UNIVERSITY OF ILLINOIS CHICAGO

Department of Surgery

The da Vinci Single port Robotic Platform in Pediatric Surgery: Assessment of Safety and Efficacy

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Abstract

The advantages of minimally invasive surgery are well documented – less postoperative pain, fewer complications, faster recovery times, shorter hospital stays, and cosmetic advantages including decreased scarring, among others[1].
Robotic surgery offers the surgeon enhanced visualization, ergonomics, dexterity, and precision[2].
The da Vinci Single Port (SP) robot was FDA approved in 2018 for single port urologic procedures and a specific otolaryngology procedures[3].
The features of the SP robot facilitates effective and safe use for many pediatric surgeries while preserving patient outcomes and satisfaction.



Figure 1: Single port robotic arms. This novel design allows each arm to enter through a single incision site, and then "buckle" outwards like an elbow once inside the inflated abdomen for full range of motion.

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Materials & Methods

This is an IRB approved prospective analysis of SP robotic surgeries on patients aged 3 months to 19 years between February 2019 to August 2022.
Patient demographics, outcomes, and patient perspectives were analyzed.

Results

Patient Demographics:

ASA range 1-3
Mean weight 61kg
Mean BMI 26
Most common surgeries were hernia repair (n=14) and cholecystectomy (n=16)

Outcomes:

Mean operative duration 119 minutes
Mean blood loss 25cc
73.1% outpatient, 19.5% admitted to the floor, 7.3% placed in ICU for management of comorbid conditions
One surgical site infection

Patient Experience:

Pain and analgesia minimal; 88% took nothing or OTC medications for ≤1 week
84.2% satisfied with the outcome and post-op recovery, 15.8% dissatisfied with the scar
46.7% back to full activity in ≤1 week, 13.3% ≤1 month, and 40% in 1-4 months.

Table 1: Types of pediatric operations performed using the Da Vinci SP Robotic since 2019

Procedure	Times performed
Cholecystectomy	16
Inguinal Hernia Repair	13
Splenectomy	2
Appendectomy	2
Mass excision	2
Umbilical Hernia Repair	1
MACE	1
Hirschsprung Pull Through	1
Nissen Fundoplication	1
Partial Nephrectomy	1
Orchiopexy	1
Pelvic Exploration	1
Adrenalectomy	1
Total:	**43**

Table 2: Patient demographics

Patient demographics	
Inclusion date	2/4/19 - 8/12/22
Male: n, (%)	22 (53.7)
Female: n, (%)	19 (46.3)
Age: mean, median, range (min-max), years	13.8, 15.2, (3mo-19)
Body weight: mean, median, range (min-max), kg	61.6, 67.5, (5.4-105.1)
BMI: mean, median, range (min-max), kg/m2	26.1, 24.2, (14-87)
Blood loss: mean, median, range (min-max), mL	26, 5, (0-500)
Operative time: mean, median, range (min-,max), hours	119, 105, (48-296)
Length of stay: mean, median, range (min-max), days	1.7, 0, (0-40)



Figure 2: Closed umbilical port site after inguinal hernia repair

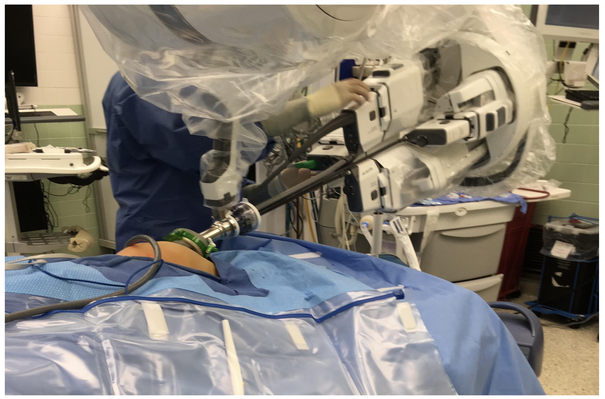


Figure 3: Intraoperative positioning of SP robot

Discussion

The SP robotic surgery platform is effective and safe for use in pediatric patients with favorable acceptance and satisfaction amongst patients and their families.
SP modality allows incisions to be minimized to a single incision, maintains the minimally invasive benefits of decreasing admission length and post-operative pain, and facilitates performing outpatient procedures with little to no scarring.
The adoption of the SP system is growing quickly across different surgical specialties. Use of it in pediatric populations is not well documented and warrants continued investigation[4].

References

1. Mohiuddin, K. and Swanson, S.J. (2013), Maximizing the benefit of minimally invasive surgery. J. Surg. Oncol., 108: 315-319. https://doi.org/10.1002/jso.23398
2. Samarasekera D, Kaouk JH. Robotic single port surgery: Current status and future considerations. *Indian J Urol*. 2014;30(3):326-332. doi:10.4103/0970-1591.128504
3. Administration FaD (2018) 510(k) Summary: SP1098 da Vinci SP Surgical System, pp 1–13
4. Sung Ku Kang, Won Sik Jang, Sang Woon Kim, Sung Hoon Kim, Sang Won Han, Yong Seung Lee, Robot-assisted laparoscopic single-port pyeloplasty using the da Vinci SP® system: initial experience with a pediatric patient, Journal of Pediatric Urology, Volume 15, Issue 5, 2019, Pages 576-577, ISSN 1477-5131, https://doi.org/10.1016/j.jpurol.2019.08.003.