

Gybalo R. V., Tsema Ie. V., Batiuk A. I. The treatment results of patients with postoperative ventral hernias after multi-stage surgery of open abdominal gunshot wounds (improvement of hernioplasty-technique). *Journal of Education, Health and Sport*. 2020;10(7):216-223. eISSN 2391-8306. DOI <http://dx.doi.org/10.12775/JEHS.2020.10.07.024>
<https://apcz.umk.pl/czasopisma/index.php/JEHS/article/view/JEHS.2020.10.07.024>
<https://zenodo.org/record/3960500>

The journal has had 5 points in Ministry of Science and Higher Education parametric evaluation. § 8. 2) and § 12. 1. 2) 22.02.2019.
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The authors declare that there is no conflict of interests regarding the publication of this paper.

Received: 19.06.2020. Revised: 09.07.2020. Accepted: 24.07.2020.

The treatment results of patients with postoperative ventral hernias after multi-stage surgery of open abdominal gunshot wounds (improvement of hernioplasty-technique)

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Abstract

Aim: to compare a new technique of the tension-free abdominal wall repair for postoperative ventral hernia after multi-stage surgery of open abdominal gunshot wounds with the open traditional and laparoscopic approaches.

Materials and methods. Treatment results of the 86 patients with postoperative ventral hernias after multi-stage surgery of the open abdominal gunshot wounds, which were divided into 2 groups. The main group included 42 patients in whom surgical treatment was carried out according to the developed method of the tension-free abdominal wall repair for postoperative ventral hernia after multi-stage surgical treatment of the open abdominal gunshot wounds. 1st and 2nd comparison group included 44 patients who were undergone an open traditional allohernioplasty and laparoscopic approaches with the composite mesh installation. Treatment results were followed up until 1 year after surgery.

Results. In the main group of patients early postoperative complications were observed in 3 (25.0%): postoperative seroma – 2 (16.7%), postoperative wound infiltrate – 1 (8.3). Among patients of 1st and 2nd comparison group cases of postoperative complications were diagnosed in 11 (61.1%): 2 (11.1%) patients – festering wounds, 4 (22.2%) – peri-

implant seroma, 3 (16.7%) – infiltration of the surgical wound, 1 (5.6%) – skin edges necrosis, 1 (5.6%) – failure of sutures of the surgical wound. The recurrences of ventral hernias were obtained in 3 (16.7%) patients from comparison group. However, there were no cases of postoperative ventral hernia recurrence in the main group of patients ($p = 0.03$).

Conclusion. A new technique of the tension-free abdominal wall repair for postoperative ventral hernia without disadvantages after multi-stage surgery of the open abdominal gunshot wounds, which allows to reduce the frequency of postoperative complications of surgical treatment and recurrence of the disease.

Keywords: abdominal gunshot wound; postoperative ventral hernia; surgical treatment; composite endoprosthesis; microfilament mesh.

Introduction

Nowadays in managing the postoperative ventral hernias, different treatment options are discussed and described, like conservative management, open method and laparoscopic technique. After surgery postoperative care of patient and wound is also discussed [1-3, 12]. The problem of treating **postoperative ventral hernias after multi-stage surgery of open abdominal gunshot wounds** is close associated with difficulties that arise in the remote period after surgical treatment of gunshot peritonitis [4-5]. It is very important to find the best method of surgical treatment of significant defects of the anterior abdomen wall that remain after numerous laparotomies during surgery treatment of gunshot peritonitis [6-7]. Surgical treatment of postoperative ventral hernias after a combat abdominal injury has a number significant features associated with the wound process [8-9]. The abdominal wall is a complex structure that has a multitude of components that include skin, muscles, aponeuroses, fat, and mesothelium. This musculoaponeurotic structure is attached to the vertebral column posteriorly, the pelvic bones inferiorly and the ribs superiorly. The integrity of the abdominal wall is essential to protect the underlying organs, allow for movement of the trunk of the body, provision of assistance in respiration and to prevent the herniation of the intra-abdominal contents [10]. Changes in the tissues of the anterior abdominal wall in case of **abdominal gunshot wounds can cause** distraction of aponeurotic things that do not allow to perform operation with the main principle of hernioplasty - plastic "without tension" [11]. Moreover, because of the lack of prospective and randomized studies which define the role of a different techniques in the treatment of **postoperative ventral hernias after multi-stage surgery of open abdominal gunshot wounds** we decided to compare a new technique of the tension-free abdominal wall repair for postoperative ventral

hernia after multi-stage surgery of open abdominal gunshot wounds with the open traditional and laparoscopic approaches.

Materials and methods

There were 86 patients with postoperative ventral hernias after multi-stage surgical treatment of open abdominal gunshot wounds, who were hospitalized in the abdominal surgery clinic of the National Military Medical Clinical Center (Ukraine, Kyiv) and Military Medical Clinical Center of the Southern Region (Ukraine, Odessa) within period from 2014 to 2020. 42 patients (48.2%) were operated on the basis of the clinic of abdominal surgery of the Military Medical Clinical Center according to the patented method (UA Patent # 127369) of a new technique of the tension-free abdominal wall repair for postoperative ventral hernia without disadvantages after multistage surgical treatment of the open abdominal gunshot wounds. 44 patients (51.2%) were undergone by classic open hernioplasty according to standard methods and laparoscopic hernioplasty using a composite microfilament mesh with an anti-adhesive membrane on the basis of the abdominal surgery department of the Military Medical Clinical Center of the Southern Region.

The plan of preoperative examination in the studied patients included standard laboratory and instrumental research methods. Laboratory methods of research were included: general clinical blood tests; general clinical analysis of urine; determination of blood group and rhesus factor; biochemical analysis of blood (total bilirubin and fractions, ALT, AST, protein and its fractions, urea, creatinine, glucose); blood electrolytes: sodium, potassium, calcium, chlorine; coagulogram. Mandatory determination of antibodies to markers of viral hepatitis, HIV tests, Wasserman's reaction was carried out for all patients.

Instrumental research methods included: electrocardiography (ECG), fluorography or X-ray examination, ultrasound (ultrasound) of the abdominal cavity and anterior abdominal wall, fibrogastroduodenoscopy (due to the high frequency of gastric ulcer, duodenal ulcer), duplex examination of the vessels of the anterior abdominal wall and lower extremities or computed tomography of the abdominal cavity.

Comprehensive preoperative preparation included dosed bandage compression of the abdomen, breathing exercises, slag-free diet for 2 weeks before surgery, bowel cleansing for 12 hours before surgery, prevention of thromboembolic complications (fraxiparin 0.3-0.6 for 12 hours before surgery), prevention of infectious complications from the wound (ceftriaxone 2 g for 2 hours before surgery), corrective therapy of concomitant pathology.

Among the studied patients there were 84 (97.7%) men and 2 (2,3%) women, the mean age was 28 ± 3.5 years (18 to 52 years). The study patients have a history of 2 to 14

open surgical interventions on the abdominal cavity for penetrating gunshot wounds (average 3.7 operations per patient).

The average duration of preoperative preparation for allohernioplasty was 9 ± 2.1 days. Contraindications to planned surgery were considered ineffective preoperative preparation, uncorrected dysfunction of the cardiovascular and pulmonary system in the conditions of bandage compression, namely the occurrence of arrhythmia, inspiratory dyspnea, reduced respiratory function to 60% of normal. In total, 2 patients were denied surgery.

Results and discussion

The results of treatment of patients in the groups of research according to the frequency of early and late postoperative complications of the surgical wound: seroma of the anterior abdominal wall, suppuration of the postoperative wound, peri-implant infiltrate, necrosis of wound edges, failure of wound sutures. The results of treatment of operated patients were monitored up to 1 year after allogeneic plastic surgery by conducting follow-up examinations of operated patients.

The main group included 42 patients, who was treated according to our method of a new technique of the tension-free abdominal wall repair for postoperative ventral hernia after multi-stage surgical treatment of the open abdominal gunshot wounds by performing open hernioplasty with supramuscular installation of polypropylene mesh allograft (UA Patent # 127369).

The essence of developed operation is that on the anterior abdominal wall two circumferential incisions are separated split flap, which in previous surgeries was imposed directly on the loop of the intestine. Mobilization of rectus abdominis muscles from cicatricially deformed fabrics and their full cutting off from oblique abdominal muscles throughout the surgical wound is carried out. The next stage is the dislocation of the rectus abdominis muscle toward the medial direction, followed by their stitching side by side with each other and with the oblique abdominal muscles toward the lateral direction. The synthetic allograft is established on muscles with fixing on perimeter: from the parties - to the aponeurotic ends of oblique muscles of abdominal wall, from above - to a costal arch, from below - to a periosteum of a pubic bone.

If necessary, additional mobilization of subcutaneous fat and allograft cover was performed. The subcutaneous fat of the anterior abdominal wall was drained with a polyvinyl chloride tube with a constant negative pressure in it. The operation is completed with layer-by-layer stitching of subcutaneous fat and skin.

1st comparison group consisted of 18 patients who were undergone surgery according to the traditional method, which consisted of open allogeneic plastics of the anterior abdominal wall with the mesh installation sub-lay, on-lay or in-lay.

26 patients of 2nd comparison group were undergone surgery by laparoscopic plastics of the anterior abdominal wall with the installation of a composite microfilament mesh with an anti-radiation membrane, directly on the loop of the intestine.

All patients in the postoperative period were prescribed adequate anesthesia with steroid (Promedol) and non-steroid analgesics (Ketalgin, Caver), as well as performed epidural anesthesia. In order to prevent complications from the wound used Cephalosparins (Ceftriaxone 2 g) for 2 hours before surgery. If indicated, antibacterial therapy was performed in the postoperative period for 5-7 days. To prevent pulmonary complications, starting from the 2nd day after surgery, patients were activated, breathing exercises were performed according to the fast-trace surgery protocol.

Prevention of thromboembolic complications included early activation of patients, elastic bandaging of the lower extremities, the appointment of low molecular weight heparins, namely Faxiparin 0.3-0.6 ml 1 time per day for 7-10 days. In the postoperative period, ultrasonographic control of fluid accumulation in the tissues of the anterior abdominal wall was performed. Drainage located near the propylene mesh allograft was removed on 3-4 day after surgery. Suture removal was performed on 10-12 day after operation. After discharge from the hospital, it was recommended to wear a bandage and limit physical activity for 2 months. An ultrasound examination of the abdominal organs and soft tissues of the anterior abdominal wall was performed on 3, 6 and 12 month after surgery.

Among 12 patients of the main group, early postoperative complications were observed in 3 (25.0%) cases: postoperative wound seroma was observed in 2 (16.7%) patients, postoperative wound infiltrate in 1 (8.3%) patient. There were no cases of postoperative wound suppuration, necrosis of skin edges and failure of postoperative wound sutures in the main group of patients.

Among 18 patients of 1st and 2nd comparison group in 11 (61.1%) observations early postoperative complications were detected: in 2 (11.1%) patients there was suppuration of the postoperative wound, in 4 (22.2%) patients - peri-implant seroma, in 3 (16.7%) patients - postoperative wound infiltrate, 1 (5.6%) operated - necrosis of the skin edges of the wound and 1 (5.6%) patient - failure of the sutures of the postoperative wound. The total number of postoperative complications was significantly higher in the comparison groups ($p = 0.03$), which performed hernioplasty according to traditional methods.

Long-term results of surgical treatment were studied in all patients of the research groups in 1 year after surgery by repeated examinations. Recurrences of postoperative ventral hernias were found in 3 (16.7%) patients of the comparison group who were undergone the traditional method of allohernioplasty. There were no primary patients with postoperative recurrence of ventral hernia who were undergone surgical treatment according to the developed method of alloheneic plastic ($p = 0.04$). Patients with postoperative recurrence of ventral hernia were re-operated according to the developed method of open allohernioplasty with supramuscular arrangement of the mesh implant. 1 (5.6%) patient of the comparison group on the 47th day after traditional allogeneic plasticity had an intestinal obstruction, which was caused by the formation of multiple adhesions between the conglomerate of the small intestine and the area of the anterior abdominal wall, where alloheronioplasty was performed. Thus, significantly better results of surgical treatment of postoperative ventral hernias after multi-stage surgical treatment of open gunshot wounds of the abdomen are observed in patients of the main group.

The recurrence of postoperative ventral hernias in the patients of the observation group was caused by postoperative wound infection, migration of the composite microfilament mash and the formation of a giant seroma of the postoperative wound, which required repeated surgery.

The proposed method of surgical treatment of patients in the main group avoids extensive viscerolysis, as for the fixation of the allograft is sufficient only the allocation of a split skin flap, which in previous surgeries was installed directly on the loop of the intestine. The use of the technique of supramuscular placement of a mesh implant avoids the need to isolate intestinal loops from the connective conglomerate, which prevents further progression of the connective process and reduces the risk of postoperative connective intestinal obstruction.

When using the proposed method of allohernioplasty, the selected rectus abdominis muscles are in direct contact with the loops of the intestine, which prevents the formation of a closed space in the abdominal cavity and significantly reduces the risk of postoperative complications, namely seromas of the anterior abdominal wall. Movement of abdominal rectus muscles in physiological position provides not only prosthetics of a front abdominal wall, but also restores its functional properties and architectonics of a muscular skeleton of a front abdominal wall.

Conclusion. The technique of open allohernioplasty with supramuscular fixation of the mesh implant is a reliable method of surgical treatment of postoperative ventral hernias

after multi-stage surgical treatment of penetrated gunshot wounds of the abdomen, which allows to reduce the incidence of postoperative complications of surgical treatment from 61.1% to 25% and postoperative recurrences of ventral hernia.

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