The Initial US Experience Using the Senhance Robot In Pediatric Surgery

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1. Introduction

Robotic surgery in children has been shown to be safe [1], but usually requires special considerations [2], and require some features that are lacking in the most frequently used robotic systems. The smaller body cavities limit the working space, the operative indications differ from adults [3], and pediatric patients need carefully thought-out, case-by-case planning of patient position and trocar placement.

Senhance Robotic Platform has a wide array of reusable 3 mm instruments available and several inherently built-in safety features.

We embarked on the first US trial using Senhance Robotic System, to prove safety, efficacy and the utility in the smaller patient population.

2. Material and Methods

- ✓ Pediatric patients: 0-18 yo. No age or weight restriction
- ✓ Camera
  - ✓ 5mm 2d Stryker Camera
  - ✓ 10mm Conmed Viking 3D Camera
- ✓ Abdominal Minimally Invasive Surgery candidates
  - ✓ Inguinal Hernia Repair
  - ✓ Cholecystectomy
  - ✓ Orchidopexy
  - ✓ Exploratory Laparoscopy

3. Senhance Robotic System

- Reusable 3mm non-articulated instruments
- Reusable 5mm articulated instruments
- 3 or 4 modular independent arms
- Magnetic adaptor permits rapid detachment of instruments if there is a surgical or anesthetic requirement
- 10mm 3D vision camera, option to use 5mm 2D commonly available camera
- Haptic Feedback that alerts when pre-set thresholds are reached
- Eye tracking camera control
- Instrument move only with pedal activation



4. Results

P	Age at Surgery	Weight	Sex	Surgery Performed
1	15 yo	64.2 kg	M	Cholecystectomy
2	17 yo	67.6 kg	M	Inguinal Hernia Repair
3	6 yo	29.45 kg	M	Inguinal Hernia Repair
4	15 yo	72.5 kg	M	Inguinal Hernia Repair
5	10 yo	66 kg	M	Cholecystectomy
6	16 yo	130 kg	F	Cholecystectomy
7	22 mo	13 kg	M	Abdominal Testis Orchidopexy
8	4 mo	8 kg	F	Exploratory Laparoscopy

P	Robotic Arm External Collisions	Set Up Pre-Incision (min)	Docking Time (min)	Op Time (hr)	Immediate Complications	Lap to Open Conversion
1	No	30	8	1:30	None	No
2	No	20	7	1:37	None	No
3	No	28	7	53	None	No
4	No	27	7	2:42	None	No
5	Yes	21	7	1:39	None	No
6	No	20	5	1:37	None	No
7	No	30	7	1:22	None	No
8	Yes	40	21	2:40	None	Yes

8 patients, 4months old to 16 yo. We had two Clavien [4] Grade 1 complications, robotic arm collision that were rectifierd re-adjusting robotic external arms. The 4 mo patient, with a mesenteric cyst, had a open conversion to locate the cyst, that required manual palpation for location.



5. Conclusion

Overall, the history of pediatric robotic surgery is still being written, but it is evident that this innovative field has the potential to revolutionize the way that pediatric conditions are treated and to greatly improve the lives of children around the world.

Our early experience show us the Senhance® robot is useful in pediatric surgery.

There is ample room to carry out most procedures when the trocars are properly positioned.

The system is relatively inexpensive and has unique utility and safety features. It has the instrument size of choice for pediatric robotic surgery.

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