Introduction: Intraperitoneal bupivacaine can reduce postoperative pain after robot-assisted laparoscopic surgery (RALS). There is a lack of pharmacokinetic (PK) data for this method in the pediatric population. We compared the PK parameters and morphine requirements after intraperitoneal bupivacaine administration via 1 bolus application or 2 a micropump nebulizer.

Methods: After IRB approval and informed parental consent, 80 children ages 6 months to 5 years, undergoing RALS received intraperitoneal bupivacaine by one of 2 methods. Group 1 received 1.25 mg/kg bupivacaine diluted in 30 mL saline via a micropump atomization device (30 μ particle size) as a bolus over ~1 min (Fig 1). Group 2 received 1.25 mg/kg of undiluted bupivacaine 0.5% via a micropump nebulizer (30 μ particle size, Aeroneb Pro, Galway, Ireland) into the CO2 insufflation tubing over 15-30 min (Fig 2). Venous blood samples were obtained at 4 time intervals between 1-120 min. At the end of surgery, 1.25 mg/kg of 0.25% bupivacaine (max 10 mL) was injected s.c. into the trocar incisions. Postoperative analgesia was achieved with ketorolac 0.6h. PRN IV morphine or an oral opioid utilizing a standardized order set and age-appropriate pain assessment tool. Plasma bupivacaine levels were measured using HPLC. PK analysis was done with WinNonlin, Monolix.

Results: PK data were available for 70 children and pain data for 72 children. There were no differences in demographics, postoperative IV morphine requirements at any time point or cumulative 24 hr IV plus oral opioid requirements between the groups (Table 1, Fig 3). No arrhythmias or clinical signs of neurotoxicity were recorded. The maximal measured bupivacaine plasma concentrations were 2.44 and 0.97 mcg/mL in groups 1 and 2, respectively. Fig 4 shows the pooled data of timed bupivacaine plasma levels and Table 2 shows the specific PK parameters demonstrating a faster Tmax and lower Cmax in group 2 (P<0.001).

Discussion / Conclusion: Bupivacaine was rapidly absorbed with both forms of pentonial administration but the peak plasma levels and Cmax were lower in the nebulizer group. No differences in postoperative analgesia requirements were noted. Lower plasma levels and low IV morphine requirements with the nebulizer may allow a change in clinical practice to same day discharge for selected children undergoing RALS.

References: