Article's History: Received: 19.08.2024; Revised: 13.12.2024; Accepted: 25.02.2025

Bulletin of Medical and Biological Research

Vol. 7, No. 1
2025

DOI: 10.63341/bmbr/1.2025.17

Journal homepage: https://bmbr.com.ua/en

UDC 582.47

Innovative approach to laparoscopic hernioplasty (TAPP) without mesh fixation

Natalya Voytyuk*

Postgraduate Student, Assistant
Bogomolets National Medical University
01601, 13 Taras Shevchenko Blvd., Kyiv, Ukraine
https://orcid.org/0000-0002-6821-1707

Volodymyr Skyba

Doctor of Medical Sciences, Professor
Bogomolets National Medical University
01601, 13 Taras Shevchenko Blvd., Kyiv, Ukraine
https://orcid.org/0000-0002-7681-4217

Abstract. The purpose of this study was to compare hernioplasty techniques with and without mesh prosthesis fixation. The study included 187 patients with primary inguinal hernias who were treated at the Municipal Non-Profit Enterprise "Kyiv City Clinical Hospital No. 1" from 2020 to 2024, divided into 2 groups: Group 1 (control group) – 92 patients, and Group 2 (experimental group) – 95 patients. The duration of surgery for lateral hernias was statistically significantly longer ($p < 0.01$) than for medial and femoral hernias. In both groups, a significant ($p < 0.01$) reduction in pain was noted within 1 month after surgery. The level of pain in the control group was greater ($p < 0.01$) compared to the group that underwent hernioplasty without fixation of the mesh endoprosthesis. In surgical intervention without mesh fixation, the incidence of complications was substantially reduced: seroma formation decreased from $10.9 \pm 0.3\%$ in the control group to $2.1 \pm 0.1\%$ in the main group ($p = 0.031$); oedema was observed in 28 patients ($30.4 \pm 0.5\%$) from the control group, and in 12 patients ($12.6 \pm 0.3\%$) from the main group ($p = 0.005$). Based on the analysed data obtained in this study, hernioplasty without fixation of the mesh endoprosthesis has considerable advantages, according to all criteria, compared to surgical intervention using a herniostapler. Hernioplasty without mesh fixation is a safe and effective technique that reduces pain, complications, and the cost of surgery, while maintaining the success of hernia repair. Proper patient selection, sufficient mesh overlap, and careful peritoneal closure are key to the success of the surgical intervention

Keywords: surgical intervention; herniostapler; inguinal hernia; hernioplasty technique; allohernioplasty

INTRODUCTION

The transabdominal preperitoneal access (TAPP) is a widely used laparoscopic technique for inguinal hernia repair. Conventionally, mesh fixation during TAPP has been used to prevent relapse. However, this practice has been associated with complications such as chronic pain due to nerve or vascular damage from fixation devices. Surgeons should carefully consider factors such as defect size, patient anatomy, and potential risks and benefits when deciding whether to use mesh during TAPP. Continued research in this area is essential to optimise patient outcomes and improve surgical techniques. Depending on the clinical situation, a surgeon can choose the type of surgery that will lead to the least number of complications. As of 2025, many scientific papers have proven that laparoscopic methods of hernioplasty have considerable advantages over open surgical interventions.

K. Doden *et al*. [1] showed that fixing the mesh on the lateral and dorsal sides of the urethral canal is dangerous due to the possibility of clamping the urethral nerve and blood vessels. In this case, the use of a self-absorbing mesh during TAPP is a rational solution in terms of avoiding fixation or suturing around the obturator canal while maintaining stable mesh fixation to prevent relapse. The researchers concluded that laparoscopic TAPP repair

Suggested Citation:
Voytyuk N, SkybaV. Innovative approach to laparoscopic hernioplasty (TAPP) without mesh fixation. Bull Med Biol Res. 2025;7(1):17–25. DOI: 10.63341/bmbr/1.2025.17

*Corresponding author

Copyright © The Author(s). This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (https://creativecommons.org/licenses/by/4.0/)

with self-retractable mesh is a rational treatment option that reduces the risk of damage to the phrenic nerve while maintaining secure mesh fixation to prevent relapse and chronic pain.

A. Elhadidi *et al.* [2] concluded that postoperative complications and chronic groin pain were reported for each technique. An equal number of participants were present in the stapler and suture groups, with the majority having one point of American Society of Anaesthesiologists (ASA) score. The mean age was 42.50 ± 13.86 years, and the body mass index (BMI) was 27.47 ± 5.88. The average duration of surgery in the stapler group was shorter than in the suture group. However, the stapler group had a considerably greater mean VAS score than the suture group. Most participants in the suture group (89.2%) had a 1-day LOS, while the 2-day LOS was considerably greater in the stapler group (12.3%) than in the suture group (9.2%). No patient reported mesh erosion, conversion, relapse, testicular atrophy, or mesh infection. Early postoperative pain was greater in the stapler group, along with prolonged hospital stay, but both were nonsignificant. The results for chronic postoperative pain and relapse rates during the 3-year follow-up were also comparable. The rate of re-hospitalisation was minimal, and no significant complications occurred. That is, the study confirmed the advantages of the method of surgery without mesh fixation by all criteria except for the incidence of complications.

The study analysed the research conducted by C. Zhang *et al.* [3], which included 6 randomised trials involving 679 patients who underwent TAPP without mesh fixation and 964 patients with mesh fixation. No significant difference in relapse was observed between the two groups. The use of self-absorbing mesh may not affect the effectiveness of TAPP. It does not increase the relapse rate and may lead to a reduction in postoperative pain in inguinal hernias with a small hernia defect (less than 3 cm). This study showed that this technique is effective for a small defect, which is a significant indication for the use of TAPP, because in case of a large hernia defect, another surgical technique should be chosen.

V.C. Nikolian *et al.* [4] conducted a fairly complete analysis of the advantages and disadvantages of hernioplasty using mesh. Mesh placement resulted in shorter hospital stays and a return to daily activities. A hernioplasty without mesh is unlikely to lead to seroma development, which is why this method is preferred in low-income countries due to the low cost and lesser availability of mesh materials. G. Caruso *et al.* [5] confirmed that TAPP is associated with shorter postoperative rehabilitation, less chronic pain and numbness in the surgical area, no risk of mesh prosthesis infection, and a faster return to daily activities. The study also noted that the disadvantages of laparoscopic interventions include a longer training period for the surgeon and higher direct costs; these costs can be offset by reducing indirect costs: shorter hospital stays and a quicker return to work.

The technique of TAPP is constantly being improved. For example, M. Furtado *et al.* [6] confirmed the effectiveness of TAPP without mesh fixation based on clearly defined anatomical landmarks describing the "inverted Y" concept. The study used the identification of five triangles and three zones of dissection for laparoscopic inguinal hernia repair. A new anatomical concept was introduced to understand the overall anatomy of the inguinal region from a laparoscopic approach and to achieve a critical view of the "danger zones". The new anatomical concepts enabled surgeons to expedite and facilitate hernia sac release and prevent intraoperative complications.

In all analysed studies, TAPP without mesh fixation was shown to reduce postoperative pain, shorten the patients' recovery after surgery, but did not affect the relapse rate. However, surgeons are still debating how best to place the mesh endoprosthesis and which surgical technique to choose [7-9]. Thus, the purpose of this study was to improve the effectiveness of surgical treatment of inguinal hernias by comparing laparoscopic hernioplasty methods, with and without mesh prosthesis fixation, and to substantiate the choice of allohernioplasty method.

MATERIALS AND METHODS

The study included 187 patients with primary inguinal hernias who were treated at the Municipal Non-Profit Enterprise "Kyiv City Clinical Hospital No. 1" from 2020 to 2024. Inclusion criteria: patients with inguinal hernias (diagnosed according to the recommendations of the European Association of Herniology and the intraoperative classification of hernia types by L.M. Nyhus [10]), men and women, over 18 years of age, for women of reproductive age – a negative pregnancy test result [11]. Exclusion criteria: a history of patients with a BMI above 40 kg/m^2, relapsed, strangulated, and inguinal hernias, decompensated cardiovascular, respiratory, renal, or hepatic failure; pregnancy and lactation; alcohol or drug abuse; logistical problems (patients' failure to attend the examination on time), non-compliance with the recommended diagnostic and treatment plan; conversion of surgery to open access.

All patients were admitted to the department as planned after undergoing a standard preoperative package of laboratory and instrumental tests (general blood test, liver and kidney complexes, electrocardiogram, abdominal ultrasound). All patients were informed about the existing methods of surgical treatment of inguinal hernias, possible complications or changes in the scope of surgery, the course of the postoperative period, and the required regimen. All patients who took part in the clinical trial gave their written voluntary informed consent following the provisions of the Declaration of Helsinki of the World Medical Association "Ethical Principles for Medical Research Involving Human Subjects Human Subjects for Medical Research" [12].

The selection of patients and their allocation to the control and experimental groups was random. The operations were performed in the absence of contraindications to anaesthesia, carboxyperitoneum, and the patients' willingness to be operated on in the way proposed based on the group assignment. Thus, 95 patients were included in the experimental group. All patients in this group underwent TAPP – inguinal hernia repair without fixation of a mesh endoprosthesis. The control group included 92 patients who underwent classical TAPP – inguinal hernia repair with a mesh endoprosthesis with fixation of the latter using the Protack 5.0 hernia stapler with titanium clips.

All patients included in the study underwent hernioplasty using a laparoscopic approach with preperitoneal placement of the mesh endoprosthesis. In patients of both study groups, only polypropylene mesh endoprostheses were used for the purity of the experiment. In the first group (control), polypropylene mesh was used. The

second group (main group) used 3D mesh. The study included 187 patients divided into 2 groups: Group 1 (control group) – 92 patients, and Group 2 (main group) – 95 patients. The groups were comparable in terms of age and gender (88.04% of men in the control group, 88.42% in the main group, and 11.96 and 11.58% of women, respectively). The average age of the patients was 59.4 years in the control group and 58.6 years in the main group. The physical status of patients before surgery was assessed according to the ASA classification [13].

Hernioplasties in the control and intervention groups were performed under general anaesthesia with muscle relaxation and artificial lung ventilation using the MAQUET FLOW-i apparatus and the OLYMPUS VISERA ELITE III video endoscopic stand. Endoscopic equipment included OLYMPUS OEV321UH endoscopic monitor, 4K, 32 inches; OLYMPUS VISERA ELITE III OTV-S700 endoscopic camera, 4K HDR; OLYMPUS VISERA ELITE III CLL-S7004 endoscopic illuminator; OLYMPUS UHI-4 CO_2 insufflator; OLYMPUS endoscopic instrument stand, OLYMPUS ESG-410 surgical diathermocoagulator; aspirator-irrigator. Statistical processing was performed using Statistical software EZR v. 1.54 (graphical user interface for R statistical software version 4.0.3, R Foundation for Statistical Computing, Vienna, Austria), MedStat v. 5.2, and Excel (Microsoft Office 2010, 2013) in the Windows 10 operating system. The Chi-square test was employed to compare the frequency of postoperative complications.

RESULTS

The analysis of all the collected data helped to identify crucial advantages of TAPP over hernioplasty with mesh prosthesis fixation for both patients and doctors. The findings of the study were evaluated based on the analysis of the results of 187 patients who underwent laparoscopic TAPP hernioplasty and the analysis of the medical records of the operated patients. All the above results, i.e., pain relief and reduced complication rates, were achieved thanks to the innovative TAPP technique without mesh fixation. After a thorough examination of the working area and determination of the type of hernia (lateral or medial), peritoneal dissection was performed. The peritoneal dissection was based on a new anatomical concept – the "inverted Y", the definition of five triangles and three dissection zones, which was introduced by Brazilian surgeons in 2018.

The new anatomical concept was introduced to understand the overall anatomy of the inguinal region from a laparoscopic approach and to achieve a critical view of the "danger zones". The new anatomical insights have enabled surgeons to expedite and facilitate hernia sac release, prevent intraoperative complications (vascular and nerve damage), and reduce postoperative complications such as early and chronic postoperative pain. This concept is based on the visual representation of an "inverted Y", the definition of five triangles, and the division of the inguinal fossa into three zones of peritoneal dissection. The visual representation of the "inverted Y" when examining the inguinal fossa from the laparoscopic approach allows recognising the anatomical structures of the inguinal area with the following elements: the lower epigastric vessels, the vas deferens, and the vessels of the spermatic cord. When analysing the data on the duration of surgical intervention in both groups (control and experimental), the duration of surgical intervention was found to depend on the type of hernia defect (lateral, medial, femoral).

Thus, the duration of TAPP can vary depending on the type of hernia defect. Lateral (indirect) hernia – usually takes longer than medial hernia due to the need for a large incision, especially in cases where a large sac extends into the inguinal canal. Medial (direct) hernia – usually faster to repair because the defect is within the Hesselbach's triangle, which often requires less incision. Femoral hernia – may require additional time due to its deeper location and the need for careful placement of the mesh to cover the femoral ring without harming the adjacent structures. Other factors that affect the duration of the surgery include the patient's anatomy, the presence of bilateral or relapsing hernias, the surgeon's experience, and any intraoperative complications. The surgical technique depends on the type of hernia that is troubling the patient. Table 1 shows the distribution of patients included in the study by hernia type.

Table 1. Results of the distribution of patients by type of hernia

	Control group					Experimental group					Total
	0	1	2	3	x	0	1	2	3	x	
PL	8	15	20	5	–	6	21	12	4	–	91
PM	10	13	15	3	–	5	19	20	3	–	88
PF	2	1	–	–	–	3	2	–	–	–	8
Total	20	29	35	8	–	14	42	32	7	–	187
	92					95					

Notes: PL – primary lateral hernia; PM – primary medial hernia; PF – primary femoral hernia
Source: compiled by the authors

Among the studied patients, 91 patients (48.66%) had primary lateral hernias, 88 patients (47.06%) had primary medial hernias, and 8 patients (4.28%) had primary femoral hernias. In the control group, 48 patients (52.17%) had lateral hernias, 41 patients (44.57%) had medial hernias, and 3 patients (3.26%) had femoral hernias. According to the size of the hernia defect in this group, patients were divided as follows: hernia that was not identified during the study – 20 patients (21.74%); under 1.5 cm – 29 patients (31.52%); 1.5-3 cm – 35 patients (38.04%), over 3 cm – 8 patients (8.70%). In the experimental group, patients with medial hernias were most common – 47 patients (49.47%), lateral hernias accounted for 43 patients (45.26%), and femoral hernias – 5 patients (5.26%). The patients were divided according to the size of the hernia defect as follows: the defect was not identified – 14 patients (14.74%), under 1.5 cm – 42 patients (44.21%); 1.5-3 cm – 32 patients (33.68%), over 3 cm – 7 patients (7.37%).

Table 2 shows the average duration of surgery in minutes depending on the type of hernia defect. The longest duration of surgical intervention was recorded in the control group for lateral hernias (74.5±0.8 min). Surgical intervention for lateral hernias in the experimental group lasted almost half as long (47.7±0.4 min), i.e., the absence of mesh fixation significantly reduces the duration of the operation. The surgical approach and technique of the operation can greatly save time. Thus, with the modified technique without fixation of the mesh, the operation time is considerably saved. In both groups of patients, the duration of surgery for lateral hernias was found to be statistically significantly longer ($p<0.01$) than for medial and femoral hernias. There was no statistically significant difference in the duration of surgery for medial and femoral hernias ($p>0.05$), which is conditioned by the identical anatomical area.

Table 2. Estimation of the average duration of surgical intervention in the control and intervention groups

Study group	Type of hernia defect	Number of patients	Mean value of surgical intervention duration (in min), X±m
Control group	Lateral	48	74.5±0.8
	Medial	41	65.6±0.5
	Femoral	3	67.7±1.5
Experimental group	Lateral	43	47.7±0.4
	Medial	47	38.3±0.6
	Femoral	5	32.4±1.1

Notes: to present a point estimate, the table shows the mean values of the duration of the surgical intervention (X) and the standard errors of the mean (m)
Source: compiled by the authors of this study

When comparing the duration of surgical intervention in the control and experimental groups, divided by the type of hernia defect, the duration of surgical intervention in the control group was found to be statistically significantly ($p<0.001$) longer than in the experimental group. Notably, the systematic algorithm of parietal peritoneal dissection influenced the speed of the operation. According to the present study, the key factors in reducing the duration of surgery included the surgeon's experience, preoperative planning, minimal adhesions, effective mesh fixation, and proper peritoneal closure.

On the first day after surgery, as soon as the patient regained consciousness and agreed to the assessment of pain, they were asked to indicate the level of their subjective pain on a visual analogue pain scale (VAS). Thus, in the control group, the scores ranged from 2 to 6 points, with an average of 4±0.1 points, and in the experimental group – from 2 to 5 points, with an average of 3.8±0.09 points. Most patients complained of pain in the area of trocar insertion and discomfort in the area of surgery. The first day after surgery, patients were recommended bed rest and avoidance of knee and hip flexion on the side of surgery (Table 3).

Table 3. Estimation of the average value of pain in patients in the control group

Term of pain syndrome assessment	Patients	Mean value of patients' pain (in points), Me±m
Day 1	n=92	4±0.1
Day 3		3±0.1
Day 7		2±0.1
1 month		1±0.1

Source: compiled by the authors

When assessing pain on day 3 after surgery, those patients who stayed in the hospital were also asked to assess pain by marking it on a visual analogue pain scale, while the patients discharged from the hospital were interviewed by telephone and were asked to rate their pain syndrome from 0 to 10 points, analogous to the VAS scale. On day 3, the pain scores ranged from 1 to 5 points in the control group, with an average of 3±0.1 points, and from 1 to 4 points in the experimental group, with an average of 2.3±0.06 points. On the second day, all patients were raised from bed and offered to walk around the hospital, with those who felt well being discharged from the hospital. 7 days after the surgery, patients operated on with mesh fixation with a herniostapler had pain scores ranging from 0 to 4, with an average of 2±0.1 points. In the group where the mesh endoprosthesis was not fixed, the pain syndrome varied from 0 to 1 point, which averaged 0.5±0.52 points (Table 4). When assessing pain one month after surgery in the control group, the scores ranged from 0 to 3 points (average 1±0.1 points), in the main group from 0 to 1 points, respectively, and the average was 0.22±0.04 points (Fig. 1).

Table 4. Estimation of the average value of pain sensations of patients in the experimental group

Term of pain syndrome assessment	Patients	Mean value of patients' pain (in points), Me±m
Day 1	n=95	3.8±0.09
Day 3		2.3±0.06
Day 7		0.5±0.52
1 month		0.22±0.04

Source: compiled by the authors

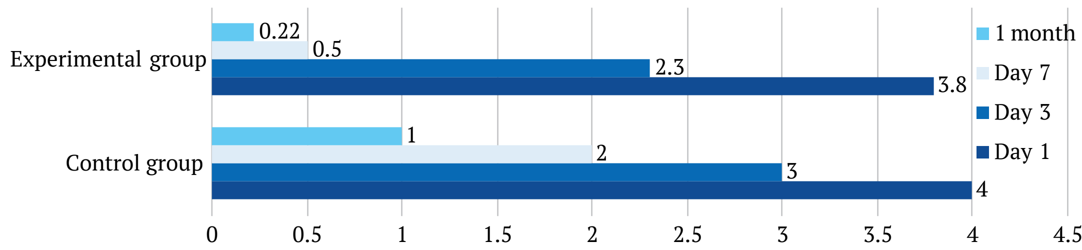

Figure 1. Comparative assessment of the average value of the pain syndrome according to the VAS
Source: compiled by the authors

Thus, in both groups, a statistically significant ($p<0.01$) decrease in pain was observed within 1 month after hernioplasty. The level of pain in the control group compared to the group that was offered TAPP plastic surgery without fixation of the mesh endoprosthesis was noted to be statistically significantly higher at $p<0.01$. Reducing pain during TAPP hernia repair without mesh fixation is an essential point for improving patient recovery. Such results were achieved by the correct choice and placement of the mesh endoprosthesis. The mesh was placed in the pre-abdominal space, where intra-abdominal pressure helps to keep it in place. During the surgery, adequate overlap (3-5 cm) outside the defect was ensured to prevent relapse without the need for fixation. Correct dissection created a sufficiently wide preperitoneal space for the mesh to lie flat without wrinkles. In the patients of the experimental group, the mesh was glued by closing the peritoneal flap, because proper suturing or attachment of the peritoneum to the mesh helps to fix it naturally. During the surgery, it was critical to avoid damage to the ilioinguinal, iliohypochondriac, and genito-femoral nerves, which prevented neuropathic pain. The surgeon avoided placing the mesh too medially or using excessive dissection near the pain triangle (lateral to the spermatic vessels), where the main nerves pass. During the surgery, the CO_2 insufflation pressure was minimised, and a lower intra-abdominal pressure (10-12 mm Hg) was used, which reduced postoperative pain. During the operation, the surgeon ensured that the peritoneum was closed without tension to prevent mesh migration or contact with the intestinal loops. The use of these techniques resulted in a reduction in postoperative pain, minimisation of chronic discomfort, and a low relapse rate.

Table 4 shows the incidence of postoperative complications in the two study groups: the incidence of complications (%) and the standard error of the incidence (± m%). The study analysed the incidence of the principal complications of hernioplasty, such as haematoma, seroma, and oedema. The most common complication of surgery among patients in both groups was oedema, while seroma was the least common complication in the operated patients. In the control group, the incidence of complications was statistically significantly greater compared to the experimental group where the surgical intervention was performed using an innovative method. The analysis revealed a decrease ($p=0.027$ by the Chi-square criterion with Yates' correction) in the incidence of haematomas from 16.3±0.4% (for patients operated on using the conventional method) to 5.3±0.2% (for patients operated on using the TAPP method without fixation of the mesh endoprosthesis). The incidence of seroma decreased from 10.9±0.3% in the control group to 2.1±0.1% in the experimental group, at $p=0.031$. Oedema was observed in 28 patients (30.4±0.5%) from the control group and 12 (12.6±0.3%) patients from the main group, which is statistically significant ($p=0.005$) less (Table 5).

Table 5. Frequency of postoperative complications in the study groups

Postoperative complications	Control group (n = 92)		Experimental group (n = 95)		Significance level of differences between groups, p
	Abs. Number	% ± m%	Abs. Number	% ± m%	
Haematoma	15	16.3±0.4	5	5.3±0.2	p=0.027
Seroma	10	10.9±0.3	2	2.1±0.1	p=0.031
Oedema	28	30.4±0.5	12	12.6±0.3	p=0.005
Increased body temperature	33	35.9±0.5	14	14.7±0.4	p=0.001

Source: compiled by the authors

The increase in body temperature in patients ranged within 37.2-38.3°C on the first day after surgery, who were prescribed antipyretics. The next day, as a rule, no fever was observed. In the experimental group, 14.7±0.4% had a fever, which was statistically significantly less ($p=0.001$) than in the control group (35.9±0.5%). The presence or absence of inguinal hernia relapse was assessed by palpation of the superficial inguinal ring and determination of the "coughing impulse" symptom and ultrasound diagnostics of the inguinal area, particularly the area of the endoprosthesis. Palpation was performed the day after surgery. Ultrasound of the inguinal area was performed on the day of suture removal. Usually, sutures were removed on day 7 after hernioplasty. The subjects were invited for a repeated examination and ultrasound of the inguinal area and the area of the placed endoprosthesis 1 and 6 months after the surgery. Early relapse after hernioplasty was assessed within 6 months after surgery using the classical and non-fixation methods. When analysing the data, relapse was detected in 8 patients (8.7±0.3%) of the control group and 4 patients (4.2±0.2%) of the experimental group, the difference was not statistically significant at $p=0.341$ (Fig. 2). The statistically insignificant difference in the relapse rate requires further investigation with a larger number of patients.

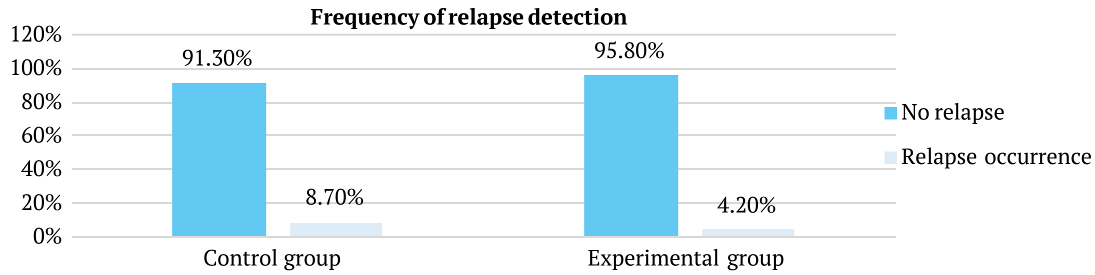

Figure 2. Presence of relapses in the postoperative period in the examined patients
Source: compiled by the authors

Minimisation of complications and relapses was achieved by proper selection of patients for TAPP, careful surgical technique, and adherence to postoperative care recommendations. The findings of the present study confirmed the significant benefits of TAPP without mesh fixation, which greatly reduced the risk of complications associated with fixation. Less postoperative pain and discomfort can enable patients to return to their daily activities and work more quickly. Not using a stapler eliminates the risk of related complications such as vascular damage, bleeding, or tissue damage. It also reduces costs by eliminating the use of fixation devices.

DISCUSSION

TAPP hernioplasty without mesh fixation is becoming an increasingly popular technique for inguinal hernia repair. This approach eliminates the need for buttons, staples, or glue, relying on adequate mesh overlap and intra-abdominal pressure to maintain its position [13, 14]. Fixing the mesh with staples or buttons can cause nerve irritation or injury, leading to postoperative pain and chronic groin pain. Avoiding fixation greatly reduces the risk of postoperative neuralgia and foreign body sensation in the groin. Patients often experience less discomfort during movement, which enables them to return to their daily activities more quickly.

Chronic pain (lasting more than 3 months) is a well-documented complication of hernia surgery, often associated with nerve impingement or tissue inflammation caused by fixation. Studies show that non-fixation techniques reduce the incidence of chronic pain, increasing overall patient satisfaction [15, 16]. A carefully selected and positioned mesh with sufficient overlap (at least 3-5 cm) ensures low relapse rates even without fixation [17]. That is why the present study used high-quality mesh prostheses and tailored to the size of the defect. In the first group (control), polypropylene mesh was used. In the second group (experimental), a 3D mesh was used (photo of the mesh, size, characteristics). To minimise the relapse rate, patients were strictly selected according to the inclusion criteria, because in case of a large defect or relapsing hernia, the surgeon may choose a mesh-fixed technique or even open access to reduce further complications. Therefore, the choice of surgery technique should be made individually, according to the characteristics of each patient.

Several clinical trials show no substantial difference in relapse rates between fixation and non-fixation techniques when performed by experienced surgeons. For small and medium-sized hernias (especially those under 3 cm), mesh fixation may not be necessary, as the correct positioning of the mesh in the preperitoneal space provides adequate stabilisation. However, in case of large hernias or weak tissues, the risk of relapse may be slightly higher without fixation [18, 19].

Thus, in the study by K.A. Riemenschneider *et al.* [20], after analysing seven prospective randomised controlled trials of 1,732 patients, 737 procedures were performed without fixation and 995 procedures with mesh fixation, it was concluded that the current evidence is very uncertain and mesh fixation may have a small or no effect on hernia relapse and chronic postoperative inguinal pain in patients undergoing TAPP inguinal hernia repair. The findings of the study by K.A. Riemenschneider *et al.* are consistent with the data of the present study that TAPP without mesh fixation has advantages over laparoscopic hernioplasty with mesh fixation.

The risk of mesh migration is minimal if the peritoneum is properly closed, and anatomical landmarks are observed [21-23]. Less postoperative pain facilitates early ambulation, reducing the risk of complications such as deep vein thrombosis and pulmonary complications. Many patients resume normal activities and return to work earlier than those who underwent fixation [24]. Devices for fixing the mesh (buttons, staples, glue) increase the cost of the procedure. Avoiding fixation reduces operating costs without compromising clinical outcomes.

Risk of mesh removal: proper dissection and placement are essential to prevent folds or migration that can lead to relapse. Learning curve for surgeons: this technique requires experience to ensure proper mesh placement and secure peritoneal closure [25]. Patient selection is essential: it is best suited for uncomplicated primary hernias, whereas large, complex, or relapsing hernias may benefit from fixation [10]. Thus, only patients with uncomplicated hernias were included in the current study, and hernia relapse is a contraindication to TAPP without mesh fixation, in which case the doctor chose another technique for the operation.

The study by A.K. Nahid *et al.* [26] reflected analogous results to the present study. Thus, it was confirmed that pain and the time required to return to normal life and work after surgery were significantly less in the non-fixation group. The absence of mesh fixation was cost-effective, with less postoperative pain and a lower relapse rate [27]. In the current study, patients who underwent TAPP without mesh fixation also returned to life faster and experienced less discomfort in the postoperative period than patients who underwent hernioplasty with mesh fixation.

R.F. Ali *et al*. [28] reached the same conclusion as in the present study. Thus, in this study, the researchers were found that the pain score 7 days after surgery, during the first month, and after three months were significantly higher in the group with mesh fixation ($p < 0.001$). The group with mesh fixation had a longer operative time than the group without fixation (69.34 ± 13.55 vs. 60.92 ± 10.18). The relapse rates did not differ between the groups, as in the current study. The absence of fixation of the mesh endoprosthesis for TAPP is effective with minimal postoperative pain and minimal risk of relapse. In the current study, analogous data were obtained regarding the duration of pain and the time of surgery.

The findings of other colleagues' studies are also fully comparable to the data obtained in the present study. T.A.A.M. Habeeb *et al*. [29] confirmed that fixation of a mesh endoprosthesis with a stapler increases the risk of chronic groin pain. Laparoscopic TAPP inguinal hernia repair without mesh fixation was significantly safer and reduced the relapse rate. Furthermore, mesh fixation increased the risk of postoperative complications and patient costs.

S. Qureshi *et al*. [16] studied the long-term results after hernioplasty one year later. In the study, the difference in pain scale scores at the time of discharge and the average number of days of hospital discharge were statistically significant ($p < 0.005$), analogous to the results of the current study. After 1 year of follow-up, the relapse rate was comparable and low in both groups. At one year of follow-up, there was no significant difference in relapse and chronic pain between the mesh-fixed group and the non-mesh-fixed group. In their studies, surgeons almost unanimously confirmed that laparoscopic TAPP hernioplasty without mesh fixation is much more effective and practical than surgical interventions using a stapler. Therefore, in patients without contraindications, when choosing a surgical intervention, TAPP plastic surgery without the use of a mesh endoprosthesis should be preferred.

TAPP without mesh fixation provides considerable benefits in the postoperative period, including pain reduction, faster recovery, and lower rates of chronic pain, with relapse rates comparable to fixation methods. It is a cost-effective and patient-friendly approach, especially when performed by experienced surgeons.

CONCLUSIONS

The analysis of the data obtained revealed a considerable advantage of laparoscopic hernioplasty without mesh fixation, using the technique involving a herniostapler. The time for surgical intervention depends on the type of hernia defect. The longest time for surgical intervention among all the patients examined was recorded in patients with a lateral hernia when the hernia defect was repaired by fixing the mesh. Laparoscopic peritoneal surgery without mesh fixation significantly reduces the time of surgery. The absence of mesh fixation when repairing a hernia defect using the laparoscopic method greatly reduces pain in patients in the dynamics, compared to those in whom the mesh was fixed. The method of performing operations without fixation of the mesh endoprosthesis leads to a decrease in the incidence of postoperative haematomas. According to the analysed data, surgical intervention without the use of a herniostapler considerably reduces the incidence of postoperative seromas and oedema. The incidence of temperature reactions in patients with hernioplasty by the non-fixation method was significantly reduced. The frequency of relapse in 6 months after surgery was not high in both groups and did not depend on the surgical technique.

The analysis of the data obtained in the study showed significant advantages, according to all criteria, of hernioplasty without fixation of the mesh endoprosthesis, compared with surgical intervention using a herniostapler. TAPP without mesh fixation appears to be a safe and effective approach for appropriately selected patients, reducing postoperative pain and chronic discomfort while maintaining a comparable relapse rate for small to moderate hernias. However, careful patient selection is crucial, and in some cases, fixation may be necessary to ensure optimum long-term results. The relapse rate did not differ depending on the surgical technique, and it is probable that a greater number of patients should be included in the study to investigate the complication rate depending on the surgical technique more accurately. Further studies may compare various techniques of laparoscopic preperitoneal hernioplasty without mesh fixation to further improve the surgical technique.

ACKNOWLEDGEMENTS

None.

FUNDING

None.

CONFLICT OF INTEREST

None.

REFERENCES

[1] Doden K, Yoshimura T, Iwaki Y, Kato H, Kawaguchi M, Watanabe T. Laparoscopic transabdominal preperitoneal obturator hernioplasty with self-gripping mesh: A case report with operative video. Int J Surg Case Rep. 2021;89:106657. DOI: 10.1016/J.IJSCR.2021.106657

[2] Elhadidi A, Negm A, Shouma A. Comparing stapler and sutured mesh fixation techniques for laparoscopic TAPP repair: A study on chronic groin pain on 3-year follow-up. Updates Surg. 2024;76(4):1467–73. DOI: 10.1007/S13304-024-01754-1

[3] Zhang CX, Li J, Suo HJ, Bai JP. Non-fixation versus fixation of mesh in laparoscopic transabdominal preperitoneal repair of inguinal hernia: A systematic review and meta-analysis of randomized controlled trials. PLoS One. 2024;19(12):e0314334. DOI: 10.1371/JOURNAL.PONE.0314334

[4] Nikolian VC, Coleman NL, Podolsky D, Novitsky YW. Robotic-assisted transabdominal preperitoneal ventral hernia repair. Surg Technol Int. 2020;36:95–7.

[5] Caruso G, Evola G, Benfatto SAM, Gangemi M. Transabdominal Preperitoneal (TAPP) inguinal hernia repair. IntechOpen. 2022. DOI: 10.5772/intechopen.101962

[6] Furtado M, Claus CMP, Cavazzola LT, Malcher F, Bakonyi-Neto A, Saad-Hossne R. Systemization of laparoscopic inguinal hernia repair (TAPP) based on a new anatomical concept: Inverted Y and Five Triangles. ABCD Arq Bras Cir Dig. 2019;32(1). DOI: 10.1590/0102-672020180001E1426
[7] Jiang T, Zhang C, Wang XL, Yue DC, Yuan XP, Wang DC. Meta-analysis of RCTs on the safety of non-fixation of mesh in TAPP inguinal hernia repair: An updated meta-analysis. BMC Surg. 2024;24(1):317. DOI: 10.1186/S12893-024-02628-4
[8] Klymenko A, Kravchenko B, Klymenko V, Kravchenko S, Polishchuk K. Assessment of chronic pain syndrome after laparoscopic transabdominal preperitoneal plastic surgery in patients with inguinal hernia. Zaporozhye Med J. 2024;26(4):296–302. DOI: 10.14739/2310-1210.2024.4.300008
[9] Miserez M, Alexandre JH, Campanelli G, Corcione F, Cuccurullo D, Pascual MH, et al. The European hernia society groin hernia classification: Simple and easy to remember. Hernia. 2007;11(2):113–6. DOI: 10.1007/S10029-007-0198-3
[10] Nyhus LM. Individualization of hernia repair: A new era. Surgery. 1993;114(1):1–2.
[11] Stabilini C, van Veenendaal N, Aasvang E, Agresta F, Aufenacker T, Berrevoet F, et al. Update of the international HerniaSurge guidelines for groin hernia management. BJS Open. 2023;7(5):zrad080. DOI: 10.1093/BJSOPEN/ZRAD080
[12] The World Medical Association. Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects [Internet]. [cited 2024 July 10]. Available from: https://www.wma.net/what-we-do/medical-ethics/declaration-of-helsinki/
[13] Hendrix JM, Garmon EH. American society of anesthesiologists physical status classification system. In: StatPearls. Treasure Island: StatPearls Publishing; 2025.
[14] Berney CR. Guidelines for laparoscopic (TAPP) and endoscopic (TEP) treatment of inguinal hernia. Surg Endosc. 2012;26:3350–1. DOI: 10.1007/S00464-012-2293-5
[15] Spampatti S, La Regina D, Pini R, Mongelli F, Gaffuri P, Porcellini I, et al. Three-point mesh fixation in robot-assisted transabdominal preperitoneal (R-TAPP) repair of 208 inguinal hernias: Preliminary results of a single-center consecutive series. Langenbecks Arch Surg. 2022;407(6):2555–61. DOI: 10.1007/S00423-022-02542-4
[16] Qureshi S, Ghazanfar S, Leghari AA, Zubair M, Chisti S, Memon F, et al. A comparative follow up study of transabdominal preperitoneal mesh repair in inguinal hernias with or without mesh fixation. J Pak Med Assoc. 2021;71(1(A)):28–30. DOI: 10.47391/JPMA.827
[17] Bianco FM, Dreifuss NH, Chang B, Schlottmann F, Cubisino A, Mangano A, et al. Robotic single-port surgery: Preliminary experience in general surgery. Int J Med Robot. 2022;18(6):e2453. DOI: 10.1002/RCS.2453
[18] Wieland L, Alfarawan F, Bockhorn M, El-Sourani N. Comparison of eTEP and IPOM for ventral hernia surgery in the early postoperative period: A retrospective cohort study of a tertiary university centre. Hernia. 2024;28(6):2195–206. DOI: 10.1007/S10029-024-03125-6
[19] Lockhart K, Dunn D, Teo S, Ng JY, Dhillon M, Teo E, et al. Mesh versus non-mesh for inguinal and femoral hernia repair. Cochrane Database Syst Rev. 2018;9:CD011517. DOI: 10.1002/14651858.CD011517.PUB2
[20] Riemenschneider KA, Lund H, Pommergaard HC. No evidence for fixation of mesh in laparoscopic transabdominal preperitoneal (TAPP) inguinal hernia repair: A systematic review and meta-analysis of randomized controlled trials. Surg Endosc. 2023;37(11):8291–300. DOI: 10.1007/S00464-023-10237-0
[21] Henriksen NA, Montgomery A, Kaufmann R, Berrevoet F, East B, Fischer J, et al. Guidelines for treatment of umbilical and epigastric hernias from the European Hernia Society and Americas Hernia Society. Br J Surg. 2020;107(3):171–90. DOI: 10.1002/BJS.11489
[22] Schlosser KA, Arnold MR, Otero J, Prasad T, Lincourt A, Colavita PD, et al. Deciding on optimal approach for ventral hernia repair: Laparoscopic or open. J Am Coll Surg. 2019;228(1):54–65. DOI: 10.1016/J.JAMCOLLSURG.2018.09.004
[23] Novik B, Sandblom G, Ansorge C, Thorell A. Association of mesh and fixation options with reoperation risk after laparoscopic groin hernia surgery: A Swedish hernia registry Study of 25,190 totally extraperitoneal and transabdominal preperitoneal repairs. J Am Coll Surg. 2022;234(3):311–25. DOI: 10.1097/XCS.0000000000000060
[24] Bosley ME, Felix Z, Salgado-Garza G, Lansing S, Nikolian VC. Short-term outcomes of transabdominal preperitoneal ventral hernia repair with rectus aponeuroplasty (TAPPRA) for the management of incisional hernias. J Abdom Wall Surg. 2024;3:13195. DOI: 10.3389/JAWS.2024.13195
[25] Yaguchi Y, Inaba T, Kumata Y, Horikawa M, Kiyokawa T, Fukushima R. Two cases of early recurrence after transabdominal preperitoneal inguinal hernia repair. Asian J Endosc Surg. 2018;11(1):71–4. DOI: 10.1111/ASES.12408
[26] Nahid AK, Rahman S, Veerapatherar K, Fernandes R. Outcomes on mesh fixation vs non-fixation in laparoscopic totally extra peritoneal inguinal hernia repair: A comparative study. Turk J Surg. 2021;37(1):1–5. DOI: 10.47717/TURKJSURG.2021.4962
[27] Wu JJ, Way JA, Eslick GD, Cox MR. Transabdominal pre-peritoneal versus open repair for primary unilateral inguinal hernia: A meta-analysis. World J Surg. 2018;42(5):1304–11. DOI: 10.1007/S00268-017-4288-9
[28] Ali RF, Elhussainy RM, Aouf AM, Ismail TA, Ismail KA. Outcomes of mesh fixation versus non fixation in laparoscopic transabdominal preperitoneal inguinal hernia repair: A randomized clinical study. J Pak Med Assoc. 2023;73(4):8–12. DOI: 10.47391/JPMA.EGY-S4-2
[29] Habeeb TAAM, Mokhtar MM, Sieda B, Osman G, Ibrahim A, Metwalli AEM, et al. Changing the innate consensus about mesh fixation in trans-abdominal preperitoneal laparoscopic inguinal hernioplasty in adults: Short and long term outcome. Randomized controlled clinical trial. Int J Surg. 2020;83:117–24. DOI: 10.1016/J.IJSU.2020.09.013

Новаторський підхід до лапароскопічної герніопластики (TAPP) без фіксації сітки

Наталя Войтюк

Аспірант, асистент
Національний медичний університет імені О. О. Богомольця
01601, бульв. Тараса Шевченка, 13, м. Київ, Україна
https://orcid.org/0000-0002-6821-1707

Володимир Скиба

Доктор медичних наук, професор
Національний медичний університет імені О. О. Богомольця
01601, бульв. Тараса Шевченка, 13, м. Київ, Україна
https://orcid.org/0000-0002-7681-4217

Анотація. Метою даного дослідження було порівняння технік герніопластики з фіксацією сітчастого протезу та без. В дослідження було включено 187 пацієнтів із первинними пахвинними грижами, які знаходились на лікуванні в Комунальне некомерційне підприємство «Київська міська клінічна лікарня № 1» з 2020 р. по 2024 р., розділених на 2 групи: 1 група (контрольна група) – 92 пацієнта, та 2 група (експериментальна група) – 95 пацієнтів. Тривалість оперативного втручання при латеральних грижах статистично значно довша ($p < 0,01$), ніж при медіальних та стегнових грижах. В обох групах відзначалось значуще ($p < 0,01$) зниження больового синдрому протягом 1 місяця після виконання оперативного втручання. Рівень болю у контрольній групі в порівняні з групою, якій було запропоновано герніопластику без фіксації сітчастого ендопротезу був вищий ($p < 0,01$). При оперативном у втручанні без фіксації сітки суттєво знизилась частота ускладнень: утворення сером знизилась від 10,9 ± 0,3 % в контрольній групі, до 2,1 ± 0,1 % в основній групі ($p = 0,031$); набряки спостерігались у 28 хворих (30,4 ± 0,5 %) з контрольної групи, та у 12 (12,6 ± 0,3 %) хворих з основної групи ($p = 0,005$). На основі проаналізованих даних, отриманих у дослідженні, можна зробити висновок, що герніопластика без фіксації сітчастого ендопротезу має значні переваги, за всіма критеріями, порівняно з оперативним втручанням з використанням герніостеплера. Герніопластика без фіксації сіткою – це безпечна та ефективна методика, яка зменшує біль, ускладнення і вартість операції, зберігаючи при цьому успішність відновлення грижі. Правильний відбір пацієнтів, достатнє перекриття сітки та ретельне закриття очеревини є ключем до успіху оперативного втручання

Ключові слова: оперативне втручання; герніостеплер; пахові грижі; техніка герніопластики; алогерніопластики