

OUTCOMES OF SURGICAL TREATMENT OF OBESE PATIENTS WITH VENTRAL AND INCISIONAL HERNIAS

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ABSTRACT

Introduction. The results of the surgical treatment of ventral and incision hernias in the obese patients are poor, because of the high incidence of complications and relapses.

The objective of the study was to analyse the outcomes of patients with hernias, obesity and non-specific connective tissue dysplasia (NSCTD), and to define the main predictors of complications development.

Methods. We analysed the outcomes of treatment in 1133 patients, who underwent surgery for primary and incision ventral hernia between 2006-2017.

Results. Pulmonary embolism was diagnosed in 0.62% of the patients, abdominal compartment syndrome (ACS) in 3.0% of the individuals, after stretching hernioplasty. The highest incidence of wound complications was evidenced in patients with stage 3 obesity – 35.14%. The signs of NSCTD were present in 53.45% of the patients with recurrent hernia, and in 18.61% of the patients with no recurrence of hernia. In patients with obesity stage 1 and 2, the development of ACS depended only on the chosen method of surgical intervention. In patients with no recurrent hernia, the division of patients according to their blood groups did not significantly differ from the general population.

RÉSUMÉ

Résultats du traitement chirurgical des patients aux comorbidités présentant d' hernies ventrale et incisée

Introduction. Les résultats du traitement chirurgical des hernies ventrale et incisée chez les patients présentant une obésité morbide concomitante sont médiocres, comme en témoignent un grand nombre de complications et une incidence élevée de rechutes.

Objectifs et méthodes. Les résultats du traitement chirurgical de 1133 patients présentant une obésité morbide concomitante et une dysplasie du tissu conjonctif non spécifique, opérés pour une hernie ventrale primitive et incisée en 2006-2017, ont été analysés.

Résultats et discussion. Une embolie pulmonaire a été diagnostiquée chez 0,62% des patients et un syndrome du compartiment abdominal chez 3% des personnes ayant subi une hernioplastie par étirement. Chez les patients obèses, aux stades 1 et 2, le développement du SCA dépend uniquement de la méthode d'intervention chirurgicale choisie. L'incidence la plus élevée de complications des plaies a été mise en évidence chez les patients souffrant d'obésité, stade 3 – 35,14%. Les signes de NSCTD étaient présents chez 53,45% des patients présentant une hernie récidivante

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Conclusions. The non-stretching methods of hernioplasty should be a priority, especially for patients with morbid obesity, stage 2-3, and significant comorbidity. The risk group for relapses also includes the patients with NSCTD and A(2) blood group, since the incidence of NSCTD in these individuals is statistically significantly higher.

Keywords: ventral hernia, incision hernia, morbid obesity, non-specific connective tissue dysplasia, complications.

Abbreviations: CF - cardiac failure, RF - respiratory failure, NSCTD - non-specific connective tissue dysplasia, CST - components separation techniques, ACS - abdominal compartment syndrome, TAR - transversus abdominis muscle release.

INTRODUCTION

Most patients with incision hernias suffer from concomitant morbid obesity and make a special risk group for the incidence of complications after surgical interventions¹⁻⁵. In Ukraine, obesity affects 28.5% of the general population, 48% being overweight⁶. The views of the most surgeons are different regarding the treatment of these patients. No individualized approach to each patient, without considering the probable factors of hernia development, comorbidities, lack of sufficient experience and skills in choosing the optimal surgery method, lead to poor results of treatment⁷⁻¹⁰. Despite a significant number of surgical methods for abdominal wall correction, the results of surgical treatment of ventral and incision hernias are unsatisfactory, as evidenced by a large number of complications and a high incidence of relapses (4.5-42%)¹¹⁻¹⁹.

THE OBJECTIVE OF OUR STUDY was to analyse the results of the surgical treatment in patients with ventral and incision hernia, as well as to define the main predictors of complications in patients with morbid obesity.

MATERIAL AND METHODS

The analysis of the results of surgical treatment in 1133 patients, who underwent surgery for primary and incision ventral hernia, with underlying concomitant morbid obesity in 2006-2017, was performed at the Surgery Clinic of Academic and Research Institute of

et chez 18,61% des sujets opérés sans récurrence de hernie.

Conclusions. Les méthodes de non-étirement de l'hernioplastie devraient être une priorité, en particulier pour les patients présentant une obésité morbide, un stade 2-3 et une comorbidité significative. Le groupe à risque pour les rechutes devrait également inclure les patients présentant un groupe sanguin NSCTD et un groupe sanguin A(2), puisque l'incidence de la NSTDCD chez ces personnes est statistiquement significativement plus élevée.

Mots-clés: hernie ventrale, hernie incisée, obésité morbide, dysplasie du tissu conjonctif non spécifique, complications.

Abbréviations: CF - insuffisance cardiaque, RF - insuffisance respiratoire, NSCTD - dysplasie du tissu conjonctif non spécifique, techniques de séparation des composants CST, SCA - syndrome du compartiment abdominal, TAR - relâchement du muscle transversus abdominis.

Postgraduate Education of I. Horbachevsky Ternopil State Medical University, at the premises of Ternopil City Clinical Hospital No 2, Ukraine. 881 women (77.75%) and 252 men (22.24%) were involved in the study. The age of the patients was from 18 to 84 years old (the average age 53.4±5.6 years old). The time of herniation was from 2 to 34 years. Primary ventral hernias were evidenced in 199 (17.56%) patients. The other 934 (82.43%) patients suffered from postoperative (incision) hernia.

RESULTS

Among the examined 1133 patients with obesity, 461 (40.68%) patients suffered from stage 1 obesity; 359 (31.68%) stage 2 obesity, and 311 (27.44%) stage 3 obesity. Except morbid obesity, no other somatic pathology was revealed in 232 (20.47%) patients, who underwent surgery. Determination of the cardiac failure (CF) using NYHA classification revealed class I in 695 (61.34%) patients, class II in 419 (36.98%), and class III in 19 (1.68%) individuals (Table 1).

882 (77.85%) patients with respiratory failure (RF) type I underwent surgery; 222 (19.59%) - with RF type II; and 29 (2.56%) - with RF type III, respectively. It should be noted that all patients with RF type III underwent urgent salvage surgery for complications of ventral and incision hernias. 402 (35.48%) patients suffered from varicose disease of lower limbs and insufficiency of valvular apparatus of shin veins. Diabetes mellitus was diagnosed in 154 (13.6%) patients, type 1 in 20 (1.77%), and type 2 in 134 (11.83%) individuals. Non-specific connective tissue dysplasia (NSCTD)

Table 1. Comorbidities of obese patients with ventral hernias.

| | Cardiac failure | | | Respiratory failure | | | Diabetes mellitus | | Varicose vein disease | NSCTD |
|--------------------------------|-----------------|--------------|------------|---------------------|--------------|------------|-------------------|--------------|-----------------------|--------------|
| | Class I | Class II | Class III | Type I | Type II | Type III | Type 1 | Type 2 | | |
| Obesity stage 1 (461 patients) | 321 (69.64%) | 133 (28.85%) | 7 (1.52%) | 380 (82.42%) | 72 (9.54%) | 9 (1.95%) | 2 (0.43%) | 39 (8.46%) | 159 (34.49%) | 106 (22.99%) |
| Obesity stage 2 (359 patients) | 226 (50.13%) | 130 (36.21%) | 3 (0.65%) | 279 (70.41%) | 75 (20.89%) | 5 (1.39%) | 2 (0.43%) | 44 (12.25%) | 136 (29.50%) | 71 (15.40%) |
| Obesity stage 3 (311 patients) | 148 (47.28%) | 156 (49.84%) | 9 (2.87%) | 223 (71.24%) | 75 (23.96%) | 15 (4.79%) | 16 (5.11%) | 51 (16.29%) | 107 (34.19%) | 68 (21.73%) |
| Total | 695 (61.34%) | 419 (36.98%) | 19 (1.68%) | 882 (77.85%) | 222 (19.59%) | 29 (2.56%) | 20 (1.77%) | 134 (11.83%) | 402 (35.48%) | 245 (21.62%) |

Table 2. Types of surgical interventions conducted for ventral hernias in the patients with obesity.

| | Native tissue hernioplasty | Onlay | Inlay | Sublay | CST | Dermatolipectomy | Lightweight mesh | Heavyweight mesh |
|---------------------------------|----------------------------|--------------|------------|--------------|------------|------------------|------------------|------------------|
| Obesity, stage 1 (461 patients) | 149 (32.32%) | 156 (33.84%) | 21 (4.56%) | 132 (28.63%) | 8 (1.74%) | 12 (2.60%) | 126 (27.33%) | 173 (37.53%) |
| Obesity, stage 2 (359 patients) | 103 (22.34%) | 118 (25.60%) | 27 (5.86%) | 110 (23.86%) | 11 (2.38%) | 83 (18.00%) | 114 (24.73%) | 122 (36.46%) |
| Obesity, stage 3 (311 patients) | 80 (25.56%) | 127 (40.58%) | 29 (9.27%) | 64 (20.45%) | 14 (4.48%) | 177 (56.55%) | 96 (30.67%) | 130 (41.53%) |
| Total | 332 (29.30%) | 401 (35.39%) | 77 (6.80%) | 306 (27.01%) | 33 (2.91%) | 272 (24.01%) | 336 (29.66%) | 425 (37.51%) |

Table 3. Complications of surgical treatment of ventral hernias in patients with obesity.

| | Frequency of postoperative complications | Wound complications | | | | | | | |
|--------------------------------|--|---------------------|------------|--------------|------------------------|-----------------------------------|-----------------------------|--------------------------|-------------|
| | | PE | ACS | Exacerbation | Prolonged lymphorrhoea | Infiltrate of postoperative wound | Postoperative wound abscess | Cysts of the mesh region | Rejection |
| Obesity stage 1 (461 patients) | 149 (32.32%) | 4 (0.87%) | 6 (1.30%) | 58 (12.58%) | 100 (21.69%) | 117 (25.38%) | 28 (6.07%) | 34 (7.38%) | 6 (1.30%) |
| Obesity stage 2 (359 patients) | 171 (37.09%) | 1 (0.22%) | 7 (1.52%) | 43 (9.33%) | 129 (27.98%) | 144 (31.24%) | 45 (9.76%) | 39 (8.46%) | 8 (1.74%) |
| Obesity stage 3 (311 patients) | 146 (46.65%) | 2 (0.64%) | 21 (6.71%) | 37 (11.82%) | 102 (32.59%) | 110 (35.14%) | 37 (11.82%) | 28 (8.95%) | 9 (2.88%) |
| Total | 466 (41.13%) | 7 (0.62%) | 34 (3.00%) | 138 (12.18%) | 331 (29.21%) | 371 (32.74%) | 110 (9.71%) | 101 (8.91%) | 23 (41.13%) |

(5 and more phenotypic signs) was diagnosed in 245 (21.62%) of the examined patients. A higher frequency of CF class II, RF type I, and diabetes mellitus type 2 in the patients with stage 3 obesity was evidenced, compared to the patients with obesity stage 1.

332 (29.30%) patients underwent native tissue hernioplasty. Prosthetic plasty was performed in most patients (704, 62.13%) who underwent surgery, among them On-lay for 401 (35.39%), and Sub-lay for 306 (27.00%) individuals, respectively. The components separation techniques (CST) of hernioplasty were carried out only for 33 (2.91%) patients with

giant incisive hernias; no primary hernias were present in this group of patients (Table 2).

Pulmonary embolism (PE) was diagnosed in 7 (0.62%) patients who underwent surgery: 4 patients suffering from 1st stage obesity, 1 patient with obesity stage 2, and 2 with obesity stage 3 (Table 3). In all cases with PE, the stretching forms of hernioplasty were conducted: native tissue hernioplasty in 2 patients and in 5 cases in allogernioplasty by On-lay method. As a comparison, in patients without morbid obesity (256 patients, who underwent surgery), pulmonary embolism was not evidenced in the postoperative period.

Table 4. Frequency of NSCTD in patients with ventral and incisional hernia in cases of morbid obesity.

| <i>Stage of Obesity</i> | <i>The postoperative outcomes</i> | <i>Frequency of NSCTD</i> |
|------------------------------------|-----------------------------------|---------------------------|
| Obesity, stage 1 (461 patients) | No relapses n= 403 | 75 (18.61%) |
| | Presence of relapses n=58 | 31 (53.45%) |
| Obesity, stage 2 (359 patients) | No relapses n=316 | 52 (16.46%) |
| | Presence of relapses n=43 | 19 (44.19%) |
| Obesity, stage 3 (313 patients) | No relapses n=276 | 47 (17.03%) |
| | Presence of relapses n=37 | 21 (56.76%) |
| Total | | 245 (21.64%) |

DISCUSSION

A significantly higher frequency of wound complications was evidenced in patients with obesity stage 3. In our opinion, this is due to more frequent dermatolipectomy in this group of patients.

Abdominal compartment syndrome (ACS) was diagnosed in 34 patients, who underwent surgery: 6 patients with obesity stage 1, 7 patients with obesity stage 2, and 21 patients with obesity stage 3. Stretching hernioplasty was conducted in 30 cases (by native tissue - 9, on lay method - 21). Non-stretching allogernioplasty was performed for 4 patients (sub lay - 1, TAR (transversus abdominis muscle release) - 3). In addition, ACS after the stretching allogernioplasty was present in 6 patients with obesity stage 1, in 6 patients with obesity stage 2, and in 18 individuals with obesity stage 3. In the group of patients who underwent surgery by non-stretching methods of allogernioplasty, ACS was evidenced in 1 patient with obesity stage 2, and in 3 individuals with obesity stage 3. In cases of obesity absence, 4 (1.55%) patients who underwent surgery suffered from ACS. Thus, in patients with obesity stage 1 and 2, ACS depended only on the method of surgical intervention chosen. A significantly higher frequency of ACS in patients with obesity stage 3 proved that the method of surgical correction of anterior abdominal wall, as well as the changes (oedema) of adipose tissue of abdominal cavity of retroperitoneal space, paresis of intestine in the early postoperative period, are crucial in the development of this complication. This requires expansion of surgical intervention - omentectomy, and right hemicolectomy in rare cases.

In 245 (21.64%) patients with concomitant morbid obesity, who underwent surgery, the presence of phenotypic signs of non-specific connective tissue

dysplasia was confirmed. 461 patients with obesity stage 1 underwent surgery; among them, the relapse of hernia was evidenced in 58 patients. Moreover, in patients with recurrent hernia, the signs of NSCTD were present in 31 (53.45%) individuals, and in 75 (18.61%) patients with no recurrent hernia, who underwent surgery. Obesity stage 2 was diagnosed in 359 patients who underwent surgery, among them the recurrence of hernia was evidenced in 43 individuals (Table 4).

The frequency of NSCTD without relapse was determined in 52 (16.46%) patients and with its recurrence in 19 (44.19%) individuals. Similar changes were evidenced in patients with obesity, stage 3 - 313 individuals. Among them, the frequency of NSCTD in patients without recurrent hernia was determined in 47 (17.03%) patients, and in cases of its recurrence in 21 (56.76%) individuals.

The analysis of phenotypic features of non-specific connective tissue dysplasia in patients with incision hernia and concomitant morbid obesity who underwent surgery was carried out. Thus, it was proved that in the patients with blood group A (2) NSCTD was present in 236 (33.57%) cases and was of the highest incidence compared to the patients with O (1), B (3) and AB (4) blood groups in 67 (18.72%), 52 (18.91%) and 20 (24.10%) individuals, respectively (Table 5).

Among the patients with recurrent hernia, blood group A(2) was in 38 (62.52%) patients with obesity stage 1, in 29 (67.45%) with obesity stage 2, and in 20 (54.05%) individuals with obesity stage 3 (Table 6).

In patients with no recurrent hernia, the division of patients according to their blood groups did not significantly differ from the general population. Thus, the patients with blood group A (2) are a risk group for recurrence of hernia, probably due to a significantly higher frequency of NSCTD.

Table 5. Frequency of NSCTD in 1133 examined patients, depending on the blood group

| Blood group | Frequency of NSCTD |
|------------------------|--------------------|
| O(1) n=286 (25.22%) | n=67 18.72% |
| A(2) n=562 (49.54%) | n=236 33.57% |
| B(3) n=219 (19.37%) | n=52 18.91% |
| AB(4) n=66 (5.84%) | n=20 24.10% |

Table 6. Incidence of NSCTD in the patients with ventral and incisional hernia in cases of morbid obesity, depending on blood group.

| Blood group | | O(1) | A(2) | B(3) | AB(4) |
|------------------------------------|------------------------------|--------------|--------------|-------------|------------|
| Obesity, stage 1 (461 patients) | No relapses n=403 | 116 (28.78%) | 158 (39.2%) | 96 (23.83%) | 33 (8.19%) |
| | Presence of relapses n=58 | 16 (27.58%) | 38 (62.52%) | 4 (6.9%) | 0 (0.00%) |
| Obesity, stage 2 (359 patients) | No relapses n=316 | 74 (23.42%) | 157 (49.69%) | 60 (18.99%) | 25 (7.91%) |
| | Presence of relapses n=43 | 11 (25.59%) | 29 (67.45%) | 2 (4.66%) | 1 (2.33%) |
| Obesity, stage 3 (313 patients) | No relapses n=276 | 53 (19.2%) | 167 (60.5%) | 44 (15.94%) | 12 (4.35%) |
| | Presence of relapses n=37 | 13 (35.14%) | 20 (54.05%) | 2 (5.4%) | 2 (5.4%) |

CONCLUSIONS

The non-stretching methods of hernioplasty should be a priority, especially in the groups of patients with morbid obesity, stage 2-3, and significant comorbidities, that allow reducing the number of early postoperative complications and relapses significantly.

The dermatolipectomy significantly increases the incidence of wound complications in patients with ventral and incision hernia and morbid obesity, who require development of a stepwise approach of surgical treatment.

The frequency of abdominal compartment syndrome in patients with obesity stage 1 and 2 does not differ from the frequency of this complication in non-obese patients. The development of abdominal compartment syndrome depends only on the method of surgical intervention chosen.

In patients with obesity stage 3, a significantly higher incidence of abdominal compartment syndrome is evidenced, that requires expansion of surgical intervention – omentectomy, and right hemicolectomy in rare cases.

The incidence of relapse after surgical interventions in patients with ventral and incision hernia and morbid obesity depends on the type of surgical

intervention, as well as on the presence of non-specific connective tissue dysplasia, which has been evidenced in 53.45% of patients who underwent surgery, with obesity stage 1; in 44.19% with obesity stage 2; and in 56.76% of individuals with obesity stage 3.

Besides the phenotypic signs and biochemical markers of non-specific connective tissue dysplasia, the risk factors of relapse are also A (2) blood group, since these patients have a statistically significantly higher frequency of NSCTD. The presence of the above-mentioned risk factors of incision hernia relapse, in patients with morbid obesity, requires the development of new methods of surgical treatment for these patients, as well as improvement of the existing ones.

Compliance with Ethics Requirements:

„The authors declare no conflict of interest regarding this article“

„The authors declare that all the procedures and experiments of this study respect the ethical standards in the Helsinki Declaration of 1975, as revised in 2008(5), as well as the national law. Informed consent was obtained from all the patients included in the study“

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