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Case Report

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Ultrasound-Guided Transmuscular Quadratus Lumborum Block Provides Effective Postoperative Analgesia for High Ligation of Spermatic Vein

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Abstract

Postoperative pain management after varicocele surgery poses a challenge for pediatric patients. The quadratus lumborum block (QLB) is a novel regional analgesia technique that entails injecting a local anesthetic around the quadratus lumborum muscle using ultrasound guidance. In this study, we present the utilization of a single transmuscular QLB in two children as an effective postoperative analgesic method for laparoscopic extraperitoneal high ligation of the spermatic vein (LEHLSV).

Keywords

Varicocele, Quadratus lumborum block, Analgesia, Case Report

Case Presentation

Case-1:

A 9-year-old male child was scheduled for LEHLSV as the treatment for left varicocele. In the operating room, standard electrocardiogram, pulse oximetry, and noninvasive blood pressure were monitored. After anesthesia induction was performed with midazolam 1mg, cisatracurium (0.1 mg/kg), fentanyl (4 μg/kg), and propofol (3 mg/kg). #6 single lumen endotracheal tube was inserted. Then, anesthesia was maintained with 1.3 MAC sevoflurane with 40% oxygen and 60% air with volume control ventilation using 6-8 ml/kg tidal volume, and the end-tidal carbon dioxide partial pressure was kept at approximately 35-45 mmHg.

The patient was placed on the right side with the legs flexed for preparation to perform transmuscular QLB and the procedure was performed via a low-frequency curvilinear ultrasound transducer, 2 to 5 Hz (Mindray Anesus ME7; Mindray Bio-Medical Electronics Co., Ltd， Nanshan, Shenzhen) (**Fig-1**).

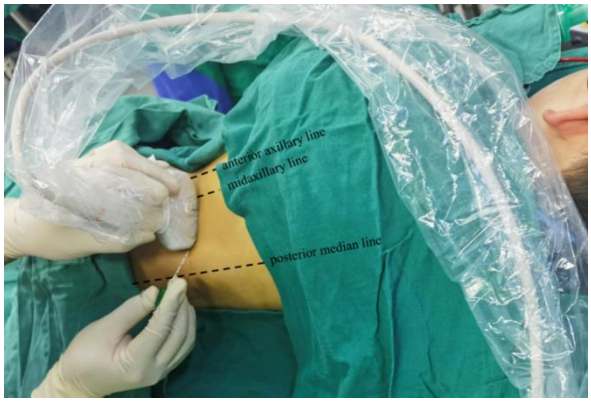

Fig-1:

Position of the Ultrasound Transducer and Puncture Needle for the Approach to the Spinal Nerve

Ultrasound images of the QLB included the psoas muscle, quadratus lumborum muscle, erector spinae muscle and transverse process (**Fig-2**). Under aseptic conditions, local anesthetics (0.33% ropivacaine 0.5

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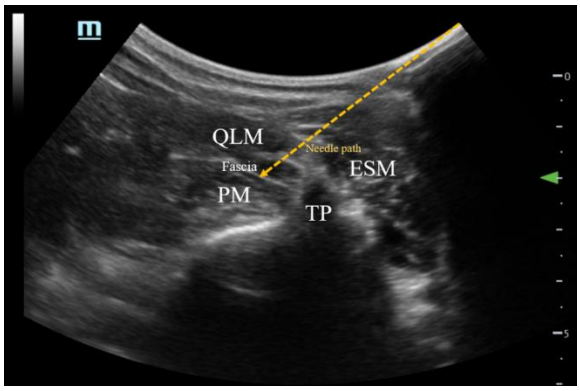

Fig-2:

Quadratus Lumborum Block using the Ultrasound-Guided: The Needle Path to the Musculofascial Plane Between the Quadratus Lumborum Muscle and Psoas Major Muscl.e

QLM: Quadratus Lumborum Muscle; PM: Psoas Major; TP: Transverse Process; ESM: Erector Spinae Muscle

ml/kg) were injected between the fascia of the quadratus lumborum muscle and psoas muscle. and good views of the needle (22 G*50 mm) were verified (**Fig-3**). During the operative time, fentanyl and

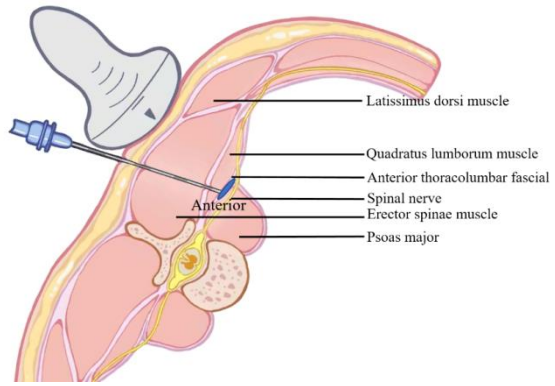

Fig-3:

Schematic Overview of Curvilinear Ultrasound Transducer and Puncture Needle During QLB.

muscle relaxant drugs were not administered. There was no hemodynamic instability during the operation. The surgical procedure lasted 38 minutes, and then the airway device was removed once the patient's spontaneous breathing recovered without neuromuscular block.

The patient did not cry awake or report pain, and the numeric rating scale (NRS) for pain was 1/10 at rest and 1/10 during movement after extubation (**Table-1**). The total dose of fentanyl was 120 μg, and no remifentanil was required during the operation. In the postoperative recovery area, the patient did not report pain, vomiting, or nausea. Up to 6, 12, and 24 hours after surgery, the pain level at rest was 1/10, 1/10, and 2/10, respectively, and the pain level during movement was 1/10, 2/10, and 3/10, respectively.

Case-2:

A 10-year-old boy with left varicocele underwent the same surgery and QLB for postoperative analgesia as Case One. The patient did not cry awake or report pain, and the NRS for pain was 1/10 at rest and 1/10 at movement after extubation (**Table-1**). In the postoperative recovery area, the patient did not report pain, vomiting, or nausea. Up to 6, 12, and 24 hours after surgery, the pain level at rest was 1/10, 1/10, and 2/10, respectively, and the pain level during movement was 1/10, 3/10, and 3/10, respectively.

Both children did not experience any postoperative adverse effects, including bleeding, nausea, vomiting, drowsiness, urinary retention, and local anesthetic intoxication.

Discussion

Varicocele is a vascular disease characterized by abnormal swelling, enlargement, and tortuosity of the venous plexus around the spermatic cord. This condition can cause scrotal discomfort and pain [1], testicular atrophy, progressive hypofunction of the testicles, and is a common cause of male infertility. LEHLSV is a vital treatment for varicocele [2]. However, postoperative pain often affects recovery, which is particularly challenging for adolescent men. They have a higher morbidity of varicocele, lower pain tolerance [3], and are more likely to develop abnormal changes in personality and behavior. Therefore, good analgesia is essential.

Table-1: Postoperative NRS Scores of Patients at Different Time Intervals

Case	NRS scores at rest				NRS scores during movement			
	0	6 h	12 h	24 h	0	6 h	12 h	24 h
Case 1	1	1	1	2	1	1	2	3
Case 2	1	1	1	2	1	1	3	3

The two cases indicate that transmuscular QLB could provide effective postoperative analgesia for LEHLSV. No rescue analgesia was needed, and both the children and their parents were highly satisfied with the surgery and postoperative analgesia. The effective pain relief observed in both cases after LEHLSV confirms our hypothesis, suggesting that transmuscular QLB could be a promising analgesia method for children who underwent LEHLSV.

Ultrasound-guided transmuscular QLB is an innovative nerve block method in which local anesthetics are injected between the quadratus lumborum and the psoas muscle; the anesthetic continues to spread to the paravertebral region along the thoracolumbar fascia (TLF), blocking the ipsilateral paravertebral sensory, motor, and sympathetic nerves [4]. We understand that the QLB is a type of fascial plane block and has several approach methods, including anterior, lateral, posterior, and intramuscular approaches. Transmuscular QLB is an anterior approach method, which is one of the four types of QLBs that can achieve the widest range of blocking [5], including T_{10}-L_4. The surgical incision of LEHLSV is on the level of the umbilicus and the left McBurney point, which involves the sensation segment of the T_{10}-T_{12} nerves. QLB might cover the nerves associated with LEHLSV, and to our knowledge, no literature has reported QLB applied in postoperative analgesia of LEHLSV. Previous research suggested that ropivacaine for nerve block could achieve 24-hour postoperative analgesia [6], which was consistent with our results.

The results of the present case report also suggest that transmuscular QLB is safe, since no QLB-related complications were observed, such as nerve injury, bleeding, stray into the spinal canal, blood vessels, abdominal cavity and local anesthetic intoxication. Although the quadratus lumborum is deep, it is located away from nerves and blood vessels, reducing the risk of complications. Ultrasound-guided puncture can be used to accurately see the direction of the puncture needle and avoid penetration of the abdominal cavity and the spinal canal. In addition, the local anesthetic used in this study was ropivacaine hydrochloride, which is less toxic to the cardiovascular and central nervous systems than bupivacaine [7]. In the case report, the total dose we injected did not exceed the maximum safe dose of local anesthetic. In order to avoid puncture into blood vessels, the local anesthetic was injected after negative aspiration. There were no complications of local anesthetic intoxication, suggesting that our selection of local anesthetic formulations was appropriate. Nevertheless, our findings should be verified with a much larger sample to ensure the detection of infrequent adverse events related to the systemic toxicity of local anesthetics.

The effectiveness and safety of transmuscular QLB need to be verified in future randomized controlled trials. Some related issues, such as the optimal dose and approach, whether single or continuous QLB, should be clarified.

Conflict of Interest

The authors have read and approved the final version of the manuscript. The authors have no conflicts of interest to declare.

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