White arrows represent the needle trajectory, while white dots represent the distribution of the local anaesthetic. EO stands for the external oblique muscle, IO stands for the internal oblique muscle, TA stands for the transversus abdominis, and QL stands for the quadratus lumborum [21].

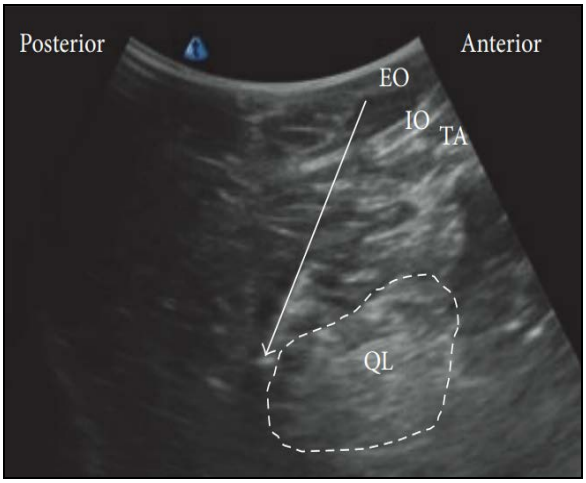

Fig 5: Images of the posterior QLB using ultrasonography. Two types of injections are (A) pre-and (B) post-injections. EO is for the external oblique muscle, IO stands for the internal oblique muscle, TA stands for the transversus abdominis, QL stands for the quadratus lumborum, the white arrow represents the needle trajectory, and the white dotted line represents the distribution of the local anaesthetic [21]

Erector spinae plane (ESP) block

The ESP blocks might possess analgesic efficacy for abdominal surgeries, such as hysterectomy, nephrectomy, and laparotomies, and has additionally been utilised for analgesics in rib fractures and chronic pain conditions. Present data in abdominal surgical procedures is confined to case reports endorsing its application for laparoscopic ventral hernia repair [22].

A high-frequency linear ultrasonic transducer is typically employed for thoracic blockade, whereas a convex transducer is utilised for lumbar blockade [23].

In order to find the spinous process, the probe is positioned in a transverse orientation. Immediately after the level has been determined, the probe is pushed laterally by three centimetres until the transverse process is found. In order to perform the transverse operation, the probe has to be positioned in a parasagittal plane and then rotated through a full 90 degrees [24].

It is necessary to identify three muscles as being superficial to the hyperechoic shadow of the transverse process. These muscles are the rhomboid major (RM), the trapezius, and the erector spinae (Figure 6). The three muscles are shown at the fifth thoracic vertebra, which is the normal level for a thoracic block. However, the RM muscle is no longer visible at the seventh thoracic vertebra in lower blockages. This shows that the thoracic block is not as effective as it might be.

A location inside the plane has been assigned to the needle. Depending on the specifics of the situation and the region that has to be treated, the method may be performed in either the cranio-caudal or the opposite direction. Furthermore, the blockage may be administered in the form of a single injection or by the installation of a catheter for continuous infusion, with the transverse process being the goal of the blockage. Saline solution should be used to execute hydro dissection, and the local anaesthetic should be delivered in the fascial plane, deeper compared to the ESM near the tip of the vertebral transverse process [24]. (Figure 6, Figure 7).

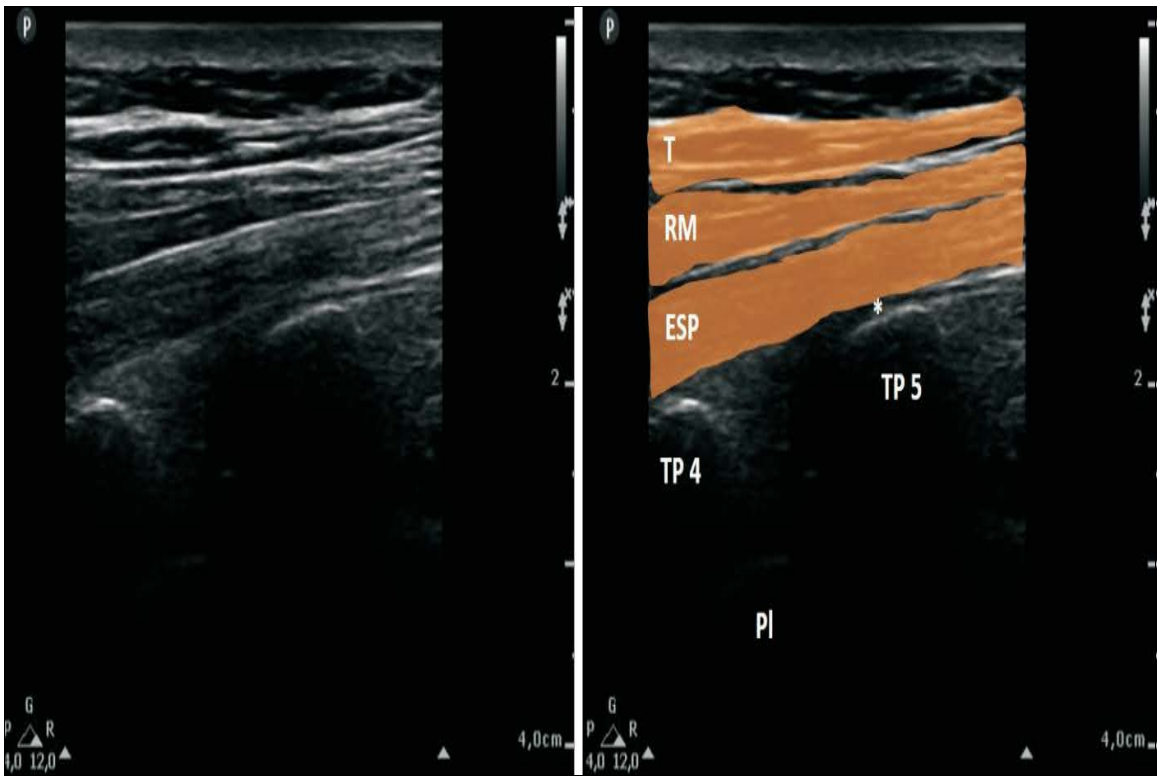

Fig 6: Sono anatomy of the ESP block at T_5 level. TP: Transverse Process, T: Trapezius, Rm: Rhomboid Major, ESP: Erector Spinae, Pl: Pleura. *Needle tip place [24]

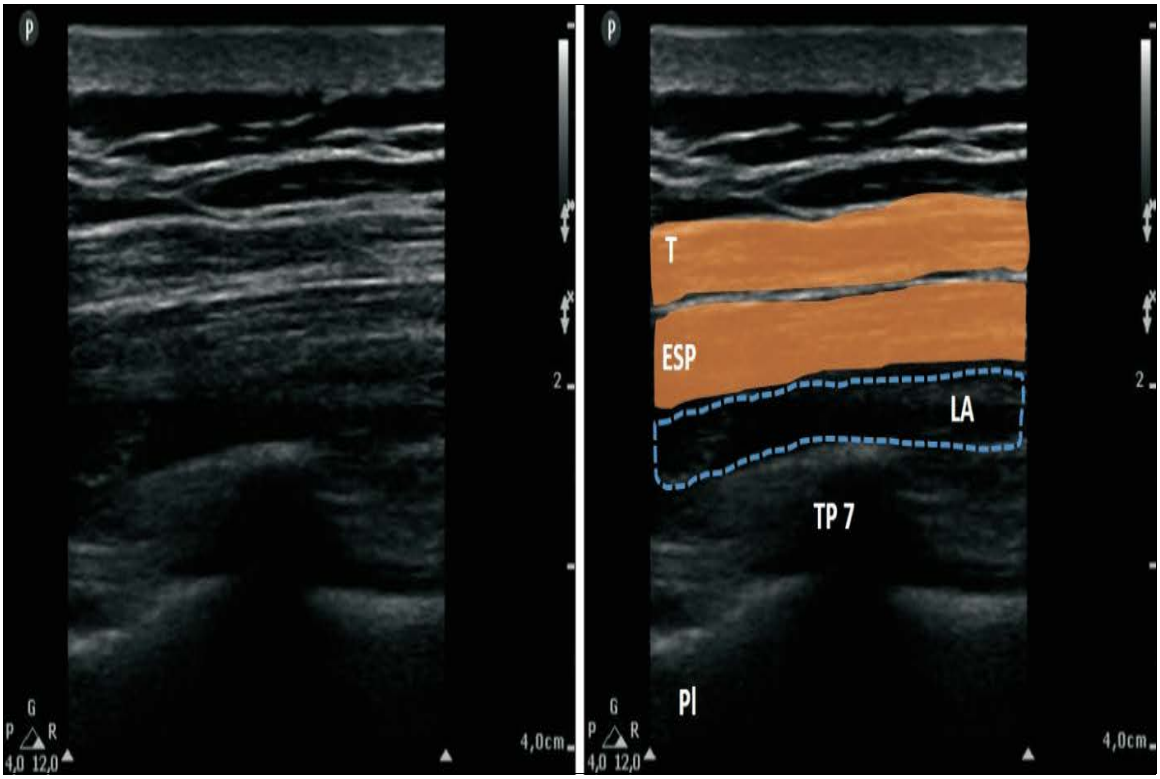

Fig 7: Sono anatomy of ESP block at T_7 level with LA diffusion shown in the dashed area. T: trapezius, ESP: erector spinae, LA: local anesthetic, TP: transverse process, Pl: pleura [24].

Conclusion

Effective postoperative analgesia after a caesarean section is crucial for maternal recovery, enabling quicker return to daily activities and infant care. While advancements in analgesic techniques like regional anaesthesia have reduced opioid consumption and improved pain management, optimal outcomes remain challenging. Ultrasound-guided blocks, including transversus abdominis plane (TAP), quadratus lumborum (QL), and erector spinae plane (ESP) blocks, offer precise, targeted pain relief and prolonged efficacy with minimal side effects. However, resource limitations and patient expectations in developing nations hinder effective pain management. Addressing these disparities through innovative approaches and widespread adoption of regional techniques can significantly enhance recovery and improve quality of life for mothers globally.

Conflict of Interest

Not available

Financial Support

Not available

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