

Postoperative complications and hernia recurrence after the use of various ventral hernia repair techniques

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Prosthetic hernioplasty (HP) for ventral hernias (VH) has a complication rate of up to 27 % and a hernia recurrence rate up to 37 %, depending on the chosen technique. The use of laparoscopic HP techniques allows for a shorter hospital stay and a lower risk of wound infection. There is a wide range of data on the superiority of laparoscopy over the open technique in terms of recurrence rates and various types of complications. The results of comparing HP with and without suturing of the hernia defect are controversial.

OBJECTIVE — to study the structure and incidence of postoperative complications, as well as the frequency of hernia recurrences after the use of open and laparoscopic HP for VH.

MATERIALS AND METHODS. A multicenter prospective study, which included 482 patients diagnosed with VH, was conducted at the clinical base of the Department of General Surgery No. 2 at Bogomolets National Medical University. A total of 279 (57.9 %) patients had primary VH, while 203 (42.1 %) had incisional VH. The patients were divided into two groups, comparable in terms of age, sex, and hernia size distribution. Group 1 included 250 (51.9 %) patients who underwent open HP with suturing of the hernia defect: subgroup 1a — open sublay ($n=243$; 50.4 %), and subgroup 1b — open intraperitoneal onlay mesh technique (IPOM) ($n=7$; 1.5 %). Group 2 included 232 (48.1 %) patients who underwent laparoscopic HP using the IPOM technique: subgroup 2a — IPOM without suturing of the aponeurosis defect ($n=81$; 16.8 %), subgroup 2b — IPOM with suturing of the aponeurosis defect ($n=108$; 22.4 %), and subgroup 2c — IPOM+ with open aponeurosis defect suturing ($n=43$; 8.9 %). Follow-up evaluations were carried out at intervals of 2 weeks, 1 month, 6 months, and 1 year to assess the presence of complications, recurrence, and satisfaction with the cosmetic effect of the operation.

RESULTS. The overall frequency of complications after HP was 15.6 %, while after open sublay it was 21.2 %, and after laparoscopic IPOM it was 9.9 %. All cases of complications belonged to Grades I—IIIb according to the Clavien-Dindo classification. In both groups, there were no fatalities. In group 1, the frequency of seroma was 11.6 % and hematoma was 5.6 %, and in group 2, it was 7.3 % and 0.9 %, respectively. A statistically significant increase in the frequency of hematoma development was observed after open HP techniques compared to laparoscopic ones ($p=0.004$), while the frequency of seroma detection was comparable ($p=0.148$). Non-suturing of the aponeurosis defect after laparoscopic IPOM in patients with VH did not result in an increase in the total number of complications or the percentage of recurrence ($p>0.05$). Laparoscopic IPOM with hernia suturing demonstrated significantly higher patient satisfaction with the appearance of the anterior abdominal wall compared to other HP techniques ($p<0.05$).

CONCLUSIONS. The open sublay and laparoscopic IPOM HP procedures have a comparable recurrence rate of VH ($p>0.05$). The incidence of infectious complications and hematomas is significantly higher after open operations compared to laparoscopic ones ($p=0.041$ and $p=0.004$, respectively).

KEYWORDS

ventral hernia, incisional hernia, hernia repair, mesh.

ARTICLE • Received 2024-04-26 • Received in revised form 2024-05-27

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Surgical treatment of ventral hernia (VH) occupies a leading place in planned abdominal surgery. More than 300,000 hernia repair procedures are performed each year in Europe [1], while the overall frequency of complications on average reaches 17.2 % [2]. Data on the frequency of complications and recurrences of hernias of the anterior abdominal wall after the use of open and laparoscopic methods of prosthetic hernioplasty (HP) vary widely and depend on the expertise of the centre where the operations were performed, the size of the studied sample, and the chosen technique of plastic hernia repair, and features driving patients in the postoperative ward period [3, 9, 14].

Using synthetic prostheses (various types of mesh) instead of merely suturing the defect leads to a notable reduction in the rate of hernia recurrences [11], regardless of where the mesh is placed. Mesh is recommended for all types of planned hernioplasty in the treatment of midline VH [23]. The most common of the open HP procedures is a retromuscular sublay technique for VH repair. The most studied laparoscopic technique is surgery with intraperitoneal mesh placement (IPOM) [12]. Laparoscopic HP for VH shows a shorter hospital stay compared to open surgery and a lower risk of wound infection, but the duration of complete patient recovery and long-term quality of life indicators are comparable [19, 24, 25]. At the same time, laparoscopic HP has advantages over open surgery in terms of quality of life in the early postoperative period [3].

However, it remains unclear how suture or non-suture repair of an aponeurosis defect influences the structure and frequency of postoperative complications, as well as hernia recurrence rate after laparoscopic and open HP. Three randomised controlled studies [8, 18, 22] involving 488 patients with postoperative VH demonstrated a slightly higher recurrence rate after IPOM without hernia suturing (10 %) than after open sublay (6 %). However, no statistically significant difference was found. There is also no data on patient satisfaction with the cosmetic result of the operation or the functional capabilities of the anterior abdominal wall [23]. It is unknown how the proportion of postoperative complications, such as seromas and hematomas, varies with the method of diagnosis in the early postoperative period.

OBJECTIVE — to study the structure and incidence of postoperative complications, as well as the frequency of hernia recurrences after the use of open and laparoscopic HP for VH.

Materials and methods

General characteristics of patients

A prospective multicenter study was conducted with the participation of 482 patients with VH (primary

ventral and incisional) who underwent various types of elective HP. The study was conducted at the clinical base of the Department of General Surgery No. 2 of Bogomolets National Medical University, in the Kyiv City Clinical Hospital No. 3 and the «Leleka» Medical Centre, from September 2011 to June 2024. The average age was 56.84 ± 14.32 years. There were 275 (57.0 %) women and 207 (43.0 %) men.

The criteria for inclusion in the study were as follows: the age of patients from 18 to 90 years, referral for the treatment of an uncomplicated VH, compensated concomitant somatic pathology, performing the operation in the elective order, consent to the possible performance of laparoscopic HP with intraperitoneal placement of the mesh, with and without suturing of the hernia defect.

The exclusion criteria from the study were as follows: age of patients under 18 or over 90 years, referral for treatment of complicated VH, including pinched VH, decompensated concomitant somatic pathology, performing the operation in an urgent order, categorical refusal to perform a possible laparoscopic HP with intraperitoneal placement of the mesh, with and without suturing of the hernia defect, subxiphoid or suprapubic location of the hernia defect.

Patients were divided into two groups, comparable in terms of age, sex, and hernia size distribution. Group 1 included 250 (51.9 %) patients who underwent open HP and was divided into 2 subgroups: subgroup 1a — open HP using the sublay technique ($n = 243$; 50.4 %), and subgroup 1b — open HP using the IPOM technique ($n = 7$; 1.5 %). All patients in Group 1 underwent suturing of the hernia defect before the mesh placement.

Group 2 included 232 (48.1 %) patients who underwent laparoscopic HP according to the IPOM technique. They were also divided into subgroups: subgroup 2a — laparoscopic IPOM without suturing the hernia defect ($n = 81$; 16.8 %), subgroup 2b — laparoscopic IPOM with suturing the hernia defect ($n = 108$; 22.4 %), and subgroup 2c — laparoscopic IPOM+ with open suturing of the hernia defect ($n = 43$; 8.9 %). Detailed patient characteristics are presented in Table 1.

The operation technique

All patients underwent HP and mesh placement. In all cases, the size of the mesh was chosen based on the calculation that the edge of the hernial defect should be covered by the mesh by at least 5 cm. The operations were performed under general combined anesthesia.

In subgroup 1a, patients underwent open HP using the sublay method, where a light macroporous polypropylene mesh was placed retromuscularly

Table 1. Demographic and pre-operative data

Characteristics	n = 482
Women	275 (57.0 %)
Men	207 (43.0 %)
Age, years	56.84 ± 14.32
Body mass index, kg/m ²	31.12 ± 4.70
ASA score	
I	135 (28.0 %)
II	330 (68.5 %)
III	17 (3.5 %)
IV	0
Obesity	201 (41.7 %)
Smokers	105 (21.7 %)
Type of hernia	
Primary ventral	279 (57.9 %)
Incisional	203 (42.1 %)

Note. Categorical variables are presented as the absolute number and percentage, while quantitative indicators are presented as M ± SD.

ASA — American Association of Anesthesiologists

preperitoneally, and the hernial defect was sutured with separate nodal sutures. If necessary, the wound was drained, according to Redon.

In subgroup 1b, herniotomy, mobilisation of the edges of the hernial defect, and viscerolysis, if necessary, were performed. After that, a composite mesh with an anti-adhesive coating was placed intraperitoneally, with fixation in at least 8 points by separate transaponeurotic sutures, followed by suturing of the aponeurosis defect with a continuous suture with non-absorbable double monofilament thread 1–0.

In Group 2, after installing trocars and creating a pneumoperitoneum, the abdominal cavity was revised, and viscerolysis, if necessary, was performed. The location of the hernial defect and the presence of other aponeurosis defects were determined, and the area for mesh placement was prepared. In subgroup 2a, the hernia defect was not sutured; a composite mesh with an anti-adhesive coating was placed intraperitoneally. The mesh was fixed to the anterior abdominal wall with transaponeurotic sutures at 4 points, then with tackers using the «double crown» technique. In subgroup 2b, the hernia defect was sutured with separate knotted transaponeurotic sutures before the mesh was placed. Then, the installation and fixation of the mesh were carried out similarly to subgroup 2a. In subgroup 2c, after viscerolysis, deflation of the pneumoperitoneum was performed. If necessary, excision of excess skin and an old postoperative scar was carried out. It was followed by open suturing of the aponeurosis

defect with a continuous suture and a non-dissolving double thread 1–0. Then, the laparoscopic stage was continued with the placement and fixation of the mesh, similarly to subgroup 2a.

Control of the patient's discharge from the hospital and postoperative follow-up

In order to prevent the development of complications and provide a standardised assessment of the patient's condition and the possibility of discharge from the hospital, we developed a control checklist (Table 2), which included the data of the patient's objective examination and their subjective feelings about the possibility of self-care for their needs. In order to assess satisfaction with the cosmetic effect of the operation and the functional capabilities of the anterior abdominal wall, we added separate sections to the above checklist. We also entered information about the patient's follow-up check-ups at intervals of 2 weeks, 1 month, 6 months, and 1 year after surgery. In addition to the objective examination of the postoperative wound, the patients underwent an ultrasound examination of the anterior abdominal wall and organs of the abdominal cavity during follow-up examinations.

Given the lack of a specialised standardised questionnaire for assessing patient satisfaction with the cosmetic result after hernia repair [4, 5], we used the Customer Satisfaction Research Index as a basis for a satisfaction score (CSAT), based on which the level of satisfaction was evaluated from 1 to 5, where 1 — very dissatisfied, 2 — not satisfied, 3 — neutral result, 4 — satisfied, 5 — very satisfied. During follow-up examinations starting 1 month after the operation, patients were additionally interviewed about their performance of their daily tasks, physical exercises, and work duties with or without restrictions.

The main criteria for discharging a patient from a hospital were as follows: absence of hyperthermia; self-service of one's needs without the help of medical personnel; lack of need for injectable forms of analgesics (pain level below 5 when moving according to a visual analogue scale); percutaneous oxygen saturation above 92 % without additional oxygen support; consent to hospital discharge.

Taking into account the risk of developing surgical infections in the wound, especially in the conditions of using a synthetic implant, before discharge from the hospital, all patients were instructed about the symptoms of inflammatory complications, in case of which it is necessary to urgently contact the attending physician. Such symptoms included an increase in body temperature above 37.5°C, pain in the area of the postoperative wound, swelling and/or redness of the skin, the appearance of

Table 2. Checklist of patient discharge from the hospital and control follow-up

No	Indicator	Possible assessment	Indicator for hospital discharge
The patient's own assessment of their condition			
1	Pain level according to the VAS scale	0–10	< 5
2	Nausea and/or vomiting	Present/Absent	Absent
3	Abdominal bloating	Present/Absent	Absent
4	Feeling hungry	0–10	0–10
5	Feeling thirsty	0–10	0–10
6	Departure gases	Present/Absent	Present
7	Defecation (stool)	Present/Absent	Present
8	General weakness	0–10	< 5
9	Satisfaction with the effect of cosmetic surgery	1–5	1–5
10	Do you want to go home?	Yes/No	Yes
11	The need to wear a postoperative bandage	Yes/No	Yes/No
The doctor's objective assessment of the patient's condition			
12	The objective patient's condition during the physical examination is satisfactory	Yes/No	Yes
13	Percutaneous oxygen saturation in the blood without additional oxygen support	0–100 %	> 92 %
14	Body temperature	35.5–41 °C	35.5–37.5 °C
15	Availability of drainage	Yes/No	No
16	The need to use narcotic analgesics	Yes/No	No
17	The need for injectable forms of analgesics	Yes/No	No
Assessment of the patient's condition during control follow-up			
18	Postoperative complication (if detected, detail)	Present/Absent	Present/Absent
19	Recurrence of hernia	Present/Absent	Present/Absent
20	Satisfaction with the effect of cosmetic surgery	1–5	1–5
21	Carrying out daily tasks, physical exercises, work duties	With restrictions/ Without restrictions	With restrictions/ Without restrictions

Note. VAS — visual analogue scale. The numbers represent the intensity of the subjective patient's feelings, where 0 is the lowest intensity and 10 is the highest intensity.

secretions from the wound, and seepage of the bandage on the wound during the day with the need for its urgent replacement. All patients were instructed on the rules of post-operative wound care at home, methods of treating the wound with an antiseptic, and changing bandages.

During the patient's follow-up check-ups, in addition to the physical examination, an ultrasound examination of the anterior abdominal wall was performed in order to collect data on the development of local complications and hernia recurrence. If complications were detected, they were evaluated

according to the Clavien-Dindo classification [7] and seromas according to the Morales-Conde classification [16].

Statistical analysis

The data were analysed with the statistical package IBM SPSS Statistics Base (version 22). All results were considered statistically significant at a value of $p < 0.05$. Quantitative data are presented as mean $\pm$ standard deviation (SD), unless otherwise stated. The normality of the data distribution was checked using the Shapiro-Wilk test ($p > 0.05$).

Results and discussion

At the time of discharge from the hospital, all patients from both groups met the requirements specified in the checklist (see Table 2). The overall incidence of complications after prosthetic ventral hernia hernioplasty was 15.6 %. In Group 1, complications occurred in 76 (21.2 %) patients after open hernioplasty. In Group 2, after laparoscopic hernioplasty with intraperitoneal mesh placement, complications were observed in 23 (9.9 %) patients. The detailed structure and frequency of complications for each of the subgroups are presented in Table 3.

All the complications we noted were related to Grades I–III b according to the Clavien-Dindo classification. In both groups, there were no fatalities. In subgroup 1a, 2 (0.8 %) patients experienced suppuration of the mesh (deep SSI) during the first 2 months after open hernioplasty sublay, which was classified as Grade III b. In both cases, the first stage of treatment involved attempting to preserve the mesh using VAC therapy, but due to its failure, the patients underwent a re-operation including mesh excision. In subgroup 1a, 4 (1.6 %) patients with hematomas in the early postoperative period required partial wound revision, and hematoma drainage, therefore we assigned these cases to Grade IIIa.

We assigned Grade II to patients who underwent a puncture of the liquid formations (seroma and hematoma) under ultrasound control and received antibacterial drugs. We classified patients who underwent only a puncture into Grade I.

We did not observe any complications during HP, including intra-abdominal bleeding, intestinal wall damage, etc., in both groups. In Group 2, there were no conversion cases, which we explain by the individualised approach in the selection of candidates for laparoscopic HP, especially with large hernia defects.

All patients were advised to limit physical activity on the abdominal muscles for 1 month after surgery. All patients in Group 1, subgroups 2a and 2c were recommended to wear a postoperative bandage for at least 1 month from the moment of surgery. Bandage compression of the anterior abdominal wall in the area of the previous location of the hernial defect reduces the risk of seroma development [27]. 76 % of patients in Group 1 and 42 % in Group 2 expressed a desire to wear a postoperative bandage at the time of discharge, explaining this by reducing the severity of the pain syndrome.

In the early postoperative period, before discharge from the hospital, all patients underwent a control ultrasound examination. At discharge,

Table 3. **Structure and incidence of complications, recurrence of ventral hernia after open and laparoscopic hernioplasty**

Postoperative complications	Group 1		Group 2			Statistics according to publications
	1a (n = 243)	1b (n = 7)	2a (n = 81)	2b (n = 108)	2c (n = 43)	
Clavien — Dindo classification						
Grade I	22 (9.0 %)	1 (14.3 %)	7 (8.7 %)	9 (8.3 %)	2 (4.6 %)	
Grade II	24 (9.9 %)	0	0	4 (3.7 %)	1 (2.3 %)	
Grade IIIa	4 (1.6 %)	0	0	0	0	
Grade IIIb	2 (0.8 %)	0	0	0	0	
Grade IVa/b	0	0	0	0	0	
Seroma	28 (11.5 %)	1 (14.3)	5 (6.2 %)	12 (11.1 %)	0	0.5—78 %
Hematoma	14 (5.7 %)	0	0	0	2 (4.6 %)	0—4.8 %
Superficial SSI	6 (2.5 %)	0	0	0	1 (2.3 %)	3.1—10.8 %
Deep SSI	2 (0.8 %)	0	0	0	0	1.5 %
Urinary infection	2 (0.8 %)	0	0	1 (0.9 %)	0	0—2.1 %
Intestinal paresis	0	0	0	0	0	0—16 %
Intestinal obstruction	0	0	0	0	0	0.5—1 %
Postoperative bulging	0	0	2 (2.5 %)	0	0	1.3—21.5 %
Intraoperative complications	0	0	0	0	0	2—8 %
Recurrence	3 (1.2 %)	0	1 (1.2 %)	1 (0.9 %)	0	

Note. SSI — surgical site infection.

both groups showed no signs of fluid accumulation in the thickness of the anterior abdominal wall, which could be subject to puncture. 2 weeks after the operation, 43 (17.2 %) patients with fluid formations in the mesh area and in the thickness of the anterior abdominal wall were found in Group 1 – 43 (17.2 %) and in Group 2 – 19 (8.2 %) patients ($p = 0.004$). Simultaneously, Group 1 experienced a frequency of seroma of 11.6 % and hematoma of 5.6 %, while Group 2 experienced a frequency of 7.3 % and 0.9 %, respectively. A statistically significant increase in the frequency of hematoma development was observed after open HP techniques in comparison to laparoscopic ones ($p = 0.004$). The frequency of seroma detection was comparable ($p = 0.148$), which is consistent with the results of most publications comparing these methods [3]. In all cases, the formations were punctuated and evacuated under ultrasound control, of which in Group 1, eight (3.2 %) patients and in Group 2, three (1.3 %) patients required a repeated puncture one month after the operation. In Group 1, the maximum volume of evacuated fluid was 100 ml, while in Group 2, it was 50 ml.

According to the Morales-Conde classification, we should assign all cases of observation of punctured seromas under ultrasound control to type IV – large seromas that require puncture – in order to reduce symptoms (pain, discomfort). However, in only one case, a patient from subgroup 1a experienced minor discomfort in the area of the postoperative wound. In all other cases, the patients had no complaints; seromas were visualised during ultrasound examination of the anterior abdominal wall and were not observed longer than 3 months after the operation. In Group 1, the purpose of the puncture was to avoid suppuration of the wound, taking into account the open technique of performing HP, whereas in Group 2, it was to prevent possible protrusion and detachment of the mesh by free fluid that accumulated between the mesh and the parietal peritoneum. Therefore, we consider these cases not as complications but as incidents, classifying them into types I ($n = 52$) and II ($n = 11$). The issue of defining seroma as a complication of surgery and delineating the terms and feasibility of their puncture remains debatable [6, 15].

In the first 5 years of our study, 5 (2.2 %) patients underwent laparoscopic hernioplasty, a composite mesh was used for intra-abdominal placement with an anti-adhesive coating on both sides. In 2 out of 5 patients, we observed the development of seroma in the early postoperative period. Later, in connection with the withdrawal of this mesh from production, we used only mesh with a one-sided anti-adhesive barrier.

The frequency of infectious complications was significantly higher in Group 1 after open operations (3.2 %) compared to laparoscopic ones (0.4 %) ($p = 0.041$). Based on the results of the analysis of 5 randomised controlled trials, a similar trend was observed in the prevalence of SSI after open operations (10.8 %) over laparoscopic operations (3.1 %), but the difference in indicators did not reach statistical significance [23]. In the period of up to 14 days after the operation, local redness and swelling of the wound edges were observed in 6 patients after HP sublay in Group 1 and in 1 patient after IPOM+ hernioplasty in Group 2. The patient in Group 2 had obesity and type II diabetes. In all cases, after ultrasound examination of the wound area, the situation was considered a superficial infection without mesh involvement. There was no need for re-hospitalisation. Against the background of oral administration of broad-spectrum antibiotics for 5–10 days and local treatment with antiseptics, the signs of inflammation regressed and the wounds healed by primary tension.

The frequency of urinary tract infection after surgery was comparable in both groups ($p = 0.952$), with 0.8 % after open surgery and 0.4 % after laparoscopic HP, and did not exceed the frequency of 0–2.1 % according to the literature [20, 21].

Prolapse or postoperative bulging was detected in 2 (2.25 %) patients in subgroup 2a after laparoscopic IPOM without mesh suturing. According to Liang et al., postoperative bulging occurs in 21.5 % of patients after laparoscopic surgery and in 1.3 % after open VH repair [13]. The development of postoperative bulging did not require repeated surgical intervention. An ultrasound examination of the anterior abdominal wall ruled out a possible hidden recurrence of the hernia.

During the entire observation period, we found 5 (1.04 %) patients with hernia recurrences, 3 (1.2 %) after open hernioplasty and 2 (0.9 %) after laparoscopic, with no statistically significant difference between groups ($p = 0.936$). In all cases, when interviewing the patient, there were episodes of sharp physical exertion in the anamnesis. In Group 1, after open suturing of the hernia using the sublay technique, out of 3 cases of recurrence, in one case, superficial infection of the wound occurred in the early postoperative period. In Group 2, in one case, a relapse developed 11 months after the operation against the background of excessive physical exertion in a 65-year-old woman with a postoperative ventral hernia L 3- L 4 of more than 10 cm who was initially treated with IPOM and transcutaneous suturing of the hernia defect. During the repeat operation, the capacity of the applied sutures of the aponeurosis was diagnosed, but the edge of the

aponeurosis of the oblique muscles of the abdomen was torn off, resulting in the formation of a hernial defect near and below the eliminated previous one, with the migration of the lower edge of the mesh into the hernial sac. Therefore, a partial resection of the mesh that migrated into the hernia sac was performed. It was followed by open suturing of the aponeurosis with the placement of an additional mesh laparoscopically using the IPOM+ technique. In the second case, the relapse developed after laparoscopic IPOM without suturing of the hernial defect above the upper edge of the mesh. Consequently, relaparoscopy was performed. The procedure included suturing of the aponeurosis defect and prosthetic hernioplasty of IPOM with a larger mesh.

According to S. Olmi et al., independent risk factors for hernia recurrence are mesh coverage of a defect of less than 4 cm, use of resorbable fixation devices, mesh bulge, and infection, as well as patient-related factors such as advanced age and type of lateral iliac hernia L3 [17]. In our study, after laparoscopic operations, the first case of relapse exhibited three of the factors listed above, while the second case had 2.

We did not observe a statistically significant increase in the recurrence rate in subgroup 2a after IPOM without suturing of the hernia defect (1.2 %) compared to subgroup 2b with suturing (0.9 %) ($p = 0.59$). It is worth noting that 51 (63 %) patients in this subgroup were over 65 years old. According to the surveys conducted during follow-up examinations one year after IPOM without suturing the aponeurosis defect, the rate of performing daily tasks, physical exercises, and work duties without restrictions was 93.9 %, with restrictions 6.1 %, and was comparable to the similar indicator in patients in subgroups 2b and 2c, who underwent IPOM with suturing the aponeurosis defect. According to the data from separate randomised controlled trials, suturing of a hernia defect shows advantages over

the technique of IPOM without suturing of a hernia. But the result of the meta-analysis by S. Jeong et al. testifies to the effect of the closure of fascial defects only on the level of seroma formation [10]. While the meta-analysis of A. Tandon et al. demonstrates significantly fewer adverse hernia-site events [26]. Therefore, we consider it a priority to perform hernia defect suturing in patients of working age when the benefits of restoring the function of the anterior abdominal wall outweigh the prolongation of the duration of the surgical intervention and the increase in anesthetic risk.

Satisfaction with the cosmetic effect of the operation during the entire observation period was 5 % higher in Group 2 after laparoscopic hernioplasty than in Group 1 after open hernioplasty. 97.9 % of patients were interviewed one month after the operation, 69.5 % after 6 months, and 29.2 % after one year. Detailed indicators of the level of satisfaction with the appearance of the anterior abdominal wall are presented in Table 4.

In Group 1, satisfaction with the cosmetic effect after open HP did not statistically differ between subgroups when performing the operation using the sublay technique and open IPOM in all observation periods (2 weeks — $p = 0.881$; 1 month — $p = 0.675$; 6 months — $p = 0.69$; 1 year — $p = 0.913$). In subgroup 1a, there were 2 cases where patients rated the cosmetic effect as «2 points — unsatisfied». In both of these cases, the patients were diagnosed with mesh suppuration and the postoperative wound was healing by secondary tension. Similarly, during the entire observation period, the highest satisfaction with the cosmetic effect in Group 2 was recorded in subgroup 2b after laparoscopic IPOM with suturing of the hernia defect ($p < 0.05$). The indicators for subgroups 2a and 2c after IPOM without suturing the defect and IPOM+ were lower than for subgroup 2b ($p < 0.01$), but comparable to each other ($p = 0.10$).

Table 4. The level of patient satisfaction with the cosmetic effect of surgery after open and laparoscopic ventral hernia repair (M $\pm$ SD)

Period after surgery	Group 1		Group 2		
	1a (n = 243)	1b (n = 7)	2a (n = 81)	2b (n = 108)	2c (n = 43)
2 weeks	4.39 $\pm$ 0.64 n = 243	4.43 $\pm$ 0.54 n = 7	4.69 $\pm$ 0.52 n = 81	4.96 $\pm$ 0.19 n = 108	4.54 $\pm$ 0.63 n = 43
1 month	4.33 $\pm$ 0.65 n = 240	4.43 $\pm$ 0.54 n = 7	4.69 $\pm$ 0.52 n = 81	4.96 $\pm$ 0.19 n = 108	4.54 $\pm$ 0.63 n = 43
6 months	4.48 $\pm$ 0.56 n = 153	4.57 $\pm$ 0.54 n = 7	4.46 $\pm$ 0.50 n = 69	4.97 $\pm$ 0.17 n = 70	4.67 $\pm$ 0.48 n = 36
1 year	4.53 $\pm$ 0.50 n = 61	4.50 $\pm$ 0.55 n = 6	4.38 $\pm$ 0.49 n = 34	5, 0 $\pm$ 0 n = 23	4.65 $\pm$ 0.49 n = 17

Summarising the results of our study, it is worth noting that the frequency of wound infection can be reduced by using laparoscopic HP techniques. Open surgical interventions can lead to a higher frequency of inflammatory complications from the wound and hematomas. The frequency of recurrence after open and laparoscopic HP is comparable.

In our study, there is a limitation regarding the duration of follow-up for most patients at one year. The longest follow-up time was 4 years in 6 patients who underwent laparoscopic surgery (IPOM). In 3 out of 4 patients, the aponeurosis defect was not sutured. In all 6 cases, mesh migration, hernia recurrence, or other complications were not observed in the late postoperative period.

Given the low rate of hernia recurrence and complications, as well as the limited sample of patients, we did not take into account the effect of different types of tackers on the treatment outcome. Moreover, the indicators of complications depending on the size of the hernial defect were not considered separately. In order to study the influence of certain factors related to the HP technique on the structure and frequency of complications and the level of relapses, it is advisable to continue research on a larger sample of patients with a follow-up period of more than one year.

Conclusions

The open sublay and laparoscopic IPOM HP procedures have a comparable recurrence rate of VH ($p > 0.05$). Non-suturing of the aponeurosis defect after laparoscopic IPOM in patients with VH did not result in an increase in the total number of complications or the percentage of recurrence ($p > 0.05$). Laparoscopic IPOM+ hernioplasty allows for reliable elimination of the hernia defect and demonstrates high patient satisfaction with the cosmetic effect of the operation. Laparoscopic IPOM with hernia suturing shows significantly higher patient satisfaction with the appearance of the anterior abdominal wall compared to other laparoscopic HP techniques. The use of ultrasound diagnostics during planned postoperative examinations allows for more accurate diagnosis of complications and hernia recurrence and increases the detection rate of such complications as seromas and hematomas, including clinically insignificant ones, thus increasing the number of punctures. An individual-personalised approach to choosing a method of surgical treatment, taking into account the risk factors for the development of complications, and conducting planned examinations after surgery using ultrasound diagnostics is promising for further research.

DECLARATION OF INTERESTS

The authors have no conflicts of interest to declare.

Funding. No special funding was provided for the study. The authors declare no competing financial interests.

ETHICS APPROVAL AND WRITTEN INFORMED CONSENT STATEMENTS

All procedures performed in this study were in accordance with the ethical standards of the current Ukrainian regulations and with the 1964 Helsinki Declaration and its later amendments.

AUTHORS CONTRIBUTIONS

O.Y. Ioffe: work concept and design, critical review;
T.V. Tarasiuk: work concept and design, data collection and analysis, statistical analysis, writing the manuscript;
M.S. Kryvopustov: statistical analysis, critical review;
O.P. Stetsenko: critical review.

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Післяопераційні ускладнення та рецидив грижі після застосування різних методів хірургічного ушивання вентральних гриж

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Протезувальна герніопластика (ГП) вентральних гриж (ВГ) асоціюється із 27 % ускладнень та з 37 % рецидиву грижі залежно від методики виконання. Використання лапароскопічних методів ГП дає змогу скоротити тривалість перебування пацієнта в стаціонарі та знизити ризик ранової інфекції. Дані щодо переваги лапароскопії над відкритою методикою за показниками рецидиву та інших видів ускладнень значно відрізняються. Контраверсійними є результати порівняння результатів ГП з/без ушивання грижового дефекту.

Мета — вивчити структуру та частоту післяопераційних ускладнень, частоту рецидивів грижі після застосування відкритої та лапароскопічної ГП гриж передньої черевної стінки.

Матеріали та методи. Проведено мультицентрове проспективне дослідження на клінічних базах кафедри загальної хірургії № 2 Національного медичного університету ім. О. О. Богомольця із залученням 482 пацієнтів із ВГ. Первинні ВГ були у 279 (57,9 %) пацієнтів, післяопераційні ВГ — у 203 (42,1 %). Пацієнтів розділили на дві групи, порівнянні за віком, співвідношенням статей та розміром грижі. Група 1 — 250 (51,9 %) пацієнтів, яким застосовували відкриті методи ГП з ушиванням дефекту апоневрозу: підгрупа 1а — відкрита sublay (243 (50,4 %)), підгрупа 1в — відкрита IPOM (7 (1,5 %)), група 2 — 232 (48,1 %) пацієнти, яким проводили лапароскопічну ГП за методикою IPOM: підгрупа 2а — IPOM без ушивання дефекту апоневрозу (81 (16,8 %)), підгрупа 2в — IPOM з ушиванням дефекту апоневрозу (108 (22,4 %)), підгрупа 2с — IPOM+ з ушиванням дефекту апоневрозу відкрито (43 (8,9 %)). Контрольні огляди пацієнтів, оцінку наявності ускладнень, рецидиву та оцінку задоволеності косметичним ефектом операції проводили через 2 тиж, 1 та 6 міс, 1 рік.

Результати. Загальна частота розвитку ускладнень після виконання ГП ВГ становила 15,6 %, після відкритої sublay — 21,2 %, після лапароскопічної IPOM — 9,9 %. Усі випадки ускладнень належали до I — IIIb ступеня за класифікацією Клав'є-Діндо. Летальних наслідків в обох групах не було. У групі 1 частота сером становила 11,6 %, гематом — 5,6 %, у групі 2 — 7,3 та 0,9 % відповідно. Виявлено статистично значуще підвищення частоти розвитку гематом після відкритих методів ГП порівняно з лапароскопічними ($p = 0,004$), тоді як частота виявлення сером була порівнянною ($p = 0,148$). Неушивання дефекту апоневрозу порівняно з ушиванням у пацієнтів з ВГ при лапароскопічній методиці IPOM не призводило до зростання загальної кількості ускладнень та частоти розвитку рецидиву ($p > 0,05$). Лапароскопічний IPOM з ушиванням грижі асоціювався із статистично значущо ($p < 0,05$) більшою задоволеністю пацієнтом вигляду передньої черевної стінки порівняно з іншими методами ГП.

Висновки. Виконання відкритої sublay та лапароскопічної IPOM ГП показало порівнянну частоту розвитку рецидиву ВГ ($p > 0,05$). Частота розвитку інфекційних ускладнень та гематом статистично значущо вища після відкритих операцій порівняно з лапароскопічними ($p = 0,041$ та $p = 0,004$ відповідно).

Ключові слова: вентральна грижа, післяопераційна грижа, ушивання грижі, сітка.