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Retrospective Study

Multifactor study of efficacy and recurrence in laparoscopic surgery for inguinal hernia

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Author contributions: Chen WL designed the study; Deng QQ drafted the work and collected the data; Xu W and Luo M analyzed and interpreted the data and wrote the article.

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Abstract

BACKGROUND

Inguinal hernia is a common clinical manifestation in children with a low self-healing rate.

AIM

To determine the effect of laparoscopic surgery on indirect inguinal hernia and the risk factors for postoperative recurrence and to provide a reference for the clinical treatment and prevention of recurrence.

METHODS

We selected 360 children who underwent laparoscopic high ligation in our hospital as the laparoscopic group and 120 patients treated for inguinal hernia with conventional surgery as the control group. The operation time, blood loss, incision length, hospitalization time, total hospitalization cost and surgical complications were compared between the two groups. According to telephone follow-up or return visits, the children who had recurrence within 2 years after the operation in the laparoscopic group were analyzed, and the laparoscopic high ligation hernia sac level was analyzed by the logistic multifactor method. Ligation was used to treat recurrence in children with inguinal hernia.

RESULTS

The operation time, blood loss, length of incision, and length of hospital stay in the laparoscopic group were lower than those in the control group ($P < 0.05$). The total hospitalization cost in the laparoscopic group was higher than that in the control group ($P < 0.05$). The operative complication rate was 1.67% lower than that in the control group (12.50%) ($P < 0.05$). In 360 children with laparoscopic high ligation of the hernia sac, 14 patients had recurrence within 2 years after surgery. After analysis, 14 cases in the recurrence group did not recur. The preoperative incarceration rate, inner ring diameter, ligature use and age difference were statistically significant ($P < 0.05$). According to logistic regression

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multivariate analysis, an inner ring diameter ≥ 1.0 cm, the use of an absorbable ligature line and age > 3 years increased the risk of postoperative recurrence in children with inguinal hernia after laparoscopic high ligation of the hernia sac ($P < 0.05$).

CONCLUSION

Laparoscopic surgery for indirect inguinal hernia in children has the advantages of low trauma and a rapid postoperative recovery. An inner ring diameter ≥ 1.0 cm, the use of absorbable ligature, and age > 3 years may increase the risk of recurrence after laparoscopic high ligation of the hernia sac.

Key Words: Laparoscopic high ligation of the hernia sac; Pediatric; Inguinal hernia; Recurrence; Risk factors

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Core Tip: At present, surgical treatment is the main treatment method for inguinal hernia in children. The traditional open surgical incision is large, and it is very easy to damage the nerves in the inguinal area in children. The high-risk factors that cause recurrence after laparoscopic surgery for inguinal hernia have been analyzed, and early prevention and treatment to improve the prognosis of children has been deemed significantly important. In this study, we analyzed the effect of laparoscopic surgery on indirect inguinal hernia and the risk factors.

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INTRODUCTION

Inguinal hernia is a common clinical manifestation in children with a low self-healing rate. It is mainly caused by congenital unclosed peritoneal sheath-like processes. Some children may have inguinal hernia incarceration causing small intestinal obstruction. As the disease progresses, it will cause small intestinal obstruction, seriously affecting the physical and mental health and safety of children[1,2].

At present, surgical treatment is the main treatment method for inguinal hernia in children. The traditional open surgical incision is large, and it is very easy to damage the nerves in the inguinal area in children[3]. Postoperative incision infection is prone to cause recurrence. In recent years, laparoscopy has been widely used in clinical practice with small incisions, slight trauma, few complications, *etc.*, but studies have shown that there is still a certain recurrence rate after laparoscopic surgery. Therefore, the high-risk factors that cause recurrence after laparoscopic surgery for inguinal hernia have been analyzed, and early prevention and treatment to improve the prognosis of children has been deemed significantly important[4].

This study analyzed the effect of laparoscopic surgery on inguinal indirect hernia and the risk factors for postoperative recurrence to provide guidance and a basis for clinical practice.

MATERIALS AND METHODS

A total of 360 children with previous laparoscopic hernia sac ligation in our hospital were selected as the laparoscopic group, and 120 children with indirect inguinal hernia treated with traditional surgery were selected as the control group. The selection period in this study was from January 2014 to May 2017. Inclusion criteria: (1) The diagnostic criteria of indirect inguinal hernia in children referred to the standard in Fu-Tang Zhu's "Practical Pediatrics"; (2) All children received surgical treatment in our hospital from January 2014 to May 2017, and the postoperative data were complete;

and (3) This study obtained approval from the medical ethics committee before consulting the patient data. Exclusion criteria: (1) intestinal tumors; (2) intestinal obstruction, abdominal infection, intestinal perforation, *etc.*; (3) congenital megacolon, *etc.*; (4) severe liver and kidney function diseases; and (5) chromosomal genetic diseases.

The laparoscopic group consisted of 341 males and 19 females, aged 1 to 13 years, with an average age of $3.39 \pm$ years. The distribution of the affected side was as follows: 152 cases on the left side, 133 cases on the right side, and 75 cases on both sides. The control group consisted of 110 males and 10 females, aged 1 to 13 years, with an average age of $3.58 \pm$ years. The distribution on the affected side was as follows: 52 cases on the left side, 46 cases on the right side, and 22 cases on both sides. There was no statistically significant difference in age, sex, or distribution on the affected side between the two groups ($P > 0.05$).

Surgical procedure

Control group: Traditional surgical treatment was performed. A 20-25 mm incision was made at the midpoint of the inguinal ligament on the upper side of the affected groin parallel to the inguinal ligament. The lower peritoneal edge was searched for the hernia ring. A high-position double-pouch suture was used to complete the ligation. After the operation, suturing was performed, the patient received bed rest for 12 h after the operation, diet and water were restored within 3-5 h, and routine anti-inflammatory and other conventional measures were given after the operation.

Laparoscopy group: After satisfactory general anesthesia, continuous epidural anesthesia was performed; 5 mm and 3 mm incisions were made in the umbilicus and the outer edge of the rectus abdominis, respectively, and a 5 mm trocar was implanted after the establishment of an artificial pneumoperitoneum with carbon dioxide. Laparoscopic instruments were placed, and hernia needles were used. Nylon thread was inserted vertically from the projection of the inner surface of the inner ring, and the needle was inserted at the laparoscopic retroperitoneal origin of the needle. The needle was drawn around the half-circle of the inner ring, and the nylon thread was cut, tightened and knotted twice. After the operation was completed, suturing was performed, the patient was bedridden for 12 h after the operation, and diet and water were restored within 3-5 h. Conventional anti-inflammatory and other conventional measures were given after the operation.

Statistical analysis

SPSS 21.0 software was used for statistical analysis. The indices of age, operation time, bleeding volume, incision length, and hospitalization time in the two groups were expressed as mean \pm SD. The comparison between groups was made with two-sample independent *t* tests; the comparison of count data was made with the χ^2 test; and logistic regression analysis was used for factor analysis. $P < 0.05$ was considered statistically significant.

RESULTS

Comparison of procedure-related parameters between the laparoscopic and control groups

Patients in the laparoscopic group had a lower operative time, less bleeding, a smaller incision length, and a shorter length of hospital stay than those in the control group ($P < 0.05$). The total cost of hospitalization was higher in the laparoscopic group than in the control group ($P < 0.05$) (Table 1).

Comparison of surgical complication rates between the laparoscopic and control groups

The rate of surgical complications in the laparoscopic group was 1.67% lower than the rate of 12.50% in the control group ($P < 0.05$, Table 2).

After analyzing the follow-up records, 14 of 360 children with laparoscopic high ligation of the hernia sac had recurrence within 2 years after surgery. Statistically significant differences were found in the incidence of preoperative incarcerations, diameter of the internal ring orifice, use of ligature threads, and age between children in the recurrence and non-recurrence groups ($P < 0.05$, Table 3).

Table 1 Comparison of operative-related indices between the laparoscopic group and the control group (mean ± SD)

Group	n (%)	Duration of surgery (min)	Blood loss (mL)	Cut length (cm)	Hospital stay (d)	Total hospital expenses (\$)
Laparoscopic group	360	28.5 ± 5.9	3.8 ± 1.0	0.69 ± 0.16	3.5 ± 1.0	6695.2 ± 1058.4
Control group	120	35.0 ± 8.3	10.5 ± 3.0	2.30 ± 0.54	4.8 ± 1.2	5501.6 ± 884.2
<i>t</i> value		-9.372	-36.749	-50.405	-11.708	11.125
<i>P</i> value		0.000	0.000	0.000	0.000	0.000

Table 2 Comparison of operative complications between the laparoscopic group and the control group

Group	n (%)	Scrotal hematoma	Incision infection	Hydrocele	(%) complications
Laparoscopic group	360	5	0	1	6 (1.67)
Control group	120	11	2	2	15 (12.5)
χ^2 value					25.247
<i>P</i> value					0.000

Table 3 Single-factor analysis of postoperative recurrence of indirect inguinal hernia due to laparoscopic high ligation of the hernia sac

Factors	Recurrence (n = 14)	(n = 346)	χ^2 value	<i>P</i> value
Age (yr)			4.284	0.038
≤ 3 yr	8 (57.14)	277 (80.06)		
> 3 yr	6 (42.86)	69 (19.94)		
Sex			2.961	0.085
Male	12 (85.71)	331 (95.66)		
Female	2 (14.29)	15 (4.34)		
Obesity			0.472	0.492
Yes	3 (21.43)	51 (14.74)		
No	11 (78.57)	295 (85.26)		
Preoperative incarceration			4.756	0.029
Yes	6 (42.86)	66 (19.08)		
No	8 (57.14)	280 (80.92)		
Hernia sac			0.696	0.706
Left	6 (42.86)	146 (42.2)		
Right	4 (28.57)	129 (37.28)		
Bilateral	4 (28.57)	71 (20.52)		
Diameter of inner ring (cm)			4.594	0.032
cm < 1.0	8 (57.14)	279 (80.64)		
cm ≥ 1.0	6 (42.86)	67 (19.36)		
Ligation			5.875	0.015
Absorbable	9 (64.29)	114 (32.95)		
Nonabsorbable	5 (35.71)	232 (67.05)		

According to logistic regression multifactorial analysis, an internal ring orifice diameter ≥ 1.0 cm, the use of absorbable ligatures, and age ≥ 3 years increased the risk of postoperative recurrence in children with inguinal hernia after laparoscopic high ligation of the hernia sac ($P < 0.05$, Table 4).

Table 4 Results of logistic regression analysis

Parameters	SE	Walds	P value	OR	95%CI		
Age	0.664	0.261	6.472	0.008	1.943	1.165	3.240
Diameter of inner ring	0.397	0.143	7.707	0.000	1.487	1.124	1.969
Ligation	0.556	0.231	5.793	0.018	1.744	1.109	2.742
Preoperative incarceration	1.440	0.841	2.932	0.163	4.221	0.812	21.941

SE: Standard error; OR: Odds ratio.

DISCUSSION

Inguinal hernia is the most common clinical type of extra-abdominal hernia and is characterized by protrusion of the contents of the abdominal cavity outward through a weakness in the abdominal wall, resulting in the need for surgery. The incidence of inguinal hernia has been increasing in recent years due to the inability to heal on its own after formation. The main treatment is surgery, with a reported 0.3%-3% chance of inguinal hernia incarceration or strangulation, and the mortality rate in patients undergoing emergency surgery for incarceration or strangulation exceeds 5% [5]. In humans, inguinal stasis occurs in a triangular area on either side of the anterolateral lower abdomen, an area that is susceptible to increased intra-abdominal pressure. This area also contains blood vessels and nerves traveling from the abdomen to the lower extremities, so thinning of this region can occur in a variety of congenital or postnatal factors. This leads to the occurrence of inguinal hernia [6,7]. It is currently clinically believed that the disease occurs due to the following factors: First, due to the congenital failure of syrxinx closure; second, due to transient intra-abdominal pressure changes; and third, the triggering of abnormal collagen metabolism or changes in the composition of tissues in the inguinal region, leading to a weak abdominal wall [8,9].

Surgery is a significant clinical treatment for inguinal hernias, and traditional open surgery requires, on the one hand, removal of the external oblique tendon membrane during the procedure. Incision during the process of separating the hernia sac can lead to damage to structures such as blood vessels and nerves in the spermatic cord and, in severe cases, can also lead to complete torsion. On the other hand, this procedure may not allow for exploration of the contralateral side due to certain limitations of the procedure [10]. Regardless of the presence of an occult hernia, inguinal hernia is easy to misdiagnose [11,12]; in addition, open surgery causes greater trauma in children and slows the postoperative recovery. The loss of important structures within the spermatic cord in children will affect their growth and development, and the number of postoperative complications increases significantly [13]. In recent years, the wide application of laparoscopic surgery in the clinic has demonstrated significant advantages. On the one hand, the magnification effect of laparoscopy can be observed in children with inguinal hernia. The clear visualization of the spermatic cord, vas deferens and other structures reduces the chance of injury; additionally, the incision is small, the scar is aesthetically pleasing, and the recovery after surgery in children is fast [14]. On the other hand, laparoscopic surgery does not cause loss of tissue in the inguinal region during high hernia sac ligation, and there is no need to separate the spermatic cord. The procedure can also be performed without opening the testicular muscle, effectively reducing surgical complications [15]. In addition, the procedure allows for exploration of the contralateral inguinal region, which can be performed simultaneously in children with an occult hernia. Performing ligation reduces the chance of reoperation and reduces pain in children [16].

Although laparoscopy has obvious advantages in the treatment of inguinal hernias, there is still a certain chance of recurrence, which requires reoperation in children. This increases the financial burden and trauma to children and can lead to serious medical complications; thus, it is important to actively explore the causes of postoperative recurrence in children [17]. Risk factors are important for the treatment and clinical prevention of postoperative recurrence. This study analyzed a variety of factors and found that older age was a high-risk factor for postoperative recurrence, mainly in the groin in children with a younger age. The musculature of this area is weak, and the hernia sac ligation process does not result in greater tension; however, the musculature develops with age, becoming robust and therefore prone to greater resistance during the ligation process and thus making it highly likely that the hernia

sac will not be tightened, leading to recurrence[18]. The large diameter of the inner ring is also an important factor in recurrence, as the inner ring is weaker than the superficial muscles and fascia. A significant increase in abdominal pressure can lead to excessive pressure from the ligature line and the sliding release of the tightly ligated sac, causing recurrence[19]. A review of four surgical approaches in the treatment of pediatric hernias found that laparoscopic high ligation alone was not reliable, and by lowering the ligation in the laparoscopic approach, suturing of the pelvic girdle and inferior arch to narrow the internal ring was more reliable, suggesting that the clinical practice of high ligation of the hernia sac in children with a large internal ring is more effective. Laparoscopic repair should be performed at the time of ligation to reduce the recurrence rate[20]. In addition, this study also found that the type of ligature was an important factor in postoperative recurrence, and the commonly used suture is usually completely absorbed in 56-70 d, maintains three quarters of the tensile strength for two weeks and loses 95% of the tensile strength in January; however, by this time, the hernia will have been absorbed. Incomplete occlusion can lead to recurrence, and the application of absorbable sutures produces mild irritation of surrounding tissues and less scar tissue formation. Scar tissue is important for deterring recurrence, hence the use of absorbable sutures in relatively more children with recurrence[21].

This study showed that the operative time, massive bleeding, incision length, and length of hospital stay were lower in the laparoscopic group than in the control group, but the total cost of hospitalization was higher in the laparoscopic group than in the control group, suggesting that the use of laparoscopic surgery for pediatric inguinal hernia can shorten the operative time and speed up postoperative recovery, but that overall surgical costs are elevated. The rate of surgical complications in the laparoscopic group was 1.67% lower than the rate of 12.50% in the control group, indicating that treatment with laparoscopic surgery for pediatric inguinal hernias can reduce postoperative complications. An analysis of postoperative recurrence in children found that the incidence of preoperative incarceration, an internal ring orifice diameter ≥ 1.0 cm, the use of nonabsorbable ligature threads and age > 3 years were significantly important factors influencing postoperative recurrence. According to logistic regression multifactorial analysis, an internal ring diameter ≥ 1.0 cm, the use of absorbable ligatures, and age > 3 years were important factors for postoperative recurrence. Age increases the risk of postoperative recurrence in children with inguinal hernia after laparoscopic high ligation of the hernia sac. The strengths of this study are that it confirms the advantages of laparoscopic surgery for inguinal hernia in children, analyzes the risk factors for postoperative recurrence and proposes preventive measures. However, the present study had a short follow-up time and a limited number of enrolled patients, so an expanded sample size and a long-term follow-up are needed for in-depth demonstration of the conclusions.

CONCLUSION

In summary, laparoscopic surgery for inguinal hernia in children has the advantages of low trauma, rapid postoperative recovery, and low cost. The use of absorbable ligatures, an internal ring diameter ≥ 1.0 cm and age ≥ 3 years may increase the risk of recurrence after laparoscopic high ligation of the hernia sac.

ARTICLE HIGHLIGHTS

Research background

Inguinal hernia is a common clinical manifestation in children.

Research motivation

To assess the rationality of laparoscopic treatment of inguinal hernia.

Research objectives

To determine the effect of laparoscopic surgery on indirect inguinal hernia and the risk factors for postoperative recurrence.

Research methods

We selected 360 children who underwent laparoscopic high ligation in our hospital as

the laparoscopic group and 120 patients treated for inguinal hernia with conventional surgery as the control group.

Research results

The rate of surgical complications in the laparoscopic group was 1.67% lower than the rate of 12.50% in the control group ($P < 0.05$). 14 of 360 children with laparoscopic high ligation of the hernia sac had recurrence within 2 years after surgery.

Research conclusions

Laparoscopic surgery for indirect inguinal hernia in children has the advantages of low trauma and a rapid postoperative recovery.

Research perspectives

Minimally invasive surgery benefits more patients.

REFERENCES

- 1 **Chan IH**, Tam PK. Laparoscopic Inguinal Hernia Repair in Infants and Children: State-of-the-Art Technique. *Eur J Pediatr Surg* 2017; **27**: 465-471 [PMID: 29166678 DOI: 10.1055/s-0037-1608685]
- 2 **Ece I**, Yilmaz H, Yormaz S, Sahin M. Clinical outcomes of single incision laparoscopic surgery and conventional laparoscopic transabdominal preperitoneal inguinal hernia repair. *J Minim Access Surg* 2017; **13**: 37-41 [PMID: 27251835 DOI: 10.4103/0972-9941.181394]
- 3 **Bouras G**, Burns EM, Howell AM, Bottle A, Athanasiou T, Darzi A. Linked hospital and primary care database analysis of the impact of short-term complications on recurrence in laparoscopic inguinal hernia repair. *Hernia* 2017; **21**: 191-198 [PMID: 28130603 DOI: 10.1007/s10029-017-1575-1]
- 4 **Koivusalo AI**. A Review of the Incidence, Manifestation, Predisposing Factors, and Management of Recurrent Pediatric Inguinal Hernia. *Eur J Pediatr Surg* 2017; **27**: 478-483 [PMID: 29121686 DOI: 10.1055/s-0037-1608675]
- 5 **Sheen AJ**, Pilkington JJ, Baltatzis M, Tyurkylmaz A, Stathakis P, Jamdar S, Siriwardena AK. Comparison of Mesh Fixation Techniques in Elective Laparoscopic Repair of Incisional Hernia-ReliaTack™ v ProTack™ (TACKoMesh) - A double-blind randomised controlled trial. *BMC Surg* 2018; **18**: 46 [PMID: 29996841 DOI: 10.1186/s12893-018-0378-3]
- 6 **van de Wal M**, Thewes B, Gielissen M, Speckens A, Prins J. Efficacy of Blended Cognitive Behavior Therapy for High Fear of Recurrence in Breast, Prostate, and Colorectal Cancer Survivors: The SWORD Study, a Randomized Controlled Trial. *J Clin Oncol* 2017; **35**: 2173-2183 [PMID: 28471726 DOI: 10.1200/JCO.2016.70.5301]
- 7 **Ceccanti S**, Cervellone A, Pesce MV, Cozzi DA. Feasibility, safety and outcome of inguinal hernia repair under spinal vs general anesthesia in preterm and term infants. *J Pediatr Surg* 2020 [PMID: 33143880 DOI: 10.1016/j.jpedsurg.2020.09.064]
- 8 **Miyake H**, Fukumoto K, Yamoto M, Nakajima H, Sekioka A, Yamada Y, Nomura A, Urushihara N. Risk factors for recurrence and contralateral inguinal hernia after laparoscopic percutaneous extraperitoneal closure for pediatric inguinal hernia. *J Pediatr Surg* 2017; **52**: 317-321 [PMID: 27894761 DOI: 10.1016/j.jpedsurg.2016.11.029]
- 9 **Gong D**, Qin C, Li B, Peng Y, Xie Z, Cui W, Lai Z, Nie X. Single-site laparoscopic percutaneous extraperitoneal closure (SLPEC) of hernia sac high ligation using an ordinary taper needle: a novel technique for pediatric inguinal hernia. *Hernia* 2020; **24**: 1099-1105 [PMID: 32266601 DOI: 10.1007/s10029-020-02180-z]
- 10 **Niu X**, Song X, Su A, Zhao S, Li Q. Low-pressure capnoperitoneum reduces stress responses during pediatric laparoscopic high ligation of indirect inguinal hernia sac: A randomized controlled study. *Medicine (Baltimore)* 2017; **96**: e6563 [PMID: 28383434 DOI: 10.1097/MD.0000000000006563]
- 11 **Chen KY**, Xiang GA, Wang HN, Gao P, Xiao FL. [Laparoscopic high ligation of hernia sac and median umbilical fold covering internal ring in treating pediatric indirect inguinal hernia]. *Zhonghua Wai Ke Za Zhi* 2007; **45**: 207-209 [PMID: 17498385]
- 12 **Tartar T**, Saraç M, Bakal Ü, Onur MR, Kazez A. A rare cause of inguinal abscess: perforated appendicitis due to foreign body in Amyand's hernia. *Turk J Pediatr* 2020; **62**: 889-892 [PMID: 33108097 DOI: 10.24953/turkjped.2020.05.026]
- 13 **You J**, Li G, Li S, Chen HT, Wang J, Cheng YT, Xu HL. [Laparoscopic orchiopey for inguinal palpable cryptorchidism]. *Zhonghua Nan Ke Xue* 2019; **25**: 1093-1096 [PMID: 32251560]
- 14 **Zhou J**, Chen X, Jiang T. Pediatric inguinal hernia treated by single-port laparoscopic water injection hernia crochet needle. *Wideochir Inne Tech Maloinwazyjne* 2020; **15**: 239-244 [PMID: 32117511 DOI: 10.5114/wiitm.2019.86799]
- 15 **Fukahori S**, Sakamoto S, Hashizume N, Masui D, Higasidate N, Tsuruhisa S, Nakahara H, Koga Y, Saikusa N, Ishii S, Tanaka Y, Yagi M. Laparoscopic identification of combined pediatric femoral hernia and ruptured abdominal cyst of the canal of Nuck: A report of an extremely rare case. *Asian J Endosc Surg* 2020 [PMID: 32924249 DOI: 10.1111/ases.12866]

- 16 **Kilda A**, Berzanskis M, Lukosiute-Urboniene A, Malcius D, Barauskas V. High recurrence rate of children's inguinal hernia after percutaneous internal ring suturing: a single-center study. *Hernia* 2020 [PMID: 33029687 DOI: 10.1007/s10029-020-02316-1]
- 17 **Mohtashami S**, Safa N, Guadagno E, Baird R, Poenaru D. Derivation of a complication burden score based on disability-adjusted life years to assess patient burden following surgery: a pilot study. *Can J Surg* 2020; **63**: E517-E526 [PMID: 33155974]
- 18 **Liu X**, Cao H, Tan X, Qiao L, Zhang Q, Shi L. Comparison of the Effect of Laryngeal Mask Airway Versus Endotracheal Tube on Airway Management in Pediatric Patients with Tonsillar Hypertrophy. *J Perianesth Nurs* 2020 [PMID: 33168406 DOI: 10.1016/j.jopan.2020.06.020]
- 19 **Abdullayev T**, Korkmaz M. Transvers testicular ectopia: A case report and literature review. *Int J Surg Case Rep* 2019; **65**: 361-364 [PMID: 31786469 DOI: 10.1016/j.ijscr.2019.11.007]
- 20 **Patoulias I**, Rahmani E, Patoulias D. Congenital Spigelian hernia and ipsilateral cryptorchidism: a new syndrome? *Folia Med Cracov* 2019; **59**: 71-78 [PMID: 31904751 DOI: 10.24425/fmc.2019.131381]
- 21 **Alshammari D**, Sica M, Talon I, Kauffmann I, Moog R, Becmeur F, Schneider A. Our Laparoscopic Surgical Technique and Experience in Treating Pediatric Inguinal Hernia Over the Past Decade. *J Indian Assoc Pediatr Surg* 2020; **25**: 28-33 [PMID: 31896896 DOI: 10.4103/jiaps.JIAPS_233_18]



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