

The Use of Self-Locking Implants in the Open Treatment of Patients with Large and Giant Peri-Incisional Ventral Hernias

Andrey Vitalievich Protasov, Lidiya Amerkhanovna Evloeva, Mekhaeel Shehata Fakhry Mekhaeel, Ayaz Aydyn ogly Dzhabiev, Maria Naimovna Navid

Peoples' Friendship University of Russia (RUDN University), Miklukho-Maklaya Street, 6, Moscow, 117198, Russian Federation

Abstract: *The paper discusses the problem of the use of self-locking implants in the open treatment of peri-incisional ventral hernias. The beneficial effects of the use of new generation implants are shown. A review of the experience of using ProGrip and Adhesix self-locking implants in Russian invasive surgery is presented. The study aims to improve the surgical treatment of patients with large and giant peri-incisional ventral hernias by introducing self-locking implants into clinical practice.*

Keywords: *peri-incisional ventral hernia, Parietene ProGrip, Adhesix, implantation.*

I. INTRODUCTION

The research on hernias of the anterior abdominal wall as a pluricausal disease has been conducted for more than three thousand years. Doctors have been trying to find a way to treat this complex medical problem for centuries. In the annals of 300 BC there is a mention of a hernia. Hippocrates revealed a pattern between the type of hernia and certain professions. According to historians, at about the same time, Herophilus from Chalcedon and Erasistratus performed a successful hernia excision. By the beginning of the 20th century, medicine had a relatively rich knowledge base on the cause and methods of treating ventral hernias.

The most important innovation in modern hernioplasty is the use of a mesh implant, which allowed hernia repair to be performed using a tension-free method [1]. In 1965, J. Rives developed a hernia repair technique in which the implant was placed into the preperitoneal space. In 1984, R. Stoppa used a large dacron mesh to strengthen the transverse fascia in patients with a high risk of relapse [2]. The development of laparoscopic surgery began at the same time. The first successful laparoscopic herniorrhaphy was performed by R. Gerom in the 1980s. A few years later, R.J.

Fitzgibbons proposed the use of a mesh implant when performing laparoscopic herniorrhaphy [3-5].

However, despite the minimally invasive and low-trauma method, endoscopic technologies also led to the development of complications, such as postoperative ileus (especially with the intraperitoneal location of the implant), the formation of urinary tract fistulas due to decubitus of the implant, injuries of hollow organs and macrovessels, and the development of severe forms of neurodynia. Therefore, the research and development of new methods and technologies in herniology continues to this day [6-9].

II. MATERIALS AND METHODS

The clinical material for this work was compiled based on the surgical department of the Federal State Budgetary Institution of Health (FSBIH) Clinical Hospital (CH) No. 85 of the Federal Medical and Biological Agency (FMBA) of Russia. The material was based on the analysis of hernia repairs for peri-incisional ventral hernias, which were performed in 2014-2018. The results of 60 hernia repairs were analyzed. The study included patients with large and giant hernias (according to the classification of K.D. Toskin and V.V. Zhebrovsky), with the sizes of hernial orifice higher than 10 cm, i.e. W3 and W4 (according to the classification of J.P. Chevrel and A.M. Rath (SWR classification, 1999), finalized and approved by European Society of Herniology (EHS) in 2009). All hernias in this category of patients were peri-incisional, with localization along the midline. All patients underwent hernioplasty using the Sublay technique, with a retronasal or antepertoneal location of the implant [10-15].

Patients were divided into groups by sex, age, size of hernial orifice, co-morbidity index, and categories of earlier surgeries. Twenty-seven men (45%) and 33 women (55%) underwent surgeries. The average age of patients was 62.5 ± 12.1 years (Table 1).

Table 1: Distribution of operated patients in groups by sex and age*

Groups	Sex abs. (%)		Age distribution according to WHO classification abs. (%)				Total	Average age
	Male	Female	25-44 years	45-60 years	61-75 years	76-90 years		
Group 1 (Adhesix)	5 (29.4%)	12 (70.6%)	1 (5.9%)	5 (29.4%)	7 (41.2%)	4 (23.5%)	17 (28.3%)	66.12±11.25
Group 2 (Parietene Progrid)	14 (66.7%)	7 (33.3%)	3 (14.3%)	8 (38.1%)	6 (28.6%)	4 (19.0%)	21 (35.0%)	60.48±14.53
Group 3 (standard)	8 (36.4%)	14 (63.6%)	1 (4.6%)	11 (50.0%)	8 (36.4%)	2 (9.1%)	22 (36.7%)	61.55±10.29
Total	27 (45%)	33 (55%)	5	24	21	10	60	62.5±12.11

*Chi-square = 0.456 (> 0.05)

Lab tests and instrumental methods of diagnosis

All patients admitted to the hospital and included in the study signed a voluntary informed consent for examination and surgical intervention. At the prehospital phase, all patients underwent a preoperative examination according to the standard program, which included clinical blood and urine analysis, biochemical analysis of blood (with a mandatory assessment of transaminases, bilirubin, electrolytes, protein, creatinine, BUN, and glucose levels), coagulogram, blood typing and Rh phenotyping, RW, HIV test, the content of hepatitis B surface antigen and HCV antibodies, as well as ECG with an interpretation of its results and roentgen examination of thoracic organs.

All patients participating in the study underwent endotracheal anesthesia with regard to the assessment of anesthetic risk factors according to the ASA scale. The position on the surgical table was horizontal, on the back. The surgical area was treated three times with an antiseptic solution.

Characteristics of the surgical technique for hernioplasty of peri-incisional ventral hernias

All patients were operated using open access approach according to the standard technique of ventral hernia repair with the use of the Sublay implant. Five stages were identified in the operational technique used: the first stage – access, the second stage – the isolation of the hernial sac, the third stage – the creation of a bed for the implant, the fourth stage – the fixation of the mesh implant, and the fifth stage – layered closure. In all groups, differences were present only in the fourth stage of the operational technique – different implant fixation methods were used. At this stage, special attention was paid to the size of the implant being cut out. The edges of the implant should extend beyond the edge of the defect by about 3-4 cm. In our study, the total area of the hernial defect in all groups was 137.5 ±

73.6 cm². The size of the mesh implant was 367.8 ± 186.3 cm².

III.RESULTS AND DISCUSSION

Analysis of the results of surgical treatment of patients with peri-incisional ventral hernias

The course of the early postoperative period was studied in patients that underwent surgeries on large and giant peri-incisional ventral hernias by examination, analysis of medical records, and questioning of patients.

The immediate results of performing hernioplasty for peri-incisional hernias were evaluated using the following indicators:

1. The duration of surgical intervention;
2. The frequency of development of complications during the postoperative period (wound complications).

The operation time in the comparison groups directly depended on the method of placement and fixation of the implant. The average time of surgical intervention in the group with standard implants with antepertoneal and retronasal placement was 81.0 ± 22.7 minutes and 125.0 ± 40.0 minutes, respectively. In the group that received Adhesix implants, the average time of surgical intervention with antepertoneal and retronasal placement was 56.3 ± 12.7 minutes and 75.0 ± 24.9 minutes, respectively. In the group that received Progrid implants, the average time of surgical intervention with antepertoneal and retronasal placement was 66.5 ± 20.6 minutes and 79.6 ± 14.2 minutes, respectively. The time of surgical intervention was expectedly lower in groups that received self-locking implants compared to the group that received standard polypropylene implants, which require fixation with suture (Fig. 1).

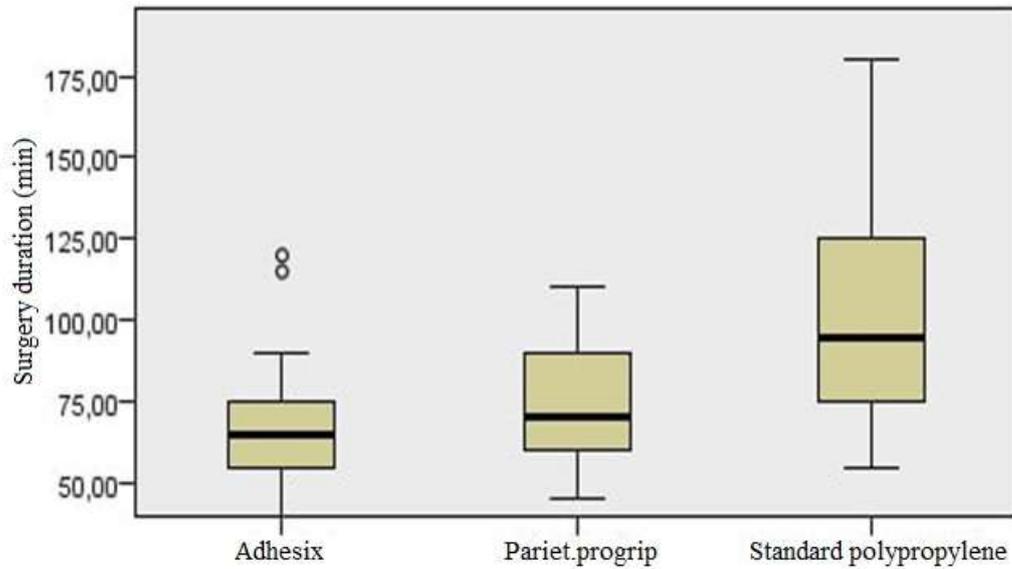


Fig. 1: Duration of surgery in different groups depending on the type of implant

Wound complications were mainly represented by seromas (11.7%) and hematomas (13.3%). Additionally, several patients had infiltrative changes in the abdominal wall (6.6%), and postoperative wound infection was observed in 3.3% of cases. It should be noted that not a single seroma was

observed in the postoperative period in the groups that received self-locking implants. This complication was recorded in patients in the case of a large volume of serofluid requiring additional drain (Table 2).

Table 2: Wound complications in patients depending on the type of implant

Implant type	Hematomas		Seromas		Infiltrate		Maturation		Total	
	abs.	%	abs.	%	abs.	%	abs.	%	abs.	%
Adhesix	2	3.3	0	0	0	0	0	0	2	3.3
Progrid	4	6.7	0	0	1	1.7	0	0	5	8.3
Standard polypropylene	2	3.3	7	11.7	3	5.0	2	3.3	14	23.3

The critical value of $\chi^2 = 15.507$ at $p = 0.05$

IV. CONCLUSION

Results of hernioplasty for large and gigantic peri-incisional ventral hernias were evaluated based on the duration of surgery. The duration of surgery in the comparison groups directly depended on the method of placement and fixation of the implant. The average time of surgical intervention in the group with standard implants with antepertitoneal and retranasal placement was 81.0 ± 22.7 minutes and 125.0 ± 40.0 minutes, respectively. The average time of surgical intervention in the group that received Adhesix implants with antepertitoneal and retranasal placement was 56.3 ± 12.7 minutes and 75.0 ± 24.9 minutes, respectively. In the group that received Progrid implants, the average time of surgical intervention with antepertitoneal and retranasal implantation was 66.5 ± 20.6 minutes and 79.6 ± 14.2 minutes, respectively. Consequently, reliable data

were obtained on the reduction of the duration of surgery in groups with self-locking implants by 1.32 times with their antepertitoneal implantation and 1.58 times with retranasal implantation.

Additionally, sutural surgery technique was characterized by a higher injury rate. During the operation, the implant was fixed around the perimeter, anchoring to the aponeurotic structures was performed using interrupted suture. In this case, tissues in the fixation zone can be injured, which leads to an increased inflammatory process around the suture with the formation of excess granulations.

The results indicate a significant twofold (on average) decrease of the incidence of postoperative wound complications with the use of self-locking implants for peri-incisional ventral hernias (7 times for Adhesix implantation and 2.8 times for Progrid).

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