



Ultrasound-guided bilateral rectus sheath block vs. conventional local analgesia in single port laparoscopic appendectomy for children with nonperforated appendicitis



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ABSTRACT

Introduction: Despite its minimally invasive approach, laparoscopic surgery can cause considerable pain. Regional analgesic techniques such as the rectus sheath block (RSB) offer improved pain management following elective umbilical hernia repair in the pediatric population. This effect has not been examined in laparoscopic single-incision surgery in children. We sought to compare the efficacy of bilateral ultrasound-guided RSB versus local anesthetic infiltration (LAI) in providing postoperative pain relief in pediatric single-incision transumbilical laparoscopic assisted appendectomy (TULA) with same-day discharge.

Methods: We retrospectively reviewed 275 children, ages 4 to 17 years old, who underwent TULA for uncomplicated appendicitis in a single institution from August 2014 to July 2015. We compared those that received preincision bilateral RSB (n = 136) with those who received LAI (n = 139). The primary outcome was narcotic administration. Secondary outcomes included initial and mean scores, time from anesthesia induction to release, operative time, time to rescue dose of analgesic in the PACU and time to PACU discharge.

Results: Total narcotic administration was significantly reduced in patients that underwent preincision RSB compared to those that received conventional LAI, with a mean of 0.112 mg/kg of morphine versus 0.290 mg/kg morphine (p < 0.0001). Patients undergoing RSB reported lower initial (0.38 vs. 2.38; p < 0.0001) and mean pain scores (1.26 vs. 1.77; p < 0.015). Time to rescue analgesia was prolonged in patients undergoing RSB compared to LAI (58.93 min vs. 41.56 min; p = 0.047).

Conclusion: Preincision RSB for TULA in uncomplicated appendicitis in children is associated with decreased opioid consumption and lower pain scores compared with LAI. As the addition of this procedure only added 6.67 min to time under anesthesia, we feel that it is a viable option for postoperative pain control in pediatric single-incision laparoscopic surgery.

Retrospective comparative study: LEVEL III EVIDENCE.

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Management of perioperative pain often requires the use of opioid medications in order to provide appropriate analgesia. In an attempt to reduce the amount of opioids needed to provide effective postoperative pain control, we have been utilizing regional analgesic techniques more consistently. The rectus sheath block (RSB) is a regional anesthetic technique that works by anesthetizing the ventral rami of T7–T12, the somatic nerves supplying the umbilical area. Several trials have demonstrated the safety and efficacy of RSB in reducing postoperative pain in elective open umbilical hernia repair [1–4]. In 2015 Hamill *et al.*

examined RSB in traditional pediatric laparoscopic appendectomy using a three-port approach and found that the technique decreased pain scores but did not impact opioid requirements [5]. At our institution the surgical approach to pediatric appendicitis has been a laparoscopic single-incision appendectomy where the appendix is mobilized and removed through a solitary port in the umbilicus. In cases of uncomplicated appendicitis the majority are discharged the same day. While RSB has been examined in the adult population for single-incision cholecystectomy and gynecologic procedures, its use in pediatric single-incision surgery has not been explored [6,7]. In 2014, the anesthetic management of children undergoing single-incision appendectomy for appendicitis at our institution evolved to include bilateral US-guided RSB in addition to general anesthesia.

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The goal of this study was to compare the outcomes of cases in which the US-guided RSB was performed during single-incision laparoscopic appendectomy for nonperforated appendicitis in children with cases in which local analgesic infiltration (LAI) was utilized. The primary aim was to elucidate whether this approach could provide effective analgesia compared to traditional local analgesic administration as evidenced by reduced opioid consumption. We hypothesized that the dermatomal distribution provided by the RSB would be particularly effective in pediatric single-incision transumbilical laparoscopic appendectomy with same-day discharge, reducing opioid consumption and postoperative pain scores.

1. Methods

In this retrospective chart review, data were collected from a prospectively maintained billing database from the division of pediatric surgery at a single tertiary care children's hospital from July 2014 to August 2015. Approval was obtained from Cohen Children's Medical Center's institutional review board prior to data collection. A total of 500 patients that underwent appendectomy for appendicitis were identified. Exclusion criteria included all gangrenous or perforated appendicitis (based on pathologic analysis), surgery utilizing a traditional 3-port approach, and children that stayed overnight for antibiotics, leaving 275 patients for analysis.

Since 2011, our surgical approach to pediatric appendicitis has been a transumbilical single-incision laparoscopic appendectomy (TULA). Laparoscopic access to the abdomen is obtained through a single incision in the umbilicus to allow for a 12 mm trocar. A 10 mm right-angle laparoscope allows for visualization and for a single working instrument to be inserted. Any retroperitoneal adhesions are mobilized laparoscopically and the appendix is extracorporealized through the umbilicus and resected at the level of the skin (Fig. 1). It is common practice to discharge these patients the day of surgery. At this institution seven different pediatric surgeons perform this operation in equal numbers.

All children received either preincision bilateral ultrasound-guided rectus sheath blocks by the anesthesiologist or local analgesic infiltration into the surgical wound by the surgical team. The execution of the RSB was based on whether the attending anesthesiologist assigned to the procedure was skilled in performing the RSB.

In cases where RSB was performed, the abdominal wall was cleansed with 2% chlorhexidine gluconate and the ultrasound probe was used to identify the rectus sheath just cephalad to the umbilicus. The probe was moved laterally until the lateral border of the rectus abdominis muscle was identified and a 22-gauge needle was used for an in-plane technique (Fig. 2). Either 0.25% bupivacaine or 0.5% bupivacaine was injected in the posterior rectus sheath on each side (for a total of 1 ml/kg or 0.5 ml/kg, respectively).

For the cases where local analgesia was administered by the surgeon, patients received a subcutaneous injection at the surgical site of either 0.25% or 0.5% bupivacaine at a maximal dose of 1 ml/kg or 0.5 ml/kg, respectively. Whether the local analgesia was administered before or after surgical incision was based on surgeon preference. The total volume administered was variable and rarely was greater than 10 mL.

The primary outcome was total opioid administration (in mg/kg of morphine equivalents) for hospital length of stay. Secondary outcomes were intraoperative and postoperative opioid administration, initial and mean pain scores, operative and postoperative administration of non-narcotic analgesia, time to first rescue dose of analgesia in the post anesthesia care unit in minutes (PACU) and length of stay in the PACU in minutes. Pain scores were assigned by PACU nurses using a numerical age-appropriate visual analog scale (FACES age < 12 years or VAS pain scale > 12 years). Administration of narcotic and non-narcotic analgesia intraoperatively was determined by the attending anesthesiologist and obtained from the anesthesia record. PACU administration of all analgesics was performed by nursing staff based on pain scores. Time from anesthesia induction to anesthesia release defined the time (in minutes) from induction of general anesthesia, including endotracheal intubation, to the

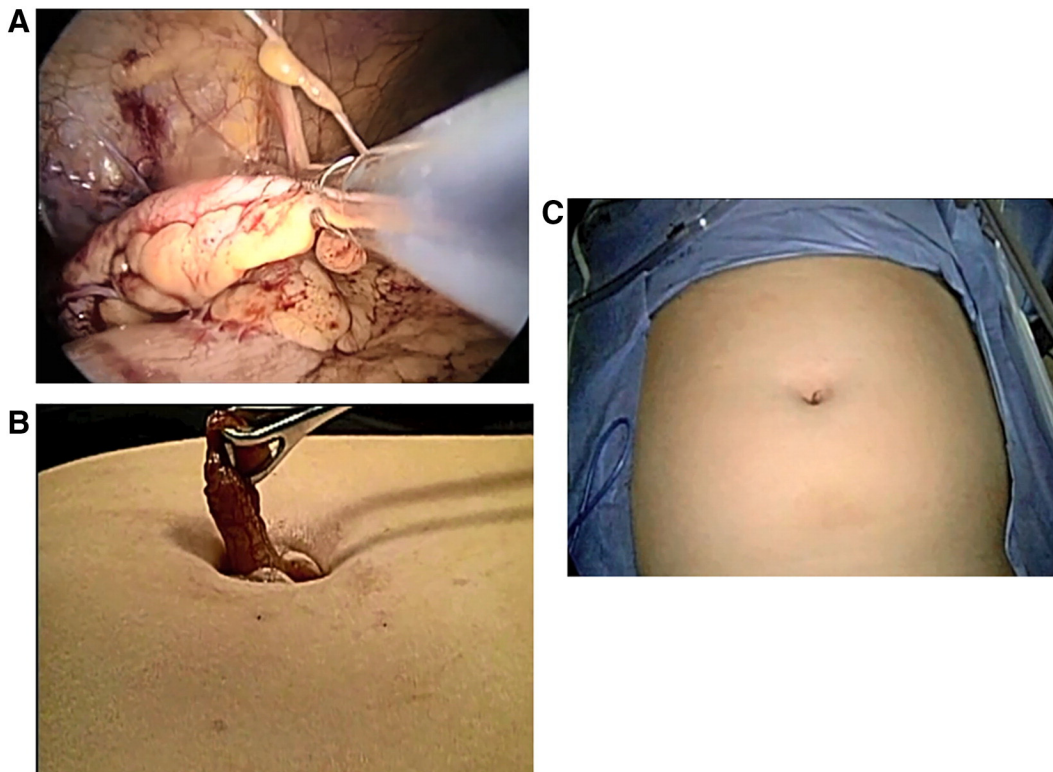


Fig. 1. Transumbilical laparoscopic-assisted appendectomy (TULA) procedure. (A) Laparoscopic mobilization of the appendix utilizing 10 mm working port placed in umbilicus. (B) Removal of appendix through umbilicus and (C) extracorporeal appendectomy. (D) Typical appearance of abdomen post procedure.

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