

CASE STUDY

Quadratus Lumborum Block as Intraoperative Analgesic Treatment in Pediatric with Hirschprung's Disease

Pita Mora Lesmana¹, Marilaeta Cindryani Ra Ratumasa², I Made Subagiarta²,
Tjokorda Gde Agung Senapathi³

¹Resident, ²Lecturer, ³Associate Professor Anesthesiology and Intensive Therapy Department, Faculty of Medicine, Udayana University – Prof IGNG Ngoerah General Hospital

*Corresponden author : subagiarta@unud.ac.id

ABSTRACT

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Background: A 4-year-old boy diagnosed with Hirschsprung's disease since birth will undergo a planned Duhamel procedure. Internationally, the prevalence of Hirschsprung's disease is approximately 1 in 1,500 to 1 in 7,000 live births and usually requires immediate intervention through surgical procedures. The extended length of pediatric surgeries presents a unique challenge for anesthesiologists aiming to minimize the use of opioids, considering their less desirable effects in this patient population. In this case, we opted for the use of quadratus lumborum block (QLB) as intraoperative analgesia. This refers to a meta-analysis by Wen-li Zhao et al, all suggest that QL block offers more effective postoperative pain relief in children after lower abdominal surgeries.

Management: After the patient was intubated, we performed a quadratus lumborum block using an anterior approach as an intraoperative analgesia technique. The local anesthetic used was 0.375% ropivacaine + 4 mg dexamethasone, volume 10 ml on both sides. Dermatome covered anterior QL block includes T₄ to T₁₂-L₁, blocks the anterior and the lateral cutaneous branches of the nerves

Result: No additional opioid dose administered during the surgical procedure. **Conclusion:** The QLB in pediatric patients is quite effective in managing pain during surgery for patients undergoing the Duhamel procedure.

Keywords : QLB, Intraoperative Analgesic, Hirschprung, Pediatric

Background

Effective pain control during intraoperative abdominal surgery improves postoperative recovery, increases patient and parent satisfaction, reduces hospital length of stay, and reduces costs. Regional anesthesia has become an important component of pain management during surgical procedures in pediatric patients, due to its opioid-saving effect and improved perioperative outcomes. QLB block is an "interfascial layer block", first described by Blanco as a variation of the TAP block in 2007. Three types of QLB are described based on the location of local anesthetic deposits associated with the quadratus lumborum muscle (QLM). (1) In this case, we used an anterior approach, which will be explained further in the discussion section. Referring to a systematic review journal and meta-analysis conducted by Wen-li Zhao, et al, it is recommended to use the QL block for pediatric patients undergoing lower abdominal surgery. This recommendation is based on the limited research evidence at this time, which suggests that this method is an effective postoperative analgesic technique. (2) In this case, we also found the effectiveness of QL block as intraoperative analgesia in reducing opioid requirements in pediatric patients.

Hirschsprung's disease (HSCR) or congenital megacolon is a condition characterized by the loss of the ability to expand and contract the intestine due to the absence of ganglion cells in the myenteric (Auerbach) and submucosa (Meissner) plexuses. Internationally, the prevalence of Hirschsprung's disease (HSCR) is approximately 1 in 1,500 to 1 in 7,000 live births. (3) Hirschsprung's disease (HSCR) is considered a surgical emergency and requires immediate intervention via surgical procedures. Intra-operative pain management using QL blocks in pediatric patients appears

to be beneficial for this group of patients.

Case Presentation

A 4-year-old boy was diagnosed with Hirschsprung's disease at birth and was scheduled for Duhamel surgery. The patient was born spontaneously and immediately cried, weighing 3200 grams, body length 51 cm. Development history according to age. Current weight 11 kg, height 98 cm, with FLACC score 0/10. On preoperative physical examination, vital signs were good. There was a colostomy bag in the abdomen, no distension was found, and bowel sounds were normal. Laboratory examination was normal. The patient's physical status was evaluated as ASA II with Hirschsprung's disease. The patient is kept warm by using a heating mat. On the day of surgery, the patient is sedated using general anesthesia. Induction was carried out using sevoflurane, 20 mcg fentanyl, and 5 mg atracurium. After the patient was intubated, a quadratus lumborum block with an anterior approach was performed using ultrasound guidance, as shown in Figures 1 and 3. We used ultrasound with a linear probe, followed by ultrasound setting for pediatric abdominal imaging. The position during the QL block procedure can be seen in Figure 4. The Stimuplex is inserted at a depth of 8 - 10 cm for the anterior QL block using ultrasound guidance. The local anesthetic used was ropivacaine 0.375% + dexamethasone 4 mg, volume 10 ml on both right and left sides. The dermatome block in the anterior QL block can be seen in Figure 2. The operation lasted 4 hours. There was no addition of opioids during surgery. Postoperative analgesia was provided with paracetamol 150 mg every 8 hours intravenously and fentanyl 50 mcg in 0.9% NaCl 20 ml at a rate of 0.8 ml/hour with PICU care.

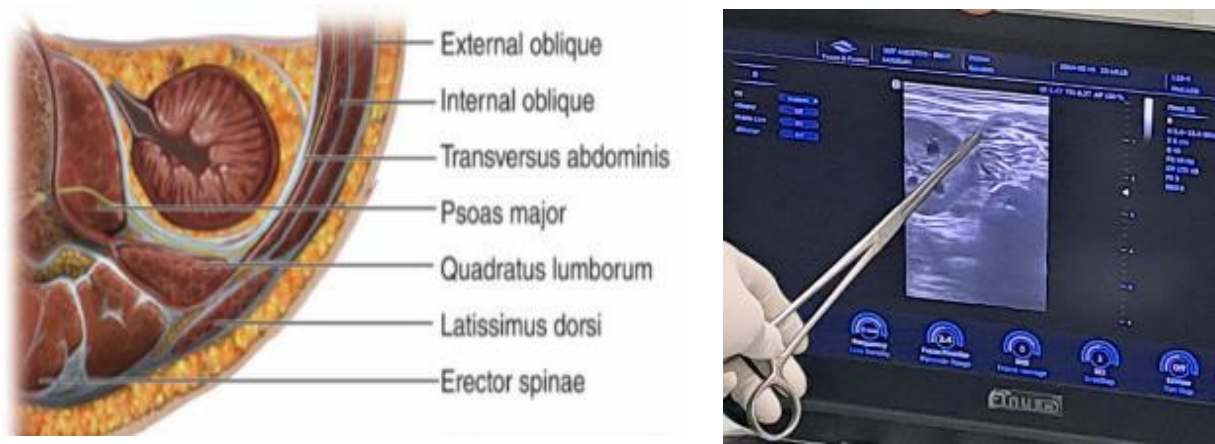


Figure 1. Position of Quadratus Lumborum on ultrasound

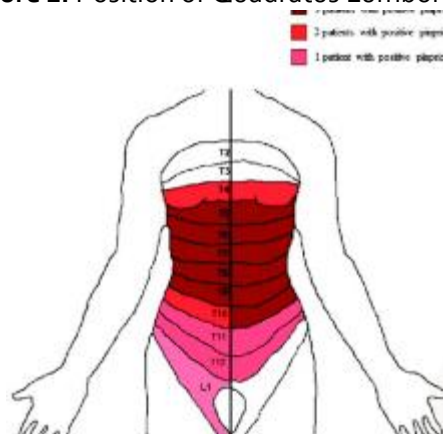


Figure 2. Blocked dermatomes in Anterior QL block: T₄ to T₁₂-L₁

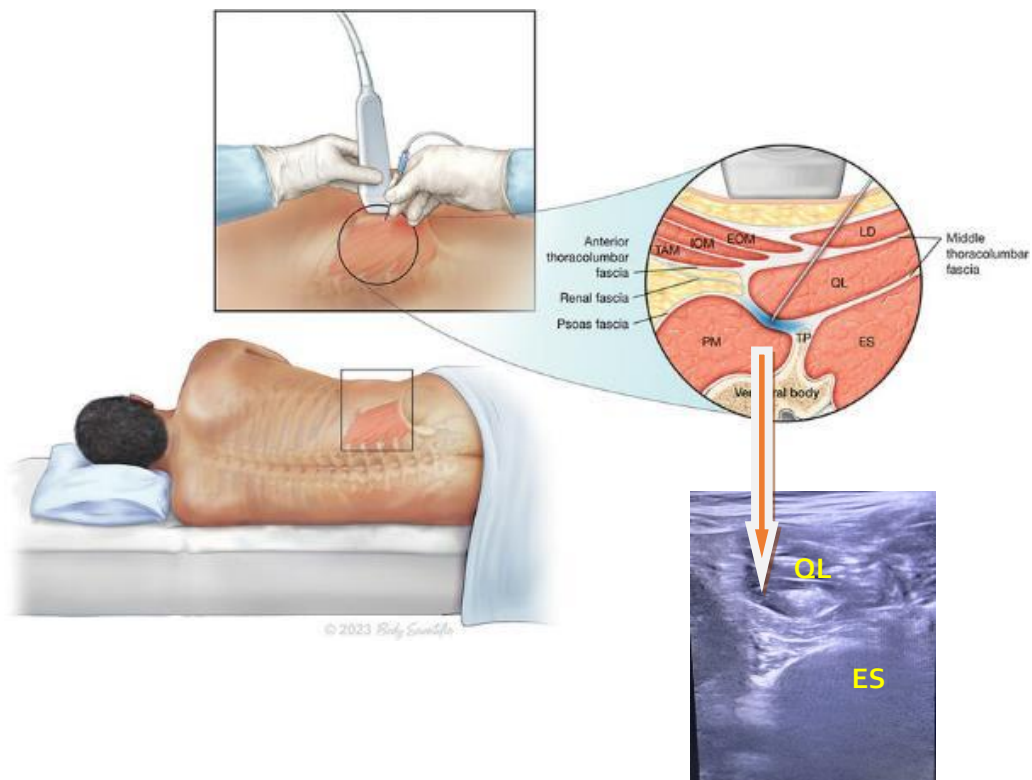


Figure 3. Quadratus Lumborum Block



Figure 4. Patient position when QL block is performed

Discussion

In this case, we used general anesthesia combined with QL block for Duhamel surgery. The combination of regional block with general anesthesia can reduce the intraoperative stress response thereby reducing catecholamine release. Regional blocks prevent nociceptive signals from the surgical wound from reaching the central nervous system thereby inhibiting endocrine and metabolic responses to surgery.

Preoperative management included administration of IV ketamine 5 mg and IV midazolam 0.5 mg as anti-anxiety agents. Induction was carried out using sevoflurane, fentanyl 2 mcg/kg, and atracurium 0.5 mg/kg. After the patient was intubated, the patient was positioned in the right and left lateral decubitus positions to undergo QL blocks on the right and left sides, respectively. QL block provides broad and long-lasting analgesia because this block can provide analgesia from T₄-L₁. The key to analgesia lies in the thoracolumbar fascia (TLF). The TLF is a complex connective tissue tube structure formed by the ligation of the aponeurosis and the fascial layer, which encloses the back

muscles, connecting the anterolateral abdominal wall with the lumbar paravertebral region. It is believed that local anesthetic spreads along the TLF and endothoracic fascia into the paravertebral space.

Studies show that QL block is an effective analgesic method for abdominal surgery, especially effective for lower abdominal surgery, also no studies report complications after QL block. Good regional block and adequate analgesia can prevent catecholamine release induced by the surgical stress response, thereby providing more stable blood pressure during the procedure.

This refers to a meta-analysis by Wen-li Zhao, MD et al, in three trials comparing QL blocks with caudal anesthesia, all showing that QL blocks offered more effective postoperative pain relief in children after lower abdominal surgery. Less effective pain relief from caudal blocks may be due to high vascularity in the epidural space; Thus, large amounts of local anesthetic are absorbed rapidly and the duration of epidural analgesia is shortened. QL block demonstrated a significant reduction in the rate of postoperative rescue analgesia within the first

24 hours.

In another article, QL blocks were superior to TAP blocks in reducing postoperative opioid requirements and pain control lasted longer after QL blocks. The reason may be that the TLF is formed by the arrangement of anterior, middle, and posterior layers. After the posterior layer and middle layer meet at the lateral edge of the spinal vertical muscle, they converge with the anterior layer at the lateral edge of the lumbar quadratus muscle to form the starting point of the aponeurosis of the transverse abdominal muscle. When a QL block is performed, local anesthesia can spread not only within the TLF but also into the transverse abdominal muscle plane and paraspinal space.

The local anesthetic dose used was 0.375% ropivacaine with the addition of 4 mg

dexamethasone in a volume of 10 ml on each side (5 ml on each side). In the article written by Aksu et al, it is stated that the dose given is local anesthesia (0.5 ml/kg, with the maximum dose limited to 20 ml). As an adjuvant to local anesthetics, dexamethasone can be used because of its anti-inflammatory properties and its ability to block neuronal discharge and nociceptor C fiber transmission. Steroids cause vasoconstriction and reduce systemic absorption of local anesthetics. In addition, local anesthesia plus dexamethasone can prolong the analgesic effect and reduce the need for postoperative analgesia. The operation lasted 4 hours. During the surgical procedure, vital signs remained fairly stable without additional opioid use, and there were no complaints of postoperative pain after Duhamel surgery in this patient.

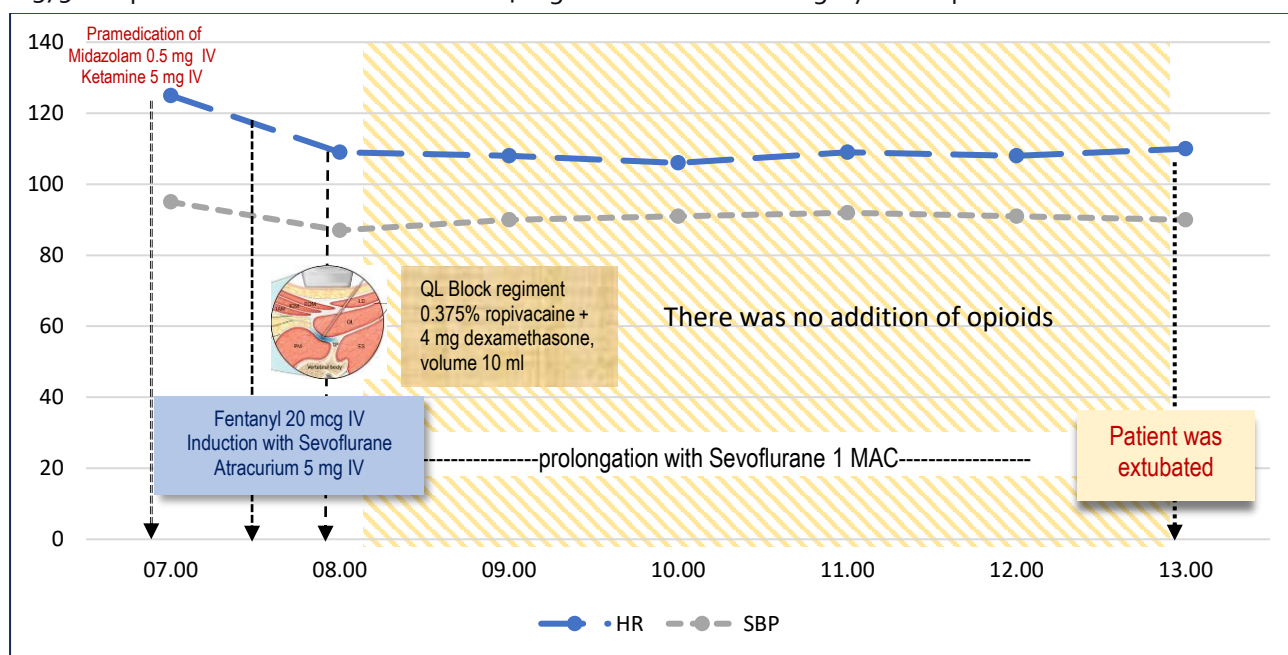


Figure 5. Chart of patient vital signs during surgery

Conclusion

Quadratus lumborum block in pediatric patients is quite effective in managing pain during surgery for patients undergoing Duhamel surgery.

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