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Case report

Ultrasound guided quadratus lumborum block for congenital diaphragmatic hernia repair : A case report

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Abstract

Perioperative use of ultrasound for various nerve blocks has gained popularity and is being widely used with precision for analgesia throughout the perioperative period. Quadratus lumborum block is a novel block that has been successfully used for various upper as-well-as lower abdominal surgeries as an anesthetic and analgesic technique as a single shot or a continuous infusion technique inserting a catheter. This analgesic technique has been described sparsely in the literature especially for neonates. We report a case of two days old child who was diagnosed as a left-sided congenital diaphragmatic hernia and was planned for surgical repair of the hernia. Ultrasound-guided quadratus lumborum block was planned for analgesic technique in this neonate to reduce opioid requirements and related complications. In the operating room, after induction of anesthesia and endotracheal intubation, the neonate was placed on lateral position. Using a high-frequency linear probe, scanning was done from anterior abdominal wall identifying the abdominal muscles namely external oblique, internal oblique, transversus abdominis from above below. On further scanning posteriorly the visualization of quadratus lumborum, psoas major, transverse process and latissimus dorsi muscle, which was the endpoint of scanning and deposition of local anesthetics. Bupivacaine 0.5% 1.8ml was injected between the planes of psoas major and quadratus lumborum muscle. This resulted in low dose opioid requirement in the postoperative period and satisfactory pain scores. This opioid sparing analgesic technique as ultrasound-guided quadratus lumborum block can be used for congenital diaphragmatic hernia repair for postoperative pain management and possible early extubation and reduction of post-op pulmonary complications.

Keywords: Analgesia ; Congenital Diaphragmatic Hernia ; Neonates ; Quadratus Lumborum block ; Ultrasound

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Introduction

Blanco was the first person to describe Quadratus lumborum block [1] in the year 2007, since then different authors have described various approaches at different times namely QL 1, 2, 3, and 4. Quadratus lumborum block provides excellent analgesia following abdominal surgeries in all age groups. With the use of Ultrasound, the complications can be minimized and potency increased. The block can be given at different points to achieve analgesia for different levels and it can also be given either single shot [2] or as a continuous infusion technique inserting a catheter. [3]

Case Report

Two days old child, weighing 3.5 kg, a referred case with a diagnosis of left-sided congenital diaphragmatic hernia was planned for surgical repair of the hernia. During a pre-anesthetic checkup, the child had difficulty breathing, nasal flaring, respiratory distress, scaphoid abdomen and was only maintaining a saturation of 82-84 % in room air. Oxygen supplementation was given with a headbox which showed improvements in Saturation to 88-92%. Preoperative biochemistry reports were within the normal range, a chest radiograph showed bowel shadow and multiple air-fluid levels on the left side of the chest. Echo-cardiography showed dextro position of heart, secundum type atrial septal defect of 2.2mm size, left to right shunt, trace tricuspid regurgitation with normal pulmonary artery pressure. The parents were counseled and consent was taken. The child was kept nil per oral as per hospital protocol.

On arrival to the operation, theatre monitors were attached as per ASA standard. An intravenous line was checked for patency and induction was initiated with intravenous propofol 10mg, fentanyl 4microgram, and succinylcholine 6mg and airway secured with 3.5 mm internal diameter uncuffed endotracheal tube. The child was then turned to right lateral position. Under all aseptic precautions and using a high-frequency linear probe of 5-12 Hz, scanning was started from the anterior abdominal wall to visualize external oblique, internal oblique, transversus abdominis muscle from above below, further scanning was continued posteriorly to visualize quadratus lumborum, psoas major, transverse process and latissimus dorsi muscle and that was the endpoint of scanning. Using the in-plane technique transmuscular Quadratus lumborum (QL3) block with 1.8 ml of 0.25 % bupivacaine was deposited. The child was turned back to the supine position and surgery was performed which lasted for 60 minutes with an uneventful period. With a tube in situ, the child was transferred to the surgical intensive care unit and gradual extubation was done after achieving adequate tidal volume. The same level of monitoring was continued postoperatively.

Postoperative pain assessment was done with the Neonatal Infant Pain Scale (NIPS) scoring system hourly for the first 6 hours and then 4 hourly for the remaining 24 hours. Intravenous paracetamol 50 mg six hourly and fentanyl 5 microgram as rescue analgesia was advised. In the first 24 hours, the child received the first dose of fentanyl 5 microgram 22 hours following surgery as the NIPS score was more than 3. Feeding was started on 2nd postoperative day and the chest drain was taken out the same day. Rest postoperative periods were uneventful and the child was discharged home on 7th postoperative day.

Figure 1 : USG Image showing QL block and related structures .QL-Quadratus Lumborum, PM-Psoas Major, TP-Transverse process,ES- Erector spinae, LD-Lattissimus Dorsi.

DISCUSSION

The first description of the quadratus lumborum block was given by Blanco in the year 2007. This block provides excellent peri-operative analgesia following abdominal surgeries in all age groups.[4] Different approaches and techniques have been described with the level of analgesia at different decades. Four different types have been described according to the site of drug deposition namely QL 1, 2, 3, and 4.[5] Table 1 shows the site of drug deposition and level of block achieved. [6]

Chakraborty et al [7]used continuous QL block through a catheter following nephrectomy surgery performed in a pediatric patient with a diagnosis of Wilms' tumour. In our case we only gave a single shot QL 3 block after intubation but prior to start of surgery which provided an excellent peri-operative period.

Baidya et al [8]gave a single shot QL 3 for pyeloplasty and they achieved successful post operative analgesia , similarly our patient was pain free for almost 22 hours post operatively.

Vasanth Rao Kadam[3] published a study regarding QL block as a postoperative analgesic technique for laparotomy in a 66 yrs ASA 3 patient scheduled for duodenal tumour excision and gave QL block for post operative analgesia which showed convincing results , similarly our study also showed excellent post operative analgesia with the use of single shot QL block.

Liu Y et al[9] published a case report, Ultrasound guided quadratus lumborum block for an opiod - free congenital diaphragmatic hernia repair and successfully performed quadratus lumborum block in a 3 day old child , similarly our patient was also a 2 days old child and quadratus lumborum block was a mode of analgesia.

	QL "1" (Lateral QL)	QL "2" (Posterior QL)	QL "3" (Anterior/ Transmuscular QL)	QL "4" (Intramuscular)
Patient Position:	**Supine**	**Semi lateral/ Lateral.**	**Lateral**	**Supine**
LA Deposition :	**Below the tapering of Transversus abdominis aponeurosis ,lateral border of Quadratus lumborum muscle.**	**At the posterior border of QL muscle.**	**Between Quadratus lumborum muscle and Psoas major muscle.**	**In the Quadratus lumborum muscle.**
Level of Analgesia :	**T7 - L1**	**T7 - L1**	**T10 - L4**	**T7 - T12**
Paravertebral spread :	**-**	**Yes**	**Yes**	**-**

Table 1 : Showing local anaesthetic agent deposition site and level of block achieved.

The pain assessment in the surgical intensive care unit (SICU) for neonates in our institute is assessed using NIPS (Neonatal Infant pain scale) scoring system and it is a routine assessment tool for neonates in post operative period.

Drug	Age (month)	Initial dose(mg/ml)	Maintenance dose (mg/kg/hr)
Bupivacaine	**0 - 6**	**0.5 - 1.0**	**0.2 - 0.25**
	>6	**1 - 2**	**0.25 - 0.5**
Ropivacaine	**0 - 6**	**0.5 - 1.5**	**0.2**
	>6	**1 - 3**	**0.4**
Lidocaine	**0 - 6**	**2**	**0.2**
	>6	**2.5**	**0.4**

Table 2 : The table was adapted from Local Anesthetic dose in neonates and infants, Critical care pain 2004.

There hasn't yet been a fixed consensus regarding the dose of local anesthetic agent used in quadratus lumborum block in Pediatric patients. Different authors have used various doses of local anesthetic agent in QL block . Gozen Oksuz in their patient used 0.5 ml per kg body weight of local anesthetic agent , Chakraborty et al in their study used 0.2 ml per kg of local anesthetic agent as a bolus dose and 0.2 ml per kg per hour as a continuous maintenance dose , Baidya et al in their study used 0.5 ml per kg of local anesthetic agent , Liu Y et al in their case

report used 0.5 ml per kg of local anesthetic agent . Similarly we also used 0.5 ml per kg of local anesthetic agent in our patient. The maximum recommended dose of local anesthetic agent in neonates and pediatrics has been shown in table 2.

With regular use of ultrasound by a skilled anesthesiologist, quadratus lumborum block can be used as an effective alternative mode of analgesia in neonates as a single shot or continuous QL block. It provides adequate analgesia with a reduction in opioid requirements following upper and lower abdominal surgeries in pediatric patients as well. The quadratus lumborum block given with the use of ultrasound minimizes the complications and potentiates its efficacy in providing adequate postoperative analgesia. QL block if routinely practiced can be an alternative to epidural analgesia, paravertebral block, and TAP block [10] to achieve adequate postoperative analgesia.

In conclusion, **t**he peri-operative use of quadratus lumborum block can also be used as an analgesic technique to provide analgesia in neonates for the repair of congenital diaphragmatic hernia, however, we need a further randomized trial for the best approach among the different quadratus lumborum blocks to get a conclusive result.

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