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METHOD OF ACTIVE DRAINAGE OF RESIDUAL CAVITY IN CASE OF ALLOHERNIOPLASTY OF POSTOPERATIVE VENTRAL HERNIAS

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Abstract

The work is based on the study and analysis of direct results of surgical treatment of 117 patients with postoperative ventral hernias, which underwent allohernioplasty with the method of onlay. The purpose of the study is improvement of direct results of surgical treatment of postoperative ventral hernias through improvement and introduction of the method of active drainage of a postoperative wound.

For decrease of the exudate from subcutaneous fat and reduction of frequency of early postoperative complications in case of hernioplasty with the usage of polypropylene net and onlay method, an addition was made to the system of Redon. The evaluation of the effectiveness of treatment methods was done taking into consideration the character and the quantity of the exudate by days, the terms of drainage tubes standing and existence of specific postoperative complications.

The course of postoperative period was studied depending on the method of the drainage of a postoperative wound. The results showed that in case of active drainage of the residual cavity with additional vacuum, statistically significant reduction of exudate volumes since the second day, as well as reduction of the terms of drainage of a postoperative wound from 6.75±0.51 days to 2.45±0.2 days were noted. The reduction of the frequency of early specific postoperative complications practically for 6 times as compared with the classical method of wound drainage proves the effectiveness of the additional vacuum. This latter improves the direct results of allohernioplasty of postoperative ventral hernias by onlay method.

Thus, data received testify to high effectiveness of the additional vacuum while drainage of the postoperative wound

Keywords: *postoperative ventral hernia, allohernioplasry, system of Redon, drainage, additional vacuum.*

INTRODUCTION

The problem of postoperative ventral hernias and their relapse is far from the final solution. The quantity of operative interventions on the abdominal cavity organs is constantly increasing. Proportionally the number of postoperative ventral hernias is increased as well. More than 5% of laparatomies and lumbotomies are complicated by the development of hernia defects [*Israelsson L., 1998; Zhebrovski V., Toskin K., 2000*].

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Endoprosthesis of abdominal wall in patients with ventral hernias makes possible to improve the results of treatment and recover the quality of patients life [*Sukovatikh B. et al., 2006*]. Nevertheless, wound complications are observed in the postoperative period after allohernioplasty in 12-50% of cases [*Egiev V. et al., 2005; Alekseev A. et al., 2006; Tutov A. et al., 2007*]. The most frequently observed wound complications are seromas, haematomas, suppurations, and ischemic necrosis of the wound edges.

The prophylaxis of wound complications after hernioplasty regarding postoperative ventral hernias is one of the most strategic issues of surgical treatment. The effective drainage of

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postoperative wounds is of high significance [*Korenkov M. et al., 2001; Timoshin A. et al., 2003*].

One of the frequent complications after hernioplasty is exudate accumulation in the wound, formation of seromas, haemotomas with the subsequent infection. The reasons of these complications underlie the specifics of the wound development process after implanting synthetic materials and applying allohernioplasty techniques. Different prevention measures were suggested [*Zhebrovski V., Toskin K., 2000*]. Currently, for liquidation of the residual cavity several methods of postoperative wound management are used: application of blind suture with periodic evacuation of the exudate under ultrasonic control, drainage of subcutaneous fat with the help of rubber dischargers and active drainage with the help of vacuum aspirators (system of Redon, valvate drainage Unovac) and usage of elastic bandage, which allows to tightly correlate the wound surfaces without disturbing the respiratory movement of the abdominal wall [*Kanshin N., Abakumov M., 1974; Soler N. et al., 1993; Kovaleva Z., 1999; Kirpichev A., Surkov N., 2001; Fedorov I. et al., 2006; Mirzabekyan Y. et al., 2006; Podoluzhni V. et al., 2006; Slavin L. et al., 2006; Tutov A. et al., 2007*].

In case blind suture is inserted when the residual cavity is not drained starting from the 3rd–4th day after the surgery, the puncture is done with the removal of serohemorrhagic content. Although, according to data of some authors the psychological connection between the patient and the doctor is broken in this case [*Slavin D., 2003*].

In case of active drainage of residual cavity, the drains are removed on the 5th–7th day after the surgery, under the condition that the quantity of exudate does not exceed 50-60 *mL*, while according to data of some authors at 30 *mL* [*Gogiya B., 2006*]. In some patients with hyperreaction to the polymer, when the quantity of the exudate is more than 100 *mL/day*, the drains are kept till the 10th –12th day after surgery [*Egiev V., 2002; Sundukov I., 2005*]. The effective drainage of subcutaneous tissue is important for prevention of wound complications after hernioplasty.

Numerous available research works were dedicated to studies on the role of passive and active wound drainage in the prevention of seromas and wound abscess development after allohernioplasty of postoperative ventral hernias. However, there are no research works studying the negative pressure in the system of Redon in case of allohernioplasty, when there would be observed the reduction of the exudate and terms of wound drainage, as well as reduction of the quantity of the early postoperative complications.

Thus, improvement of the method of active wound drainage for prophylaxis of wound complications after allohernioplasty is extremely urgent and pressing.

The purpose of the study was to enhance direct results of the surgical treatment of postoperative ventral hernias by improvement and introduction of the method of active drainage of a postoperative wound.

MATERIAL AND METHODS

With the purpose of prophylaxis and successful control over seromas, we in mandatory order drained the area between the subcutaneous fat and implanted endoprosthesis (residual cavity) by the device for the active drainage of the wound: system of Redon. No complications connected with the drainage were observed. On the contrary, the drainage of the area of the operation ensured the evacuation of the accumulated fluid and thus created favorable conditions for integration of endoprosthesis to the abdominal wall and adhesion of the bigger part of mobilized wound surfaces. The drainages were removed in case of exudate quantity less than 30 *mL* per day.

After completion of the polypropylene net fixation, along the whole length the drainage tubes were put one end being taken out through separate punctures and fixed by the stitch to the skin.

For drainage of the postoperative wound, silicone tubes with diameter of 0.5 *cm* were used. On the side surfaces of the drainage placed in the wound cavity, the holes up to 0.3 *cm* in size were cut along the whole length.

Correct suturing up the wound is of a special significance, because in case of traditional layer-

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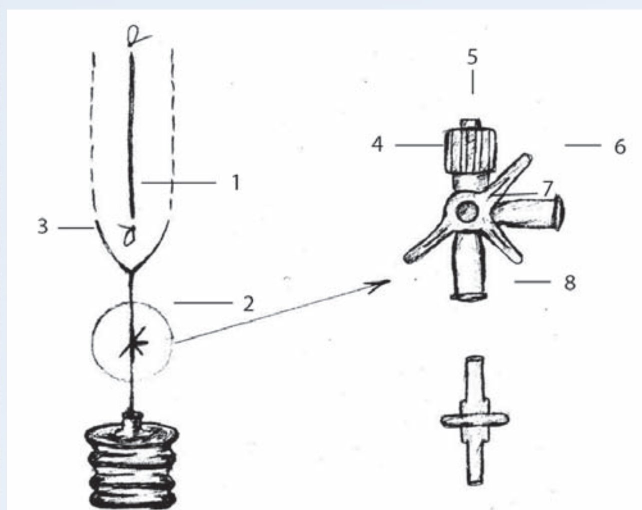
wise stitching up, residual cavities are formed among them and the wound effluent and clots of blood are accumulated as a good medium for development of the infection.

As the source of the infection more frequently originates from the subcutaneous tissue, we sutured it up by a two-layer stitch. For reduction of the residual cavity size, in mandatory order we sutured up the nadaponeurotic layer of the subcutaneous tissue by uninterrupted suture with capturing from the net and aponeurosis. Upper layers of the tissue were sutured up by interrupted absorbable sutures to contact the walls.

Immediately after the surgery the source of the vacuum was connected to the free end of the drainage tubes. For reduction of the exudate from subcutaneous tissue and reduction of the frequency of early postoperative complications in case of hernioplasty with the usage of polypropylene net by onlay method, an addition was made to the system of Redon and Patent No. 4684 obtained (Picture).



Picture. *Addition to the system of Redon for creation of additional vacuum.*

The method of creating an additional vacuum in the system of Redon was as follows: between the tee piece (1) and the balloon (2) of 500 cm^3 volume a crossover valve (3) was incorporated. On the valve there was a handle (4), which rotated by 360 degrees. The upper end of the valve (5) was narrow, the middle (6) and the lower (7) endings had lugs. For connecting the lower ending of the valve with the drainage system a plastic adapter was used (8) from the system for intravenous transfusion. We crossed the drainage tube connecting tee piece and balloon along the center. The first ending of the valve was connected with the tube coming from the wound (tee piece), the third ending – with the tube going towards the balloon through the adapter from the instillator. The second ending was used by us for connecting with the medical aspirator/suction device.

Upon turning the handle of valve to a position when all 3 holes were opened, we switched on the aspirator with the parameters of negative pressure 0.3 *atm* and sucked the air from the drainage system. After that, turning the handle, we closed the second hole (for the aspirator) and left the first and the third holes open. We disconnected the aspirator, and additionally covered the hole by the plug.

Among 117 operated patients, there were 22 (18.8%) men and 95 (81.2%) women. The age ranged from 26 to 75, the average age was 55.2±10.7 years.

In patients with postoperative hernias concomitant diseases were noted very often: in 106 (90.6%). This latter, especially taking into account their multiplicity, creates very unfavorable conditions for the surgery itself. Therefore, revealing and correction of the concomitant pathology was always viewed as the most important task of the preoperative period, especially for the patients with big and giant hernias. In 86 (73.5%) patients a combination of several concomitant diseases was noticed. The following ones were more frequently observed: cardiovascular pathology, disbolism and endocrinous pathology. Based on the concomitant pathology all patients were divided as follows: 88 (75.2%) of patients had cardiovascular pathology (CHD, arterial hypertension with inadequate blood circulation 0-1); 90 (76.9%): adiposis of the 1st to 3rd level and 18 (15.4%): diabetes of type 1–2.

All patients were divided in a way as reflected in Table 1, according to J.P Chevrel and A.M. Rath classification (SWR classification) suggested at the XXI International Congress of Herniologists in Madrid according to the size of the hernia.

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Table 1.

Division of patients with postoperative ventral hernias according to the size of hernia defect

Size of hernia	Number of patients	
	abs	%
Small	16	13.7
Medium	50	42.7
Big	40	34.2
Giant	11	9.4
Total	117	100%

The effectiveness of the applied methods of treatment was evaluated taking into account the quantity of exudate by days, terms of drainage tubes standing and occurrence of specific postoperative complications.

To evaluate the clinical effectiveness an indicator "number needed to treat" (NNT) was used that characterizes the quantity of patients, which as compared to the ordinary method of treatment, need to be treated a new way to be able to obtain additional positive results with one of the patients of the basic group as compared to the control group.

The results of the studies were processed with the package of applied programs "Statistica. Version 6.0" (StatSoft, USA), with the usage of data of parametric and non-parametric statistics.

RESULTS AND DISCUSSION

In 96 (82.1%) patients the area between the subcutaneous fat and implemented endoprosthesis (residual cavity) was drained by the device for active aspiration from the wound: system of Redon (Group I), in 21 (17.9%) patients within the Redon system additional vacuum by the above described method was applied (Group II).

While studying the impact of additional vacuum on the process of the early postoperative period, it was detected that on the 1st and 2nd days after the surgery the quantity of the exudate upon the use of additional vacuum was much less.

The quantity of the exudate on the 1st and 2nd days depending on the vacuum applied are presented in Table 2. In the first group the average quantity of exudate on the 1st day made 76.3±6.6 *mL*, on the 2nd day: 50.3±3.4 *mL*. In the second group during the first day 55.5±6.1 *mL* exudate was removed, during the 2nd day: 25.7±4.0 *mL*. The difference between the examined groups was significant based on data of the 2nd day (p=0.001), while according to the 1st day it has a tendency towards reduction (p=0.069).

Table 2.

Volume of wound exudate on the 1st and 2nd day depending on the vacuum

Days	Exudate Volume, *mL*		value of p
	Group I	Group II	
Day 1	76.3±6.6	55.5±6.1	0.069
Day 2	50.3±3.4	25.7±4.0	0.001

Taking into consideration that the average volume of the effluent in patients with the additional vacuum on the 2nd day was less than 30 *mL*, the terms of drainage for that patient group were reduced. The terms of drainage depending on the vacuum are presented in Table 3. In the first group the duration of drainage was 6.75±0.51 days, and in the second group: 2.45±0.2 days. The difference between the studied groups was statistically significant (p=0.001).

While studying the structure of postoperative complications, an interrelation was established between the additional vacuum and frequency of postoperative complications.

In Group I the complications occurred with 25 (26.0%) patients. In Group II, 1 (4.8%) patient had a complication in postoperative period: formation of seroma. Moreover, seroma appeared in a patient with primary postoperative hernia, there were multiple ligature micro-abscesses and while removal of the latter the contamination of the wound took place.

Table 3.

Terms of the postoperative wound drainage depending on the vacuum

Group	Number of patients	Terms of draining, days	value of p
Group I	96	6.75±0.51	p=0.001
Group II	21	2.45±0.20	

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Table 4.

Division of patients based on the presence (N+) or absence (N-) of complications depending on the vacuum

Groups	N+	N-	Total	χ^2 (tables 2x2)
Group I	25 (26.0%)	71 (74.0%)	96 (100%)	χ^2 = 4.51 (*p*=0.034)
Group II	1 (4.8%)	20 (95.2%)	21 (100%)	

The division of patients based on the presence (N+) or absence (N-) of complications depending on the vacuum are presented as Table 4.

In the group of patients without additional vacuum, the complications (N+) were observed in 25 cases (26.0%); there were no complications (N-) in 71 cases (74.0%). In the group of patients with additional vacuum, the complications were observed in 1 case (4.8%), and there were no complications in 20 cases (95.2%). When the tables were formed for frequencies 2x2 in the statistics χ^2 significant differences between compared groups were received based on the presence or absence of the complications (*p*=0.034).

Upon evaluation of the clinical effectiveness of additional vacuum usage, the NNT indicator was equal to 4.8, which corresponds to the high effectiveness of the applied method.

$$\frac{1}{\frac{20}{21} - \frac{71}{96}} = 4.8$$

CONCLUSIONS

Thus, in case of the active drainage of a residual cavity with the additional vacuum, statistically significant reduction of effluent on the second day and reduction of time intervals of the postoperative wound drainage from 6.75±0.51 days to 2.45±0.2 days is observed. Almost 6-fold reduction of the frequencies of early specific postoperative complications as compared with the classic method of drainage signifies to the effectiveness of the additional vacuum usage. This improves direct results of allohernioplasty of postoperative ventral hernias by onlay method.

REFERENCES

1. *Alekseev A.K., Yurasov A.V., Timoshin A.D., Shestakov A.L.* [Complications of different methods of explantation in case of treatment of postoperative ventral hernias] [published in Russian]. Herniology. 2006; 3: 8.

2. *Egiev V.N.* [Nonstrain hernioplasty] [published in Russian]. Moscow. “Medical practice” Publishing House. 2002. 148p.

3. *Egiev V.N., Chizhov D.V., Filatkina N.V.* [Interrelations of polypropylene endoprosphesis with the tissues of front abdominal wall] [published in Russian]. Herniology. 2005; 2: 41-49.

4. *Fedorov I.V., Slavin L.E., Kochnev A.V.* [Seroma as the complication for the abdominal hernias surgery] [published in Russian]. Herniology Bulletin. 2006; 2: 195-198.

5. *Gogiya B.Sh.* [Surgical treatment of postoperative ventral hernias] [published in Russian]. Author’s thesis of dissertation for doctor of medical sciences. Moscow. 2006. 48p.

6. *Israelsson L.A.* The surgeon as a risk factor for complications of midline incisions. Eur. J. Surg. 1998; 164: 353-359.

7. *Kanshin N.N., Abakumov M.M.* [Active aspiration for the prophylaxis of postoperative wound abscess] [published in Russian]. Surgery Bulletin. 1974; 8: 61-65.

8. *Kirpichev A.G., Surkov N.A.* [Usage of the net from prolan in case of plastics of front abdominal wall] [published in Russian]. Moscow. Medicine. 2001. 86p.

OFFICIAL PUBLICATION OF THE YEREVAN STATE MEDICAL UNIVERSITY

9. *Korenkov M., Paul A., Sauerland S.* Classification and surgical treatment of incisional hernia: results of an experts meeting. Langenbecks Arch. Surg. 2001; 386: 65-73.

10. *Kovaleva Z.V.* [Choice of explantate for hernioplasty] [published in Russian]. Author's thesis of dissertation for candidate of medical sciences. Samara. 1999. 26p.

11. *Mirzabekyan Y.R., Smirnov N.V., Ivanov M.P., Dobrovolski S.R.* [Usage of valve drainage after hernioplasty] [published in Russian]. Herniology. 2006; 3: 30-31.

12. *Podoluzhni V.I., Karmadonov A.V., Perminov A.A.* [Chronical seromas in case of nadaponeurotic situation of the prosthesis in patients with the abdominal hernias] [published in Russian]. Herniology Bulletin. 2006; 2: 155-157.

13. *Slavin D.A.* [Clinical-experimental justification of reticular polypropylene endoprosthesis for hernioplasty] [published in Russian]. Autho's thesis of dissertation for candidate of medical sciences. Kazan; 2003: 20p.

14. *Slavin L.E., Zamaleev A.Z., Konovalova O.A.* [Influence of the method of alloplasty on results of treatment of postoperative ventral hernias] [published in Russian]. Herniology Bulletin. 2006; 2: 171-176.

15. *Soler N., Verhaeghe P., Essomba A.* Treatment of postoperative incisional hernias by composite prosthesis (polyester-poly-glactin 910). Ann. Chir. 1993; 47: 598-608.

16. *Sukovatikh B.S., Netiaga A.A., Valuiskaya N.M., Pravednikova N.V.* [The quality of patients life after surgical treatment, more frequently met hernias of front abdominal wall] [published in Russian]. Herniology. 2006; 3: 40-41.

17. *Sundukov I.V.* [Alloplasty inpatients with big and giant postoperative ventral hernias] [published in Russian]. Author's thesis of dissertation for candidate of medical sciences. Moscow. 2005. 26p.

18. *Timoshin A.D., Yurasov A.V., Shestakov A.L.* [Surgical treatment of inguinal hernia and postoperative hernias of abdominal wall] [published in Russian]. Moscow. "Triada-X" Publisher. 2003. 144p.

19. *Tutov A.S., Kuznetsov S.S., Bukreeva A.E.* [Peculiarities of early and remote postoperative period in case of surgical treatment of postoperative ventral hernias] [published in Russian]. Herniology. 2007; 2: 30-33.

20. *Zhebrovski V.V., Toskin K.D.* [Twenty years of experience in postoperative ventral hernias treatment] [published in Russian]. Surgery Bulletin. 2000; 2: 105-108.

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