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# Pathogenesis of Recurrence in Tension Hernioalloplasty

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**Annotation:** The treatment of 146 patients with postoperative ventral hernias was analysed. After local tissue plasty and prosthetic tension hernioplasty a complete recurrence of the disease most often developed. In the recurrence zone a scar with signs of remodelling in the direction of atrophy with foci of granulation tissue and with phenomena of chronic inflammation developed; after tension prosthetic methods - connective tissue with formation of voids around the synthetic prosthesis, leading to inflammatory reaction around the fibres of the prosthesis. The above-mentioned factors together with the increase of intra-abdominal pressure were the bases for the formation of hernia recurrence. In surgical treatment of postoperative ventral hernias it is recommended to use improved methods of hernioalloplasty - "on lay" without suturing the defect with implantation of the endoprosthesis with U-shaped sutures (at W1-W2) or "on lay+sub lay" with creation of a duplicate prosthesis (at W3-W4), which was performed in 56.9% and 19.8% of patients, respectively.

**Keywords:** Postoperative ventral hernia, recurrence.

**Relevance.** Over the last 20 years the improvement of the results of treatment of patients with primary and postoperative hernias is connected with the introduction into practice of synthetic prostheses made of various materials. The frequency of ventral hernia recurrences after autoplastic methods ranges from 20 to 46%, after prosthetic methods it varies from 8 to 15,3% of patients (1,3,4). Currently, the pathogenesis of recurrent hernias is considered from the point of view of the development of a constantly progressing local inflammatory process in the tissues around the prosthesis, which indicates an increased risk of wound complications at repeated operations (2,6). At the same time, the methods of prevention of complications and recurrences are not sufficiently developed (5).

The absence of clearly formulated recommendations on the choice of the operation method in patients with recurrent ventral hernias both after autoplastic and prosthetic methods of hernioplasty became the main motivation for this study.

**Objective of the study.** To improve the results of treatment of patients with recurrent postoperative ventral hernias by improving the methods of their surgical treatment.

**Material and methods.** The study was carried out in Samarkand State Medical University" at the Department of General Surgery and treated in surgical departments of the City Clinical Hospital No.2 of Samarkand and SamSMU multidisciplinary clinic. All 146 patients aged from 28 to 75 years (the average age was 57,2±9,02 years) with recurrent postoperative ventral hernias, in whom the hernia recurrence developed after tension hernioplasty.

Group Ia consisted of 94 patients after tension hernioplasty by Meyo, Sapezhko, and edge-to-edge methods. Group Ib consisted of 52 patients after prosthetic hernioplasty, in which the synthetic prosthesis was placed in the positions "on lay", "sub lay" and "in lay".

Distribution of patients by size, localisation and frequency of recurrent hernias according to the classification of J.P. Chevrel and A.M. Rath (SWR - classification 2000).

Patients with hernias of medial localisation occupied a significant place 87.2%, followed by patients with anterolateral hernias 8.1% and lateral hernias 4.7%.

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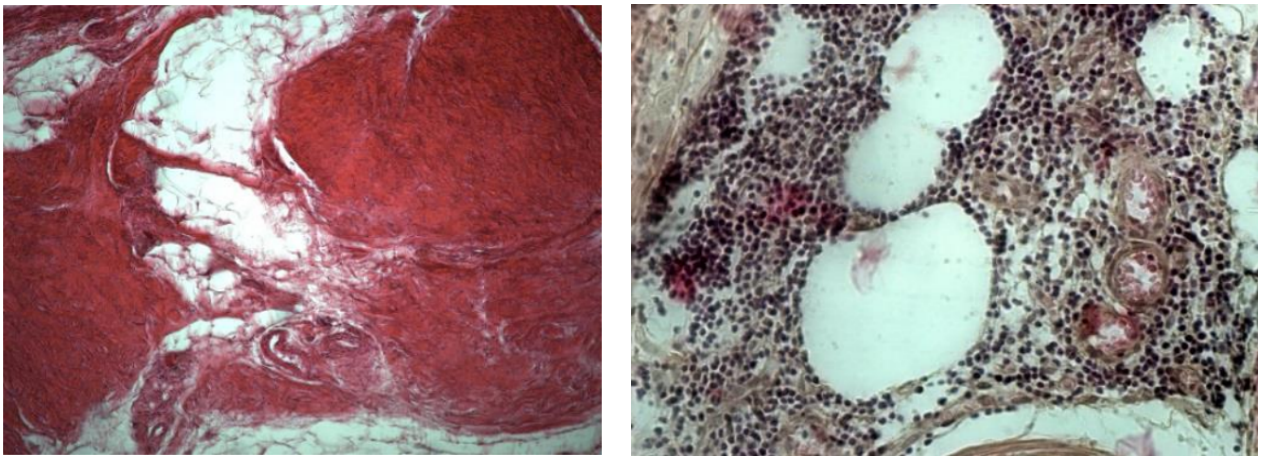
Recurrent hernias of small size (W1) were in 18.6% of patients, medium (W2) in 34.9%, large (W3) in 31.4%, and huge (W4) in 15.1%.

To find out the reasons of hernia recurrence in patients after plastic closure of defects in the abdominal wall with local tissues (group Ia) and with their reinforcement with synthetic prosthesis (group Ib) a retrospective analysis of operations in treated patients was carried out.

In patients with recurrent hernias after local tissue plasty (group Ia) there was a complete recurrence of the disease. Intraoperatively, ligatures with preserved integrity of the thread and knot were detected along the line of divergence of the edges of the previously sutured tissues, which testifies to the tissue penetration, but not to the thread rupture. After local tissue plasty, there was a correlation between hernia recurrence and the size of the bulge, which, in turn, correlated with increased intra-abdominal pressure after surgery. This indicates the inappropriateness of the applied method of plasty in case of large hernia sizes that contribute to increased intra-abdominal pressure.

In group Ia patients, microscopic studies of tissues after local tissue plasty showed that the recurrence zone represented by the scar changed the anatomy of the anterior abdominal wall during the formation of hernia elements, creating technical difficulties during surgery. In case of recurrence in the period from 2 to 6 months, the basis of the scar was mature connective tissue without signs of fibrous transformation. Collagen fibres were predominantly gathered in bundles, but the thickness and density of the fibres were not uniform. In areas of low density, there were signs of inflammation with tissue oedema and diffuse focal lymphocytic infiltration (Fig. 5a). Such changes were traced for a long distance from the recurrence zone, and at the site of hernia recurrence development there were small foci of immature granulation tissue against the background of the existing inflammation.

In group Ib patients with recurrent hernias after tension prosthetic plasty methods macroscopically similar changes were found. The main differences depending on the period of recurrence were observed directly in the area of the implant location, which were expressed in the insufficiency and irregularity of the connective tissue capsule formation around the synthetic prosthesis. In the period up to 6 months after plasty, when the synthetic material was placed in the "on lay" position, pathological integration of the prosthesis with almost complete absence of the circular capsule around it was revealed. It was based on granulation tissue intensively infiltrated with inflammatory cells, most of which were represented by lymphocytes and multiple degranulated mast cells, which formed significant "voids" between the tissue and the fibres of the synthetic material (Pic. 1). The collagen fibres forming the circular capsule of the prosthesis showed signs of fibrotic transformation. Thus, from the morphological point of view, the sign of the existing tissue tension in case of hernia gate closure with local tissues or prosthetic tension methods is chronic aseptic inflammation, which determines the processes of scar remodelling, the formation of "voids" between the fibers of the prosthesis and tissues, reducing the strength of its fixation to the tissues.



**Pic. 1. Microscopic changes in the tissues of the recurrence zone in patients of groups Ia (a), Ib (b). Haematoxylin and eosin staining: a - lipomatosis of the scar at the site of plasty with the phenomena of edema and inflammation (eq. 100); b - the phenomena of pronounced inflammation around the fibers of the synthetic polypropylene prosthesis (eq. 400);**

Results and their discussion. Among the patients of group Ia prosthetic tension plasty was repeatedly performed in 36 patients, recurrences of the disease occurred in 5 (13,9%). Prosthetic non-tensioning plasty by improved methods was performed in 58 patients. In this case "onlay" hernioalloplasty without suturing of the defect with implantation of the endoprosthesis with U-shaped sutures was performed in 50 patients (recurrence - 2), "onlay+sublay" hernioalloplasty without suturing of the defect with creation of duplicature in 8 patients. The characteristics of operations in patients in group Ia are presented in Tables 1 and 2.

**Table 1. Outcomes in patients with recurrent PVH (group Ia) depending on hernia localisation and reoperation option**

| Localisation of a recurrent hernia | Re-operation option | | | |
|---|---|---|---|---|
| | Prosthetic tension plasty n=36 | Prosthetic non-tension plasty n=58 | | |
| | Onlay hernioalloplasty with preliminary suturing of the defect | Onlay hernioalloplasty without suturing the defect with implantation of the endoprosthesis with U-shaped sutures | Hernioalloplasty "onlay+sublay" without suturing the defect by creating a duplicature | Total |
| M | 7/1 | 2 | - | 2 |
| M1 | 5/0 | 22/1 | 4 | 26/1 |
| M2 | 6/1 | 14/1 | 2 | 16/1 |
| M3 | 10/1 | 12 | 2 | 14 |
| ML | 4/1 | - | - | - |
| L | 4/1 | - | - | - |
| Итого | 36/5 | 50/2 | 8 | 58/2 |

* Note: The denominator indicates the number of hernia recurrences

**Table 2. Outcomes in patients with recurrent PVH (group Ia) according to hernia size and reoperation option**

| Size of recurrent hernia | Re-operation option | | | |
|---|---|---|---|---|
| | Prosthetic tension plasty n=36 | Prosthetic non-tension plasty n=58 | | |
| | Onlay hernioalloplasty with preliminary suturing of the defect | Onlay hernioalloplasty without suturing the defect with implantation of the endoprosthesis with U-shaped sutures | Hernioalloplasty "onlay+sublay" without suturing the defect by creating a duplicature | Total |
| W1 | 4/1 | 4 | - | 4 |
| W2 | 13/1 | 22/1 | - | 22/1 |
| W3 | 15/1 | 18/1 | 2 | 20/1 |
| W4 | 4/2 | 6 | 6 | 12 |
| Итого | 36/5 | 50/2 | 8 | 58/2 |

* Note: The denominator indicates the number of hernia recurrences

It follows from the tables that after tension alloplastic methods of surgery recurrences developed in patients regardless of the localisation of hernias in epi-, meso-, hypogastric regions, if they occupied all three regions, were anterolateral and lateral in localisation. And a similar pattern was repeated when assessing the recurrence rate of hernias depending on their size. After tension alloplastic hernioplasty, recurrences occurred in small, medium, large and giant hernias.

In tension prosthetic hernioplasty, out of 8 patients with anterolateral (4) and lateral (4) hernias after surgery for hernias of medium, large and giant size, hernia recurrence was formed only in 2 patients with giant lateral hernia.

Tables 3 and 4 show the results of treatment of group Ib patients depending on the localisation and size of the recurrent hernia.

Among the patients of group Ib, prosthetic tension plasty was repeatedly performed in 4 patients, recurrence of the disease occurred in 1 (25%). Prosthetic non-tensioning plasty by improved methods was performed in 48 patients with recurrence in 2 (3.8%) patients. In this case "onlay" hernioalloplasty without suturing the defect with implantation of the endoprosthesis with U-shaped sutures was performed in 30 patients (recurrence - 1), "onlay+sublay" hernioalloplasty without suturing the defect with the creation of duplication in 18 patients (recurrence - 1).

**Table 3. Outcomes in patients with recurrent POVH (group Ib) depending on hernia localisation and reoperation option**

| Localisation of a recurrent hernia | Re-operation option | | | |
|---|---|---|---|---|
| | Prosthetic tension plasty n=4 | Prosthetic non-tension plasty n=52 | | |
| | Onlay hernioalloplasty with preliminary suturing of the defect | Onlay hernioalloplasty without suturing the defect with implantation of the endoprosthesis with U-shaped sutures | Hernioalloplasty "onlay+sublay" without suturing the defect by creating a duplicature | Total |
| M | 4/1 | 14 | 4 | 18 |
| M1 | - | 2 | - | 2 |
| M2 | - | 4 | 6/1 | 10/1 |
| M3 | - | 6/1 | 4 | 10/1 |
| M4 | - | 4 | - | 4 |
| ML | - | - | 2 | 2 |
| L | - | - | 2 | 2 |
| Total | 4/1 | 30/1 | 18/1 | 48/2 |

* Note: The denominator indicates the number of hernia recurrences

**Table 4. Outcomes in patients with recurrent POVH (group Ib) according to hernia size and reoperation option**

| Localisation recurrent hernia | Re-operation option | | | |
|---|---|---|---|---|
| | Prosthetic tension plasty n=1 | Prosthetic non-tensioning plasty n=24 | | |
| | Onlay hernioalloplasty with preliminary suturing of the defect | Onlay hernioalloplasty without suturing the defect with implantation of the endoprosthesis with U-shaped sutures | Hernioalloplasty "onlay+sublay" without suturing the defect by combined method | Total |
| W1 | 2 | 2 | - | 2 |
| W2 | 2/1 | 10/1 | 4 | 14/1 |
| W3 | - | 14 | 8 | 22 |
| W4 | - | 4 | 6/1 | 10/1 |
| Total | 4/1 | 30/1 | 18/1 | 48/2 |

* Note: The denominator indicates the number of hernia recurrences

The analysis of the results of operations in patients with recurrent hernias (groups Ia and Ib) after local tissue plasty with prosthesis reinforcement showed that the repeated use of these methods is accompanied by a high rate of recurrence of the disease, reaching 15%. On the contrary, the use of non-tensioned improved methods of plasty reduced the number of recurrences to 3.7%.

**Conclusions.**

1. Clinical manifestations of the disease in patients with recurrent ventral hernia depend on the technique of previous hernioplasty. After plasty with local tissues, a complete recurrence of the disease most often develops. Partial recurrence of hernias along the lower and upper contours of fixation of the prosthesis to the tissues, as well as hernias through the defects of the damaged prosthesis are characteristic of the prosthetic method of plasty.

2. In patients after tension autoplastic methods in the recurrence zone a scar with signs of remodelling in the direction of atrophy with foci of granulation tissue and with phenomena of chronic inflammation develops; after tension prosthetic methods - connective tissue with formation of voids around the synthetic prosthesis, leading to inflammatory reaction around the fibres of the prosthesis. The above-mentioned factors together with increased intra-abdominal pressure are the basis for the formation of hernia recurrence.

3. In surgical treatment of postoperative ventral hernias it is recommended to use improved methods of hernioalloplasty - "on lay" without suturing the defect with implantation of the endoprosthesis with U-shaped sutures (at W1-W2) or "on lay+sub lay" with creation of the prosthesis duplication (at W3-W4), which was performed in 56,9% and 19,8% of patients respectively.

4. The proposed improved methods of non-tensioned prosthetic plasties in patients with recurrent ventral hernias allowed to improve significantly the results of treatment by reducing the recurrence of the disease from 15% to 3.7%.

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