The ropivacaine concentration required for ultrasound-guided rectus sheath block in pediatric patients undergoing laparoscopic inguinal hernia repair surgery.

Keitaro Tachi, MD, Shinichi Inomata, MD, Junko Tokuwaka, MD, Yoshiko Osaka, MD, Makoto Tanaka, MD.
Department of Anesthesiology, University of Tsukuba, Japan.

Background and goal of this study:

The rectus sheath block (RSB) is a method of obtaining analgesia by injecting a local anesthetic into the intercostal nerve passing through the rectus abdominis muscle as a target. The RSB was reported to be useful for analgesia of pediatric umbilical hernia surgery^{1,2}. However, the concentration of ropivacaine required for this block is not clear. We examined the concentration of ropivacaine required for RSB under ultrasonic guidance for children undergoing laparoscopic inguinal hernia repair surgery.

Methods:

- We studied 25 consecutive children undergoing laparoscopic inguinal hernia repair surgery.
  - Age range, 9 months to 7 years
  - ASA physical status I to II
- After the induction of general anesthesia with nitrous oxide and 5% sevoflurane in oxygen, intravenous (IV) catheter was inserted.
- Orotracheal intubation was performed without IV anesthetics or neuromuscular relaxants.
- Ultrasonic-guided RSB was then performed using a linear probe (6 – 13 Hz).
- The dosage of ropivacaine was 0.15 ml/kg on one side, 0.30 ml/kg in total.
- The concentration of ropivacaine was determined by Dixon’s up-and-down method³ starting from 0.30% in increments of 0.05%.
- After completion of the block, general anesthesia was maintained with sevoflurane (expiratory concentration 2%) in oxygen and air.
- The surgery started ≥ 15 minutes after the RSB.
- If there was body movement or a raise in the patient’s heart rate or systolic blood pressure of $\geq 20\%$ within 1 minute from the start of the surgery, the RSB was judged invalid.
- The half maximal effective concentration (EC_{50}) for the ropivacaine RSB was calculated using the probit test.

Results:

Table 1. Demographic data of patients.

Male/Female	11/14
Age(month)	53±24
Height(cm)	100.4±14.1
Weight(kg)	15.6±3.7
ASA-PS I / II	16/9
Operation time(min)	61±13

Data are shown as mean±SD.

- Demographic data of patients are shown in table1.

Figure 1. The sequential response of 25 children to initial incision with the up-and-down method. ● = failed block; O= complete block; — = mid-point of “failed –complete” pair.

- The EC_{50} of RSB using ropivacaine in the pediatric patients (weight range, 8.1–21.8 kg) was $0.16 \pm 0.09\%$ (mean±SD).
- The maximum concentration of ropivacaine required for the RSB was 0.30% in this patient series. (figure 1.)

Conclusions:

The EC_{50} of ropivacaine for ultrasound-guided RSB was $0.16 \pm 0.09\%$ in pediatric patients under general anesthesia. The highest ropivacaine concentration required for the RSB was 0.30%. We will continue our research to calculate the EC_{95} .

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筑波大学附属病院
University of Tsukuba Hospital

We have no conflict of interest to declare.