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OUTCOMES OF PEDIATRIC INGUINAL HERNIA REPAIR: THE SINGLE-CENTER COHORT STUDY

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РЕЗУЛЬТАТЫ ЛЕЧЕНИЯ ПАХОВОЙ ГРЫЖИ У ДЕТЕЙ: ОДНОЦЕНТРОВОЕ КОГОРТНОЕ ИССЛЕДОВАНИЕ

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The article compares the outcomes of traditional open and laparoscopic inguinal hernia repair performed in 550 children. The following parameters were assessed and analyzed in a specific cohort of children with an inguinal hernia: surgery time, postoperative pain severity, changes in the gonads on sonographic examination, and quality of life. The study demonstrates that the patients who underwent laparoscopic surgery show better results in the majority of the criteria if compared with those who underwent open resection. Moreover, the author-developed technique has slightly favorable outcomes. We introduce our method and report our experience with its application in this paper.

Keywords: inguinal hernia, children, inguinal ring, quality of life, postoperative pain, resistance index, Doppler ultrasonography

Приводятся результаты лечения паховой грыжи у 550 детей. Пациенты, включенные в исследование, оперированы тремя различными способами: один традиционный и два лапароскопических. В выбранной когорте исследовались такие параметры, как: длительность операции, выраженность болевого синдрома в послеоперационном периоде, доплерографические изменения в гонадах у мальчиков и качество жизни. По результатам исследования выявлено, что лучшие показатели по большинству критериев были у пациентов, пролеченных лапароскопическими способами. При этом авторский лапароскопический метод имеет ряд преимуществ перед классическим способом грыжесечения.

Ключевые слова: паховая грыжа, дети, паховое кольцо, качество жизни, послеоперационная боль, индекс резистентности, ультразвуковая доплерография

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CHIPPS – Children’s and Infants’ Postoperative Pain Scale
HRQOL – health-related quality of life
IH – inguinal hernia
IHR – inguinal hernia repair
LASSO – Laparoscopically assisted simple suturing obliteration

LHR – laparoscopic hernia repair
OHR – open hernia repair
QOL – quality of life
RI – resistance index
VAS – visual analog scale

Inguinal hernia repair (IHR) is the most common surgical procedure in childhood. The incidence of inguinal hernias (IH) in those under 18 years old ranges between 0.8 and 4.4 % [1]. It occurs in boys and girls in a 5 to 1 ratio [2]. In boys, the peak occurrence is in the first year of life, while in girls, IH occurs most often at five years old [3]. Most of IH in children are indirect (oblique) [2]. Conventional open hernia repair (OHR) in children comprises separation of the patent processus vaginalis followed by high ligation. This technique has proved effective and safe (with fewer postoperative complications) and is still considered the most commonly used approach in children. Laparoscopic hernia repair (LHR) was first used in the early 1990s and has gained a firm foothold [1]. Since its advent, many new techniques have been developed and described, including a transabdominal three-port hernial sac closure technique [4] and optical forceps during a single-port laparoscopic-assisted procedure [5]. Reported advantages of LHR include shorter operative time for bilateral cases [6], reduction in metachronous hernia development [7], and opportunity to explore and repair contralateral hernias [8]. Laparoscopic treatment is associated with fewer postoperative complications, as well as a low incidence of iatrogenic cryptorchidism [9]. A recent meta-analysis has found no difference in overall average operative time, postoperative pain occurrence, and hernia recurrence rate [10].

The widespread introduction of laparoscopic techniques in general and pediatric surgery makes us wonder if something is still to be improved. With this in mind, we have attempted to assess and compare different techniques used for pediatric LHR in our research paper.

Material and Methods. The medical records of 550 children with congenital inguinal hernia treated between 2015 and 2019 were reviewed. The patients were divided into three groups. Group 1 included 100 patients who underwent Duhamel surgery [11]. Group 2 consisted of 100 patients treated with Laparoscopically Assisted Simple Suturing Obliteration (LASSO) [12]. The remaining 350 patients (Group 3) were operated on laparoscopically using an innovative device [13]. Moreover, in Group 3 patients, diagnostic laparoscopy was performed, and the pathology of the inguinal ring was evaluated and considered [14].

Below is a description of our modified technique (Fig. 1). For better visualization of the inguinal ring, the patient should be placed in the Trendelenburg position with a rolled towel under the pelvis. A 3-mm optical trocar is inserted at the lower umbilical fold by the open method. If an umbilical hernia is present, a trocar is introduced through an aponeurotic defect. Gas insufflation is 5–6 mm Hg. Under the direct laparoscopic vision, a hernia needle is introduced through the anterior abdominal wall entering the preperitoneal space at the middle-upper line of the inner inguinal ring (Fig. 1a). Next, the needle is moved along the medial half of the inguinal ring and enters the peritoneal cavity at the opposite side of the skin puncture site (Fig. 1b). Great care is taken in boys to prevent the vas deferens and spermatic vessels

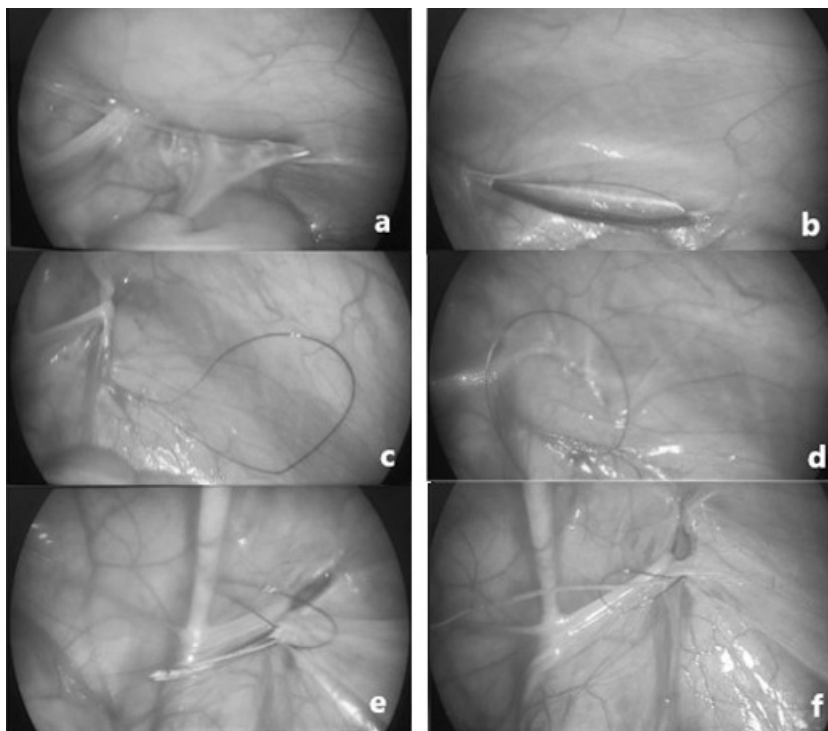


Fig. 1. Stages of surgical treatment of IH (see description in the text)

from injury. The additional suture is retained with the help of a lens, and the needle is withdrawn until the level of the peritoneum is reached (Fig. 1c). The needle is then passed along the lateral half of the inguinal ring (Fig. 1d) and pulled out at the site of the previous skin puncture. The free end of the suture is advanced through the previously created loop (Fig. 1e). Next, the needle is removed, and the loop with the suture end is pulled out to the anterior abdominal wall (Fig. 1f). In case of technical difficulties [14], an assistant 3-mm trocar for a manipulator may be inserted into the preperitoneal space either on the right or on the left side.

The duration of the operation was assessed in all the cases. In 23 boys, preoperative and postoperative ultrasound pictures of the scrotum and testicles were evaluated, and the resistance index (RI) was measured on both the operated and non-operated sides. The level of postoperative pain was measured and assessed in 60 patients using a visual analog scale (VAS) and the Children and Infant Postoperative Pain Scale (CHIPPS). Health-related quality of life (HRQOL) in the immediate postoperative period was assessed in children using the questionnaire [15].

Statistical data analysis and graphics were performed using the R environment for statistical computing visualization, version 4.1.0 (R Foundation for Statistical Computing, Vienna, Austria) and Statistica 10.0 (StatSoft, USA). When testing statistical hypotheses, we used the significance level (p) of 0.05. To compare the three groups of patients in terms of a quantitative variable, the Kruskal – Wallis test and a posthoc Dunn's test with Holm correction were used. The assessment of the statistical significance of differences in related (dependent) quantitative data was performed using the Wilcoxon test. Fisher's exact test was used to compare the groups of patients in terms of qualitative data.

Results and Discussion. Seventy-three percent of the research participants are boys, and the other 27 % are girls. The male-to-female ratio in the groups is 87 % to 13 % (Group 1), 57 % to 43 % (Group 2), and 73.1 % to 26.9 % (Group 3). Inguinal hernias are most common in

those between the ages of 0 and 5 years. But parents are often against their baby being operated on at this age. Therefore, IHR operations are usually performed between the age of 3 to 5 years (36 to 60 months). Surgical timing is, by all means, essential in the treatment of pediatric surgical patients. We assessed full operative time for unilateral IHs and bilateral IHs. Using the optimized surgical technique in Group 3 allowed for the shortest operation time (Table). However, Esposito's meta-analysis shows no significant difference between LHR and OHR in

unilateral IHR. In contrast, in bilateral disease, LHR is faster [16]. When assessing the patient's HRQOL, we found that the children in Groups 1 and 3 significantly improved their functional status. Moreover, the patients in Group 3 have a considerably greater combined value than Groups 1 and 2 (Table). We failed to find any research papers to study life quality in pediatric patients. In her research, S. T. Sapyeva assesses HRQOL in patients after hernioplasty and mentions the best results in patients operated on with an autoplasty technique [17].

Distribution of the compared characteristics in groups

Table

Parameters		Group 1	Group 2	Group 3	p-value
Sex	Male	87	57	256	<0.0001
	Female	13	43	94	
Age, months		58.20±1.02	54.19±12.77	57.77±15.38	0.9050
Operation time, min		30.80±11.30	22.15±10.97	21.13±8.84	<0.0001
Indicators of QOL, points	Physical status	30.0±3.3	24.6±4.9	32.8±2.9	0.0053
	Emotional state	26.9±2.5	25.8±5.1	29.0±1.0	0.1953
	Social status	11.5±2.5	11.1±2.4	12.8±1.9	0.4456
	General state of health	12.4±2.3	11.4±2.0	14.8±2.7	0.0680
	Total	80.7±5.4	72.9±10.9	89.4±6.9	0.0099

In OHR patients, no significant changes in the RI on both the operated (p=0.6353) and non-operated sides (p=0.4833) have been noted. In those who underwent LASSO, there is an increase in the RI on both sides (p=0.0360 and p=0.0515, respectively). While there were no significant changes in the RI on the non-operated side (p=0.4461) in Group 3, where the modified method was used, a decrease in the RI values was seen on the operated side (p=0.0220) (Fig. 2). Our results differ from those obtained by Çelebi et al. from Turkey [18], who compare the effects of OHR and LHR in pediatric patients using a Doppler ultrasound. They have noticed that in the OHR group, the RI values are slightly higher in the early postoperative period but return to be near to the preoperative values at the 6-month follow-up examination. In the LHR group, these values are the same in the early and late postoperative periods. Schier et al. [19] evaluated the effect of LHR on testicular blood flow in 65 boys with either bilateral or unilateral IH. The testicular perfusion was measured before and after anesthesia, preoperatively and postoperatively. The authors conclude LHR does not cause damage to testicular perfusion.

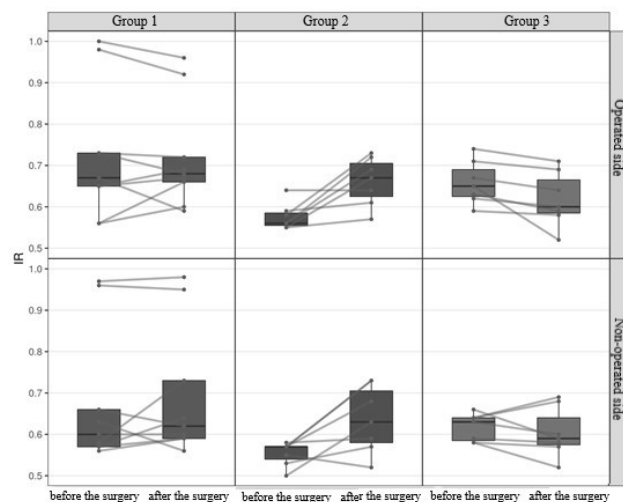


Fig. 2. Resistance Index Dynamic Changes in patients

Laparoscopic surgical procedures aim to achieve a satisfactory therapeutic result while minimizing the traumatic stress of the intervention [20]. Tissue trauma is significantly less than that with conventional open procedures. Thus post-operative pain is likely to reduce. So, Leng S. et al. [21] and Obayashi J. et al. [22] assessed pain intensity in surgical patients. One hour after the operation, the pain level was higher in those operated on by the open method. Our research also revealed that 4 hours after the surgery, OHR patients (Group 1) had more severe pain than those receiving LHR (Group 2 and Group 3). No difference in pain intensity was found in all the patients at hospital discharge (Fig. 3 and Fig. 4).

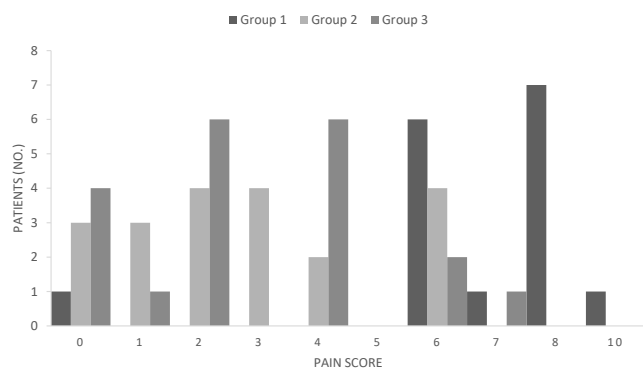


Fig. 3. Comparison of pain severity 4 hours after the surgery

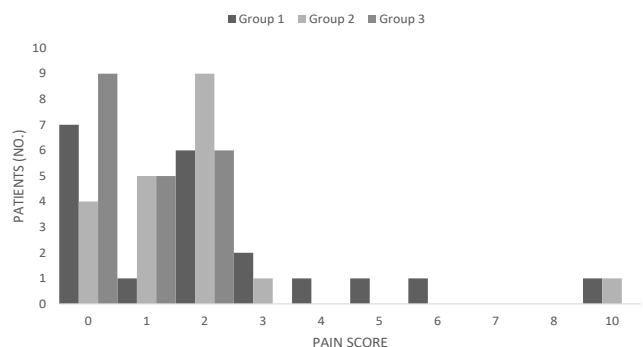


Fig. 4. Comparison of pain severity at hospital discharge

Conclusion. The analysis of IH outcomes in children is essential for critical re-evaluation and the choice of an appropriate surgical technique. Compared to other laparoscopic procedures for IHR, our modified surgical technique has the following advantages: 1) enhancement of the patient's life quality; 2) improvement of Doppler characteristics; 3) surgery facilitation; 4) shorter operative

time compared with LASSO and the Duhamel procedure (by 4.6 % and 31.4 %, respectively).

Therefore, our novel approach offers a new option for the surgical treatment of IH in the future. Further studies of the hemodynamic effects of laparoscopy on the boys' gonads are necessary to develop objective criteria for CO₂-pneumoperitoneum establishment.

Disclosures: The authors declare no conflict of interest.

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STRATEGY FOR SCAR-PREVENTION HEALING OF TRAUMATIC AND BURNS WOUNDS

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СТРАТЕГИЯ ПРОФИЛАКТИКИ ОБРАЗОВАНИЯ РУБЦОВ ПРИ ВЕДЕНИИ ТРАВМАТИЧЕСКИХ И ОЖОГОВЫХ РАН

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Treating patients with burns and massive wounds while the complications only start to develop, including pathological scarring (PS), is the most urgent task that purulent and reconstructive surgery currently faces. The study involved following up forty-two patients (age range: 21–59 years) suffering from traumatic injuries and burns wounds. Patients were broken into equal groups, namely, a study group and a control group. All this done to evaluate the efficiency of wound healing auto-stimulation through using a cold plasma flow and introducing platelet-enriched autoplasm. The outcomes the study produced point to the fact that the impact of the proposed complex provides an improvement of the healing process by an average of 4.5±0.3 days, also reducing the risk of the patient developing PS. The reason is a faster, rapid, and homogenous recovery entailed by stimulated epithelization.

Keywords: platelet-rich autoplasm, epithelization, autodermaplasty, pathological scarring

Одной из наиболее актуальных проблем, стоящих перед гнойной и реконструктивной хирургией сегодня, является лечение больных с ожогами и обширными ранами, обеспечивающее предупреждение развития патологического рубцеобразования. В ходе данного исследования, нами осуществлялось лечение 42 пациентов (возраст – 21–59 лет), у которых были обширные травматические повреждения и ожоги кожных покровов. Из общего числа пациентов были сформированы две группы (исследования и контроля) с равным количеством участников. Исследовалась эффективность заживления ран при применении потока холодной плазмы с введением обогащенной тромбоцитами аутоплазмы. Как показали полученные в ходе исследования результаты, используемая комбинация в комплексном лечении травматических ран ускоряет процесс их заживления на 4,5±0,3 суток, а также снижает риск развития патологических избыточных рубцов за счет более быстрого и равномерного заживления со стимулированной эпителизацией.

Ключевые слова: обогащенная тромбоцитами аутоплазма, эпителизация, аутодермопластика, патологические рубцы