SHORT BEVELED SHARP CUTTING NEEDLE IS SUPERIOR TO FACET TIP NEEDLE FOR ULTRASOUND-GUIDED RECTUS SHEATH BLOCK IN CHILDREN WITH UMBILICAL HERNIA: A CASE SERIES

A. ALSAEED*, A. THALLAJ**, T. ALZAHRAI***, N. KHALIL*** AND A. ALJAZAERI****

Summary

**Background:** The most common peripheral nerve blocks used in umbilical hernia repair are rectus sheath block and regional block (caudal block).

Ultrasound guidance of peripheral nerve blocks has reduced the number of complications and improved the quality of blocks. The aim of this study is to assess the post rectus sheath block pain relief in pediatric patients coming for umbilical surgery, and to evaluate the easiness of soft tissue puncture and ultrasonic appearance of two different needle types.

**Methods:** Twenty two (22) pediatric patients (age range: 1.5–8 years) scheduled for umbilical hernia repair were included in the study. Following the induction of general anesthesia, the ultrasonographic anatomy of the umbilical region was studied with a 5-16 MHz linear probe. An ultrasound-guided rectus sheath block in the lateral edge of both rectus abdominis muscles (RMs) was performed (total of 44 punctures). A 22 gauge short beveled sharp cutting needle 1.1x 30 mm needle A (BD Insyte – W, Vialon material. Spain) was used in one side, and a Stimuplex A insulated Needle 22G 50mm (needle B) was used on the other side. Surgical conditions, intraoperative hemodynamic parameters, and postoperative analgesia were evaluated.

**Results:** Ultrasonographic visualization of the posterior sheath was possible in all patients. Needle A scored 72.7% of excellent needle tip and shaft view (16 out of 22) compared to 63.63% for needle B (14 out of 22). None of the needles scored poor view. The ultrasound guided rectus sheath blockade provided sufficient analgesia in all children with no need for additional analgesia except for one child who postoperatively requested morphine 0.1 mg/kg intravenously in recovery room. There were no complications.

**Conclusions:** Ultrasound guidance enables performances of an effective rectus sheath block for umbilical hernia in the lateral edge of the rectus muscle. Use of the sharp short beveled needle of 22 gauge intravenous (IV) cannula stylet provides easy, less traumatic skin and rectus muscle penetration and better needle visualization by the ultrasound.

**Keywords:** surgery: umbilical hernia; ultrasonography; umbilical peripheral nerve block, anesthesia; analgesia, postoperative; anesthetic techniques, regional, rectus sheath block.

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Introduction

Umbilical hernia repair is a common operation in pediatric surgery. It is carried out in children over 2 years old, usually under general anesthesia combined with a regional block (caudal block). It is done as a day case procedure; a peripheral nerve block is usually the choice. The rectus sheath block was described in adults, has been used for laparoscopic surgery in gynecology, and is one of the currently used techniques in pediatric umbilical surgery. However, it may be associated with complications such as retroperitoneal hematoma and possibility of peritoneal puncture. The paraumbilical block was described in 11 pediatric patients to avoid these complications and to improve the success rate of the block. Recently, direct ultrasonographic visualization of the brachial plexus, of the sciatic nerve in the popliteal fossa, the ilioinguinal/iliohypogastric nerves, and of rectus sheath has been done successfully in children.

The aim of this case series was to investigate the ultrasound visualization of the anatomy in the umbilical region in children and to describe an ultrasound-guided new needle type needle A (22G short beveled sharp cutting stylet needle 1.1x 30 mm BD Insyte – W) that might improve the quality of the blocks and reduce the risk of complications compared with conventional needle B (Stimuplex A insulated facet tip Needle 22G 50 mm B Braun).

Methods

Approval of the IRB ethical committee (King Khalid University hospital, King Saud University, Saudi Arabia) was obtained (No14/3999/IRB), and informed consent from the parents was obtained in all cases. Twenty two children, age range 1.5–8 years, ASA physical status I or II, scheduled for umbilical hernia repair on an outpatient basis, were included in this case series. None had a history of convulsion, neuromuscular disease or hematological disorders and local anesthesia allergy. No premedication was given. Intraoperative monitoring included, ECG, pulse oximetry, non-invasive blood pressure, and end tidal carbon dioxide concentration.

After general anesthesia was induced and venous access established, fentanyl 2mic/kg was given and an appropriate size laryngeal mask airway was placed. Spontaneous ventilation with 1 MAC sevoflurane in a mixture of 50% air and oxygen was maintained in all cases throughout the procedure.

The ultrasonographic anatomy of the umbilical region was studied in each case, with 5-16MHz US linear probe (Sonosite M TURBO). The probe was positioned 1 cm above the umbilicus, and the adjustments in depth and gain were made in order to achieve the optimal sonographic view of both rectus abdominis muscle (RM), their sheaths, and adjacent structures.

The sheath and lateral edge of the RM were localized, and the peritoneum and the aponeurosis of ipsilateral transverse abdominis (TM), internal and external oblique muscles (EOM&IOM) were identified (Figure 1). After aseptic preparation of the puncture site, the ultrasound probe was covered with sterile TEGADERM film (3M Health Care St. Paul, MN,USA) and sterile ultrasound gel was used (Ultra/Phonic Pharmaceutical Innovations, Inc, New Jersey,USA). The block was performed with 22G short beveled sharp cutting stylet needle 1.1x 30 mm (BD Insyte – W, Vialon material, Spain) needle A (Figure 2, 7), assembled with extension set with T adaptor (VEINSYSTEM, Sigo, Ireland). The needle was introduced in-long axis parallel to the ultrasound probe (Figure 4) to reach the lateral border of the rectus muscle, and advanced slowly and carefully until the tip of the needle was seen just between the posterior aspect of the rectus abdominis and its sheat (Figure 1). A single injection of plain bupivacaine 0.25%, 0.25 ml/kg-1 was injected under the real-time ultrasound control. The procedure was repeated on the other side of the rectus sheath with the same drug volume and concentration, using a facet tip needle (Stimuplex A insulated Needle 22G 50mm) needle B (Figure 3, 5, 6). All blocks were done by the same operator (AHS). A blinded observer with reasonable ultrasonoguided regional block experience, and unaware of the study design was asked to assess the quality of the sonographic visualization of the needle tip and shaft and to rate the view as: +: poor, ++: good, +++: excellent.
Fig. 1
Short axis sonographic view of the periumbilical region shows: the rectus muscle surrounded by the rectus sheath (RS), Internal oblique muscle (I.O), External oblique muscle (E.O), Transversus abdominis muscle (T.A).

Fig. 2
Needle A, 22G short beveled sharp cutting stylet and needle tubing assembly

Fig. 3
Needle B: a facet tip insulated needle Stimuplex A
Fig. 4
Needle position; in plane technique lateral to the ultrasound probe

Fig. 5
Tip of Needle A: short beveled sharp tip, Needle B: facet tip

Fig. 6
Needle B tip and shaft visualization within the posterior rectus sheath fascial split by ultrasound during rectus sheath block and injection of local anaesthesia, the rectus sheath (RS), Internal oblique muscle (I.O), External oblique muscle (E.O), Transversus abodominis muscle (T.A), Local anaesthesia (LA)

Fig. 7
Needle A tip and shaft visualization within the posterior rectus sheath fascial split by ultrasound during rectus sheath block and injection of local anaesthesia, the rectus sheath (RS), Internal oblique muscle (I.O), External oblique muscle (E.O), Transversus abodominis muscle (T.A), Local anaesthesia (LA)
Surgery was then started and hemodynamic parameters were recorded throughout the surgery.

Fentanyl 1mic/kg was administered in the event of an increase in heart rate or blood pressure of more than 10% from baseline or an increase in respiratory rate of more than 20% from baseline following the skin incision or at any time during the procedure and was defined as insufficient analgesia. At the end of the procedure, the laryngeal mask was removed and general anesthesia was discontinued. Children were taken to the post anesthesia care unit (PACU).

Postoperative analgesia was evaluated by a blind investigator using the modified CHEOPS pain scale in the PACU every 10 min until discharge. Children who scored 5 at any of the evaluated times were given morphine 0.1 mg/kg IV.

In the surgical wards, trained nurses recorded the time when the child first required additional paracetamol 15 mg/kg suppository, supplement analgesia during the first day at home was with paracetamol 15 mg/kg PO every 6-8 h, and analgesia requirement were recorded during the day after telephone call.

**Results**

A total of 14 females and 8 males children were included in the study. Table 1 shows demographic data. Each patient received two punctures one on each side of the umbilicus, for a total of 44 punctures in 22 patients. No increases in the heart rate or blood pressure

![Fig. 8](image-url)  
*Heart rate in different time*

![Fig. 9](image-url)  
*Blood pressure in different time*
were recorded intraoperatively (Figure 8, 9) also no increase on respiratory rate and no patient was given additional fentanyl. Different surgeons performed the cases and assessed the surgical conditions as good in all the patients. Needle A scored 72.7% of excellent needle tip and shaft view (16 out of 22) compared to 63.63% for needle B (14 out of 22). There was statistical difference between the two groups with more visibility of the needle in group A compared to group B needles (P<0.05) by using Fisher exact test as statistical analysis. None of the needles scored poor view (Table 2).

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Peritoneum and the lateral edge of the rectus muscles was easily identified in all the cases and the punctures were performed without complication.

Only one child scored >5 in the modified CHEOPS Scale and was given morphine 0.1 mg/kg intravenous in the PACU. The nurses reported no supplement of analgesia.

All patients were discharged and no child received more than two doses of paracetamol 15 mg/kg -1 P.O at home.

**Discussion**

The rectus sheath block was first used in pediatric surgery by Ferguson et al. in 1996. The authors described that the tendinous intersections of the rectus sheath are only anterior and do not extend through the thickness of the muscle, so a potential space would exist between the posterior aspect of the muscle and its sheath. This potential space would allow dispersion of LA at several levels, enabling an effect on several intercostal nerves. The puncture was performed on each side of the abdomen, just above and lateral to the umbilicus, half-to-1 cm medial to the linea semilunaris. The block proved to be effective and safe both for umbilical and paraumbilical hernia repair.

In recent years, ultrasound is of increasing interest in regional anesthesia, as direct visualization of the anatomic structures allows optimal placement of the needle and thereby reduces the risk of inadvertent interneural, intravascular or adjacent structures injury (e.g. peritoneum).

In our case series, we described an ultrasound guided technique of the 10th intercostal nerve block using a 22G short beveled sharp cutting needle (Needle A) in order to achieve smooth and easy puncture of the skin, subcutaneous tissue, rectus sheath and muscle penetration. When performing rectus sheath block in children with the facet tip needle (Needle B), the needle tip faces a highly compliant tissue compared to adults, and tends to push rather than penetrate the tissue, thus the operator’s hand need to apply more pressure on the needle with a hazard of inadvertent peritoneal injury. In contrast to peripheral nerve block, where facet tip needle is considered as a safety measure, rectus...
sheath block does not approach specific nerve. The use facet tip needles in this block have no justification. Sonography visualization of needle A was superior to needle B. However, other cannula styles of different brands need to be investigated. Economic wise, the cost of facet tip needle is five times that of stylet needle, which might influence needle type selection for the block. Before considering using stylet needle for rectus sheath block, further study with larger numbers of patients is required before implementing the use of short sharp beveled needle for rectus sheath block in children. In conclusion, Ultrasound guided rectus sheath block is effective and safe intra and postoperative analgesic approach in children and can be alternative to caudal block in day case surgery. The use of the short beveled sharp cutting needle overcomes technical difficulty while penetrating the soft tissue, have easy penetration and good needle tip and shaft visualization compare the facet tip needle.
References


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BRIDION has not been investigated in patients receiving ionotorcum or vecuronium in the intensive care unit (ICU) setting. If neuromuscular blockade is required within 24 hours of BRIDION administration, a nondepolarizing neuromuscular blocking agent should be used instead of rocuronium or vecuronium. The most commonly reported adverse reactions were dysphagia (oral or pharyngeal) and anaphylactic complications (withdrawing, flushing, urticaria, or angioedema). In patients treated with BRIDION, a few cases of awareness were reported. The relationship to BRIDION was uncertain. In a few individuals, allergic-like reactions (i.e., flushing, urticaria, rash) following BRIDION were reported. Patients should be prepared for the possibility of allergic reactions and take emergency precautions. In a total of patients with a history of previous complications, bronchospasms were reported in 2 patients and a causal relationship could not be fully excluded.

Volunteer studies have demonstrated a slight (15%/20%) and transient (<10 minutes) prolongation of the period in tetanus observed after administration of propofol with BRIDION. However, clinical studies have demonstrated no clinically relevant effect on postsurgical recovery complications with BRIDION alone or in combination with other agents. An I.V. bolus has demonstrated an increase in pharmacodynamic interaction with anticoagulants, caution should be exercised in patients on anticoagulants for age-related or severe conditions. Any pharmacodynamic interaction is not clinically relevant for patients recovering routine postoperative prophylactic anticoagulation. Although formal interaction studies have not been conducted, no drug interactions were observed in clinical trials. Preclinical data suggest that clinically significant drug interactions are likely with the possible exceptions of corticosteroids, furosemide, and hormonal contraceptives.

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