Robotic Assisted Endoscopic Surgery Practices in Pediatric Surgery, Single Center Experience

Çocuk Cerrahisinde Robotik Yardımlı Endoskopik Cerrahi Uygulamaları, Tek Merkez Deneyimi

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ABSTRACT

Objective: While robot-assisted laparoscopic surgery (RALS) is spreading rapidly all over the world, In pediatric surgery, this spread is slower than in adult surgery for many reasons. In this study, we discuss our initial experiences with pediatric robotic surgical cases.

Material and Methods: Robotic-assisted endoscopic surgery between November 2017 and April 2022 was retrospectively reviewed. The medical records of the patients were reviewed retrospectively for some demographical features, surgical details, and follow-up time.

Results: Of the 48 children, 27 were male and 21 were female. The youngest of the cases was 10 months old, while the oldest was 17 years old (mean 7.72±5.6, median 7). The shortest follow-up period after surgery was 5 months, while the longest follow-up was 60 months. A total of 63 surgical procedures were performed on 48 pediatric patients. 17 pyeloplasty (left 10, right 7), 9 Lich Gregoir operations (right 6, left 3), 4 ureteral reimplantation and tapering procedures due to left ureterovesical junction obstruction (UJO), 3 Hemi nephrectomy, one appendicovesicostomy, One right ureteral reimplantation, 11 Nissen fundoplication, 10 gastrostomy and one gastrojejunostomy, two ovarian sparing surgeries for ovarian cyst were performed. One urachal remnant excision, one adrenal mass excision, and one thoracic outlet mass excision were performed.

Conclusion: This is the first study that includes a wide range of pediatric robotic surgical procedures in our country. Robotic-assisted laparoscopic procedures in pediatric surgery can be safely performed for many surgical pathologies. We think at the beginning some simple surgical procedures and then turning to the more complex procedures after at least 15 cases will be more appropriate.

Key Words: Children, Robot-Assisted Surgery, Minimally Invasive Surgery

ÖZ

Amaç: Robot yardımlı laparoskopik cerrahi (RALS) tüm dünyada hızla yayılırken, pediatrik cerrahide bu yayılım birçok nedenden dolayı erişkin cerrahisine göre daha yavaştır. Bu çalışmada pediatrik robotik cerrahi olguları ile ilgili ilk deneyimlerimizi tartıştık.

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Conflict of Interest / *Çıkar Çatışması*: On behalf of all authors, the corresponding author states that there is no conflict of interest.

Ethics Committee Approval / *Etik Kurul Onayı*: This study was conducted in accordance with the Helsinki Declaration Principles. This study was approved by the local ethics committee of the Gulhane Training and Research Hospital (11.05.2022/ 2022/59).

Contribution of the Authors / Yazarların katkısı*: *BAHADIR GB: Constructing the hypothesis or idea of research and/or article, Planning methodology to reach the Conclusions, Taking responsibility in logical interpretation and conclusion of the results, Reviewing the article before submission scientifically besides spelling and grammar. ***CALISKAN MB:*** Taking responsibility in the writing of the whole or important parts of the study, Reviewing the article before submission scientifically besides spelling and grammar. ***UNLU BALLI SE:*** Constructing the hypothesis or idea of research and/or article, Planning methodology to reach the Conclusions, Reviewing the article before submission scientifically besides spelling and grammar. ***ATASEVER HE:*** Taking responsibility in patient follow-up, collection of relevant biological materials, data management and reporting, execution of the experiments, Reviewing the article before submission scientifically besides spelling and grammar. ***KORKMAZ G:*** Taking responsibility in patient follow-up, collection of relevant biological materials, data management and reporting, execution of the experiments. ***YILDIRIM I:*** Taking responsibility in patient follow-up, collection of relevant biological materials, data management and reporting, execution of the experiments, Taking responsibility in the writing of the whole or important parts of the study. ***EKICI O:*** Taking responsibility in patient follow-up, collection of relevant biological materials, data management and reporting, execution of the experiments. ***CEVIK OM:*** Taking responsibility in patient follow-up, collection of relevant biological materials, data management and reporting, execution of the experiments. ***ULUBULUT KC:*** Taking responsibility in necessary literature review for the study. ***MAMBET E:*** Taking responsibility in necessary literature review for the study. ***OZTURK H:*** Taking responsibility in the writing of the whole or important parts of the study. ***SURER I:*** Reviewing the article before submission scientifically besides spelling and grammar. ***DEMIRBAG S:*** Reviewing the article before submission scientifically besides spelling and grammar.

How to cite / *Atıf yazım şekli* : Bahadir GB, Caliskan MB, Unlu Ballı SE, Atasever HE, Korkmaz G, Yildirim I ,et al. Robotic Assisted Endoscopic Surgery Practices in Pediatric Surgery, Single Center Experience. Turkish J Pediatr Dis 2023;17:147-153.

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Received / Geliş tarihi : 18.01.2023
Accepted / Kabul tarihi : 22.02.2023
Online published : 02.03.2023
Elektronik yayın tarihi
DOI: 10.12956/tchd.1233709

Gereç ve Yöntemler: Kasım 2017-Nisan 2022 tarihleri arasındaki robotik yardımlı endoskopik cerrahi vakaları retrospektif olarak incelendi. Hastaların tıbbi kayıtları, demografik özellikleri, cerrahi kayıtları ve takip süreleri retrospektif olarak incelendi.

Bulgular: 48 çocuğun 27'si erkek, 21'i kızdı. Olguların en küçüğü 10 aylık, en büyüğü ise 17 yaşındaydı (ortalama 7.72±5.6, medyan 7). Ameliyat sonrası en kısa takip süresi 5 ay iken en uzun takip süresi 60 aydı. 48 pediatrik hastaya toplam 63 cerrahi işlem uygulandı. 17 piyeloplasti (sol 10, sağ 7), 9 Lich Gregoir ameliyatı (sağ 6, sol 3), 4 sol üreterovezikal bileşke obstrüksiyonu (UJO) nedeniyle üreteral reimplantasyon ve tapering, 3 Hemi nefrektomi, bir apendikovezikostomi, bir sağ üreteral reimplantasyon,11 Nissen fundoplikasyonu, 10 gastrostomi ve bir gastrojejunostomi, over kisti olan iki hastaya over koruyucu cerrahi uygulandı. Bir urakus remnant eksizyonu, bir adrenal kitle eksizyonu ve bir torasik outlet kitle eksizyonu yapıldı.

Sonuç: Bu çalışma, ülkemizde pediatrik robotik cerrahi prosedürlerin geniş bir yelpazesini içeren ilk çalışmadır. Çocuk cerrahisinde robot yardımlı laparoskopik işlemler birçok cerrahi patolojide güvenle uygulanabilmektedir. Başlangıçta bazı basit cerrahi işlemlerin ardından en az 15 vakadan sonra daha karmaşık işlemlere geçilmesinin daha uygun olacağını düşünüyoruz.

Anahtar Sözcükler: Çocuklar, Robot Yardımlı Cerrahi, Minimal İnvaziv Cerrahi

INTRODUCTION

Today, although robotic-assisted laparoscopic surgery (RALS) applications have entered into routine clinical use in adults, it is still not possible to say the same for pediatric surgery (1). The first pediatric case (Nissen fundoplication) was reported only ten years after RALS in adults (2). The reasons for this delay in the widespread use of RALS in children depend on many factors. In our country, pediatric robotic surgery practices follow the developments in this field from behind in parallel with the world. Currently, there are only two centers actively using RALS in our country.

As a center, we started RALS applications for the first time in November 2017 and we continue in the appropriate patient group. Our study aims to discuss our experiences of the first 48 cases and to share the difficulties we encountered and the solutions we found for them.

MATERIALS and METHODS

The files of pediatric patients who underwent robotic-assisted endoscopic surgery between November 2017 and April 2022 were retrospectively reviewed. This study was approved by the local ethics committee of the Gulhane Training and Research Hospital (11.05.2022/ 2022/59). Sociodemographic data of the patients, gender, body weight, body mass index, diagnosis, accompanying diseases, findings during the surgery, surgery performed, duration of anesthesia, console duration, complications during and after surgery and hospital stay, intensive care requirements, blood and blood product needs were recorded.

In our center; It was performed by two pediatric surgeons experienced in RALS in the same center and with the same anesthesiologist. The da Vinci®, Si version (Intuitive Surgical, Inc., Sunnyvale, CA, USA was used for interventions. Two robotic work arms, 8 mm or 12 mm robotic 30° lenses for the three-dimensional camera, and a 5-10 mm trocar for an assistant's trocar were used for the procedures, depending on the surgical technique. Robotic arm placement positions recommended for standard entry sites were modified due to insufficient space for children. Especially in small children, a 3 cm or less distance between the trocars had to be left sometimes during the operation.

Definition of terms:

Operation time: It was defined as the time from skin incision (trocar placement) to skin closure. ,

Docking time: Connecting the robotic system to the patient and placing the trocar

Console time: Time from the end of the pre-console time to undocking the robot.

Anesthesia duration: It includes the total time the patient was taken to and removed from the operating table.

Surgical procedures:

In pyeloplasty; The child was placed in 45° flank position (lombotomy position). The robot was approached from the patient's back. The trans-Abdominal approach was preferred. 12 mm camera trocar over the umbilicus, surgical side (right or left lower quadrant) 8 mm from the lower quadrant, 8 mm from the surgical side (right or left upper quadrant) upper quadrant robotic working trocar, and between the camera and the upper robotic trocar A 10 mm assistant trocar was entered. Anderson Hynes technique was performed. A JJ catheter was placed in the children, and the bladder was filled with saline or methylene blue with 10% povidone-iodine to confirm the position of the catheter.

In hemi nephrectomy, the patient's position and trocar entry sites were the same as in pyeloplasty.

In vesicouretheral reflux surgery; the robot was placed in the Trendelenburg position at 20-30 degrees in the supine position, and the robot was approached from the foot side. A 12 mm camera trocar close to the umbilicus was inserted between the umbilicus and the xiphoid, an 8 mm robotic working trocar under the umbilicus from both rectus laterals, and a 10 mm assistant trocar from the left upper abdomen was inserted. Lich-Gregoir operation was performed. A catheter is placed in the bladder to fill and empty the bladder during the surgery.

In ureterovesical junction obstruction (UJO), the position of the patient and the trocar entry sites, and the position of the robot were the same as in ureteral reimplantation surgery. The ureter was separated from the entrance to the bladder and applied as reimplantation, tapering was added.

In the adrenal mass excision, the robot was approached from the patient's back in the lateral decubitus position. A 12 mm camera trocar at the level of the umbilicus, 8 mm robotic working trocars from the left lower quadrant and left upper quadrant, and a 10 mm assistant trocar 3 cm above the umbilicus were inserted.

The patient with a right thoracic outlet mass was placed in the left decubitus position. A 12 mm camera trocar was inserted at the junction of the mid-axillary line 6th intercostal space, anterior and posterior axillary lines 5, two 8 mm robotic working trocars at the junction of the intercostal space, and a 10 mm assistant trocar was inserted between the posterior trocar and the camera trocar.

In the Nissen fundoplication, the patient was placed in the supine position at 10-30 degrees reverse Trendelenburg position, and the robot was approached from the cranial side of the patient. A 12 mm camera trocar at the umbilicus level, 8 mm robotic working trocars from both lateral rectus, a 10 mm assistant trocar from the right lower quadrant, and a 5 mm liver retractor (Nathanson, Strong ArmTM, Nathanson liver retractor system, USA) under the xiphoid were inserted.

RESULTS

Of the 48 children whose families' consent was obtained, 27 were male and 21 were female. The youngest of the cases was 10 months old, while the oldest was 17 years old (mean 7.72±5.6, median 7). The children's body weights were between 8-102kg (mean 29.3±22.1kg). Body mass indexes ranged from 8-43kg/m^2 (mean 18.6±6.4 kg/m^2). The diagnoses of the children are indicated in Table. The shortest follow-up period after surgery was 5 months, while the longest follow-up was 60 months (mean 37.9±16.7 months).

Initially in older children, simpler surgical techniques were used (due to ovarian masses at 15 and 17 years old), and later on to younger children and more complex surgeries with progression to different points of the learning curve for RALS.

A total of 63 surgical procedures were performed on 48 pediatric patients. 17 pyeloplasty (left 10, right 7), 9 Lich Gregoir operation (right 6, left 3), ureteral reimplantation and tapering procedure due to left UJO (n=4), Hemi nephrectomy (n=3), appendicovesicostomy (n=1), One right ureteral reimplantation, Nissen fundoplication (n=11), gastrostomy (n=10) and one gastrojejunostomy, two ovarian sparing surgeries for ovarian cyst were performed. One urachal remnant excision, one adrenal mass excision, and one thoracic outlet mass excision were performed.

Pyeloplasty

In patients who underwent robotic-assisted laparoscopic pyeloplasty; A total of 17 patients were operated on (left 10, right 7), 10 months -17 years old (median 6 years old). Anesthesia duration ranged from 3.5 to 7.5 hours (median 4.5 hours); operative time was between 3-6.5 hours (median 4 hours). The hospital stay ranged from 3 days to 22 days (median 5 days). Since the JJ catheter did not work effectively in two patients, one developed urinoma on the 5th and the other 7th postoperative day. A nephrostomy catheter was placed with interventional radiology. And these patients were discharged on the 19th and 22nd postoperative days.

Ureteral reimplantation

A total of eleven ureteral reimplantation surgeries were performed in eight children (1-14 years; median 3 years, 2 boys and 5 girls) due to vesicourethral reflux, four of which were right, one left, and three were bilateral. Appendicoveiscostomy was added to one patient due to a neurogenic bladder. Anesthesia duration ranged from 4.5 hours to 6.5 hours (median 5 hours), and operative times ranged from 4 hours to 5.5 hours (median 4.5 hours). In the postoperative controls of the patients with the shortest follow-up period of 2 years and the longest 4 years, two patients had recurrence (bilateral right grade 5 left grade 3), and subureteric injection was performed and reflux was corrected.

A total of 5 pediatric patients aged between 1 and 8 years (median 5 years), all male due to UJO, were operated on. In one of these patients, due to an accompanying urachal cyst, the robotic intervention was performed in the same session. Anesthesia duration was between 5.5-7 hours (median 6 hours) and operation times varied between 5-6 hours (median 5 hours). The hospital stay was between 4 and 19 days (median 5). Urinoma developed in one patient because the DJ catheter fell into the distal ureter.

Hemi nephrectomy

Left Hemi nephrectomy was performed on a total of three patients, one girl and two boys, aged two years 2 and one 5 years old. They were discharged 3,4,6 days after surgery without any complications.

Fundoplication

Of the patients who underwent robotic-assisted laparoscopic Nissen fundoplication, 10 had severe neurological sequelae and one had milder neurological sequelae. In addition, these patients had also severe extremity contractures and posture disorders. Two of the 11 patients who underwent Nissen fundoplication were female and 9 were male. An additional gastrostomy was performed in 10 patients, and an additional gastrojejunostomy was performed in one patient. Two children

Table: Demographical Features, Surgical Details, and Follow-Up Time of the Patients.

Patient	Age (Y)	Gender	Weight (Kg)	Height (M)	Bmi	Operation	Operation Time (H)	Anesteshia Time (H)	Hospitalization (Day)	Complication	Intensive Care	Follow Up (M)
1	16	M	31.0	1.50	13.78	Fundoplication+ Gastrostomy	5.00	6.00	16	None	No	56 Months
2	7	M	30.0	1.20	20.83	Fundoplication+ Gastrostomy+ Hiatal Hernia Repair	4.00	4.50	8	None	No	56 Months
3	16	M	32.0			Fundoplication+ Gastrostomy+ Hiatal Hernia Repair	6.50	8.00	2	None	Yes	51 Months
4	2	M	8.0	0.80	12.50	Fundoplication+ Gastrostomy+ Hiatal Hernia Repair	2.50	3.50	3	None	Yes	49 Months
5	10	M	45.0	1.50	20.00	Fundoplication+ Hiatal Hernia Repair	3.00	4.00	8	None	No	48 Months
6	16	M	17.0	1.50	7.56	Fundoplication+ Gastrostomy	3.50	4.00	2	None	Yes	42 Months
7	4	M	12.0	1.00	12.00	Fundoplication+ Gastrostomy	2.50	3.00	5	None	No	39 Months
8	9	M	15.0	1.30	8.88	Fundoplication+ Gastrostomy+ Hiatal Hernia Repair	2.50	3.00	6	None	No	35 Months
9	2	M	11.0			Fundoplication+ Gastrostomy	3.50	4.00	6	None	No	35 Months
10	5	M	34.0	1.20	23.61	Left Uretheral Reimplantation + Tapering	6.00	7.00	5	None	No	56 Months
11	8	M	25.0	1.25	16.00	Right Uretheral Reimplantation+ Appendicovesicostomy	5.50	6.50	6	None	No	38 Months
12	5	M	20.0	1.10	16.53	Left Hemi Nephrectomy	5.00	6.00	6	None	No	50 Months
13	11	M	40.0	1.56	16.44	Left Pyeloplasty	4.00	5.00	22	Urinoma (Post-Op 6th Days)	No	48 Months
14	1	M	12.0	0.53	42.72	Left Pyeloplasty	3.00	4.00	4	None	No	43 Months
15	16	M	79.0	1.82	23.85	Left Pyeloplasty	3.15	3.45	7	None	No	42 Months
16	6	M	23.0	1.10	19.01	Left Pyeloplasty	6.50	7.50	6	None	No	40 Months
17	4	M	17.0	1.05	15.42	Left Pyeloplasty	4.00	5.00	5	None	No	36 Months
18	3	M	16.0	0.98	16.66	Left Pyeloplasty	4.00	5.00	6	None	No	22 Months
19	6	M	26.0	1.20	18.06	Right Pyeloplasty	3.50	5.00	3	None	No	13 Months
20	17	M	62.0	1.80	19.14	Left Pyeloplasty	3.00	4.00	5	None	No	11 Months
21	2	M	14.0	0.86	18.93	Right Hemi Nephrectomy	4.50	5.50	3	None	No	58 Months
22	11	M	30.0	1.41	15.09	Right Thoracal Mass Excision	3.00	4.50	7	Intraoperative Hypertension	No	44 Months
23	3	M	14.0	0.90	17.28	Bilateral Uretheral Reimplantation (Vur)	4.00	5.00	4	Re-Reflux + / Urethral Stricture(Cystostomy)	No	22 Months

Patient	Age (Y)	Gender	Weight (Kg)	Height (M)	Bmi	Operation	Operation Time (H)	Anesthesia Time (H)	Hospitalization (Day)	Complication	Intensive Care	Follow Up (M)
24	1	M	12.0	0.81	18.29	Right Uretheral Reimplantation (Vur)+ Urachal Remnant Exision	4.50	5.50	19	J-J Catheter Slides Into Bladder / Urinoma	No	50 Months
25	6	M	21.0	1.15	15.88	Left Uretheral Reimplantation+ Tapering+ (Uvo)	6.00	7.00	7	None	No	21 Months
26	5	M	15.0			Left Uretheral Reimplantation+ Tapering+ (Uvo)	5.00	6.00	5	None	No	14 Months
27	2	M	12.0	0.83	17.42	Left Uretheral Reimplantation+ Tapering+ (Uvo)	4.50	5.50	4	None	No	13 Months
28	11	F	33.0	1.50	14.67	Fundoplication+ Gastrostomy Take Down+ Gastrostomy	6.00	7.00	19	None	No	61 Months
29	6	F	18.0	1.10	14.88	Fundoplication+ Gastrostomy	3.50	4.00	6	None	No	42 Months
30	2	F	16.0	1.00	16.00	Right Hemi Nephrectomy	3.00	4.00	4	None	No	47 Months
31	17	F	42.0	1.64	15.62	Ovary Cyst	2.00	2.50	4	None	No	68 Months
32	15	F	62.0	1.57	25.15	Ovary Cyst	2.00	2.50	2	None	No	62 Months
33	7	F	33.0	1.45	15.70	Right Pyeloplasty	3.50	4.50	7	None	No	51 Months
34	2	F	12.5	0.78	20.55	Left Pyeloplasty	4.50	5.00	6	None	No	45 Months
35	11/12	F	9.0	0.73	16.89	Right Pyeloplasty	3.50	4.50	9	J-J Catheter Obstruction / Nephrostomy	No	40 Months
36	18	F	95.0	1.75	31.02	Left Pyeloplasty	5.00	6.00	4	None	No	23 Months
37	15	F	102.0	1.60	39.84	Left Pyeloplasty	4.00	5.00	3	None	No	22 Months
38	14	F	48.0	1.60	18.75	Right Pyeloplasty	5.50	7.00	4	None	No	19 Months
39	5/6	F	9.0	70.00	0.00	Right Pyeloplasty	3.00	4.50	4	None	No	7 Months
40	7	F	25.0	1.20	17.36	Left Pyeloplasty	2.00	2.50	4	None	No	1 Months
41	9	F	33.0	1.45	15.70	Right Pyeloplasty	5.50	6.50	5	None	No	59 Months
42	16	F	71.0	1.75	23.18	Left Surrenal Mass Excision	2.00	2.50	5	None	No	37 Months
43	1	F	11.5	0.76	19.91	Left Uretheral Reimplantation (Vur)	3.50	5.00	5	None	No	55 Months
44	14	F	34.0	1.35	18.66	Right Uretheral Reimplantation (Vur)	4.50	5.00	7	None	No	53 Months
45	12	F	37.0	1.52	16.01	Right Uretheral Reimplantation (Vur)	4.00	4.50	2	None	No	52 Months
46	1	F	10.0	0.82	14.87	Right Uretheral Reimplantation (Vur)	4.50	5.00	3	None	No	40 Months
47	3	F	18.0			Bilateral Uretheral Reimplantation (Vur)	4.50	5.50	6	None	No	35 Months
48	5	F	16.0	90.00	0.00	Bilateral Uretheral Reimplantation (Vur)	5.50	6.50	5	None	No	7 Months

had gastrostomy previously, the gastrostomy was taken down initially robotically, and gastrostomy was performed again after fundoplication. The age at surgery was between 25 months and 17 years (median 10 years), body weight was between 8-44 kg (median 19 kg), and body mass index was between 7.7 and 36.4 (median 18.3). The duration of anesthesia was between 2.5 hours and 8 hours (mean 4 hours), while the duration of surgery was between 2 and 6.5 hours (mean 4 hours).

While the first Nissen fundoplication was 240 minutes (45-300 minutes) (the longest time belonged to the patient who had fundoplication, gastrojejunostomy, and gastrostomy), it was observed that this time decreased to 45 minutes (fundoplication without gastrostomy).

Three pediatric patients with severe neurological problems who underwent fundoplication were transferred to the intensive care unit due to respiratory distress after surgery. They needed intensive care for up to two months. Independent of the interventions, three children died due to their primary pathology (two children died 3 and 4 years after the operation). Another child died 6 months after the operation due to the development of esophageal cancer.

Other procedures

A 16-year-old female patient was discharged 5 days after surgery for a left adrenal mass. The duration of anesthesia was 2.5 hours and the operation time was 2 hours.

A ten-year-old patient with a right thoracic outlet mass. Anesthesia time was 4.5 hours and surgery time was 3 hours. Histopathological examination was compatible with paraganglioneuroma. He was discharged on the 4th day of hospitalization after surgery.

Ovarian-sparing surgery was performed in two female cases as initial robotic cases due to ovarian cysts.

In terms of hospital stay, the shortest was two days and the longest was 22 days (mean 6.2 days, median 5 days). After the operation, five children needed blood and blood products transfusion; Four of them were given erythrocyte suspension, two of them were given FFP and one patient was given albumin.

There was no need for conversion to open or endoscopic surgery in any of the cases.

DISCUSSION

This is the first study in our country that includes the use of RALS in the field of pediatric surgery. Unfortunately, there is not much data available on RALS nationally on this subject. On the other hand, more than 400 international studies have been conducted on RALS in pediatric surgery since the first case report in 2001. An important part of these publications belongs to pediatric urology.

The learning curve of RALS is much shorter than endoscopic surgery, however in conventional endoscopic surgery, It takes a long time to acquire the sufficient skill. Moreover, studies have shown that RALS has a shorter learning curve (1, 3-6). At the same time, important limitations of RALS include the lack of tactile feedback, but this deficiency can be overcome over time by the brain's evaluation of visual data (7).

In our first cases, while the console time was 4.3 hours on average in the first 5 pyeloplasty cases, it decreased to 2.5 hours in the last 5 cases. However, there was no statistically significant decrease in surgeries performed with ureteral-reimplantation(mean 4.5 hours).

Some lesions which are difficult to reach due to locations such as thoracic outlets can cause a dangerous challenge to surgeons and could be accomplished more easily by RALS than by conventional thoracoscopic approach. In one of our cases, a paraganglioma of approximately 4x3 cm in diameter located at the thoracic outlet could be removed in a very short time (operation time; 2,5 hours).

Robotic pyeloplasty; is becoming the preferred procedure of choice in the pediatric age group. According to a study, robotic pyeloplasty has become reported as the most frequently performed intervention in childhood for UPJ obstructions in the USA (8). In most of the existing robot series for pyeloplasty, the hospital stay has decreased to <24 hours (9-11). Although our postoperative hospital stay in robotic pyeloplasty seems longer than in other studies, Its stays continue to decrease. Robotic fundoplication has significant advantages when considering laparoscopic or open surgery, especially in patients with severe anatomical problems. Although the positioning of the patient with severe neurological impairment in robotic fundoplication causes some challenges to the surgeon, this problem could be overcomed by experienced robotic surgery team.

In the beginning one of the factors that causes prolonged operation time is docking procedures, it can be shortened with getting more experience. While in our series the mean docking time for the first 15 cases was 33 minutes, it decreased to 13 minutes for the last 15 cases. This data was also supported by other studies about docking time (1-3). While Gutt et al. (12) was reported an average docking time of 23 minutes Salö et al.(1) had been showing a lower docking time of 5-10 minutes in fundoplication. According to our data, the longest docking time belong to the patients with severe anatomical problems which underwent Nissen fundoplication (mean 39 minutes), and unfortunately, this time was not reduced significantly despite getting more experience. The mean undocking time including skin closure of the patient from the operating table was 30 minutes (15-38 minutes).

One of the other problems faced by surgeons who have just started or are willing start RALS is an adaptation to the console and operation room setup, which is different from endoscopic or

Figure: Hypertrophic scar-like port-side wound healing is shown. Postoperative 3th month. *Robotic ports, → assistant port, ⇨ Camera port

open surgery. In this period, the help of doctors and technicians experienced in robotic surgery will help them overcome the initial problems. Since we had the advantage of working with a group of very experienced technicians (approximately 1500 cases in total) when we started, we did not encounter any problems.

Cost-effectiveness issue is still a limitation problem of routine use of robotic surgical devices. According to one study, it had been reported that between 3 and 5 robotic cases, per week, should be required to overcome the cost-effectiveness problem (13). We solved this problem by sharing the robot with other surgical specialties.

Currently, many pediatric surgery centers actively practice robotic surgery in the world. When the literature is searched, the rates of conversion to open surgery have been reported within a wide range (0-50%) depending on the surgical procedures. (1). While this rate was initially 36% in pyeloplasty and 40% in hemi nephrectomies, it has been reported to decrease in that rate rapidly with the increase in cases (1). The most important reasons for conversion to open surgery are; the high body mass index of the patient, severe anatomical problems, and technical reasons that have been reported (1). No technical problems were encountered in our series. There has been no conversion to open or laparoscopic surgery in our series.

It is known that the main advantage of minimally invasive surgery is better cosmetic results. However, in some of our cases, we found hypertrophic scar-like port-side wound healing problems which was has been not reported in pediatric cases and we are still investigating the cause of that (Figure).

This is an initial experience report from a third level pediatric surgeon center. The growing robotic pediatric surgical experience will result in better scientific data.

As a result; Robotic-assisted laparoscopic procedures in pediatric surgery can be safely applied to many surgical pathologies. We think that it would be more appropriate for centers to start robotic surgical procedures, that is, to prefer simple surgical procedures at the beginning and then turn to more complex procedures.

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