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# Long-term results of prosthetic plasty of extensive and giant incisional ventral hernias

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**Abstract**--The problem of surgical management of extensive and giant incisional ventral hernias (IVH) is relevant around the globe despite the development of high technologies and the introduction of new treatment methods by leading surgical centers. The authors note that today there are unresolved issues of preventing the recurrence of the disease. The article provides a detailed comparative analysis of the long-term results of surgical management of such a category of severe patients. The introduction of an improved technique of tension-free IVH prosthetic plasty in conjunction with the proposed option for preventing the development of wound complications has significantly reduced the incidence of long-term complications, including wrinkling of the prosthesis, the formation of skin-prosthetic fistulas, and also negated the risk of prosthesis tearing off with the development of a paraprosthesis hernia.

**Keywords**---prosthetic hernia, incisional ventral hernias (IVH), complications.

## **Introduction**

Relevance. Approximately 350,000 ventral hernia plasty surgeries are performed annually in the United States, of which near 150,000 are postoperative hernias. That places a significant burden on the healthcare system. In addition the reoperation rate is 12.3% after five years and up to 23% after ten years <sup>[11]</sup>.

In the United Kingdom, over 120,000 laparotomies are performed each year. They are followed by over 7,000 postoperative hernia procedures. That is close to 6%, but the actual incidence of postoperative hernia may be higher as this figure does not count patients who choose not to consider surgery or do not attend for personal or medical reasons <sup>[12]</sup>. Given the morbidity and mortality associated with the condition and methods of recovery <sup>[13]</sup>, it is clear that the choice of the ideal plasty method is critical.

A landmark prospective randomized controlled trial reported by Burger in 2004 evaluated the results of IVH plasty with primary suture and mesh <sup>[9]</sup>. There were 97 patients in the suture group and 84 patients in the mesh group. The recurrence rate at ten years was 67% in the suture plasty group compared to 32% in the mesh plasty group.

In other words, when evaluating the effectiveness of the developed algorithm of measures to reduce postoperative complications, the long-term period is of no little importance when in some cases, a new development can lead to unexpected results and consequences <sup>[1, 2, 3, 4, 5, 6, 7, 8, 10]</sup>.

## **Materials and Methods**

The study included 448 patients with extensive (large) and giant IVH who were treated in the surgical department of the 1st clinic of the Samarkand State Medical Institute from 2012 to 2021. They were conditionally divided into two groups: the study group included 128 patients operated on in the period from 2020 to 2021, and there were 320 patients in the comparison group operated on from 2012 to 2019 inclusive.

The following experimental and morphological studies were carried out: development of an experimental model of incisional large ventral hernia (ILVH); experimental study of the effectiveness of new methods of combined incisional hernias plasty; development of a method of laser photodynamic therapy (LPDT) in the prevention of infectious complications in allohernioplasty of incisional ventral hernias (IVH). At the same time, an assessment was made of the morphological features of the state of tissues during prosthetic plasty according to the proposed method.

Modern methods including radiation and laboratory methods were used to evaluate the results of diagnostics and surgical management, along with a

routine examination complex. The results obtained were statistically processed with an emphasis on assessing the reliability of the obtained results. The developed method for preventing the wound infection in alloplasty of IVH guarantees an increase in the antibacterial effect of the domestic antiseptic FarGALS agent and stimulation of local reparative activity by providing a photosensitizing and photodynamic effect on the exposure to low-energy laser radiation.

## Discussion

The study was conducted in two groups to evaluate the clinical results of the proposed tactical and technical aspects. The analysis was made by taking into account various factors. The long-term results were monitored in 316 patients of the comparison group and 127 patients of the study group (4 deaths in the comparison group and one death in the study group were excluded).

The comparative incidence analysis of long-term wound complications depending on the size of the hernia (Table 1) showed that in the comparison group, wrinkling of the prosthesis was more often noted and amounted to 3.5% in extensive and 4.0% in giant hernias; while in the study group in extensive hernias wrinkling of the prosthesis was not noted in any case, and in giant hernias, it occurred only in 1 (1.3%) case. A similar pattern was with the incidence of skin prosthetic fistulas: in the comparison group, it was 3.5% with extensive hernias and 5.5% with giant ones, while in the study group, it was 2.0% with extensive and 2.6% with giant hernias. Detachment of the prosthesis with forming a post-prosthetic hernia was noted only in the comparison group: 3 (2.6%) cases with extensive and 7 (3.5%) with giant hernias.

Table 1  
Comparative incidence of long-term wound complications depending on the size of the hernia

| Complications   | Comparison group                |       | Study group |      |
|---|---------------------------------|-------|-------------|------|
|   | abs.                            | %     | abs.        | %    |
| Extensive hernias   |                                 |       |             |      |
| Wrinkling of the prosthesis   | 4                               | 3,5%  | 0           | 0,0% |
| Skin prosthetic fistulas  | 4                               | 3,5%  | 1           | 2,0% |
| Detachment of the prosthesis with the formation of a post-prosthetic hernia | 3                               | 2,6%  | 0           | 0,0% |
| Total:  | 11                              | 9,6%  | 1           | 2,0% |
| Statistical difference  | $\chi^2=2,957$ ; Df= 1; p=0,086 |       |             |      |
| Giant hernias   |                                 |       |             |      |
| Wrinkling of the prosthesis   | 8                               | 4,0%  | 1           | 1,3% |
| Skin prosthetic fistulas  | 11                              | 5,5%  | 2           | 2,6% |
| Detachment of the prosthesis with the formation of a post-prosthetic hernia | 7                               | 3,5%  | 0           | 0,0% |
| Total:  | 26                              | 12,9% | 3           | 3,9% |
| Statistical difference  | $\chi^2=4,869$ ; Df= 1; p=0,028 |       |             |      |

In general, in the long-term period, 9.6% of complications after plasty of extensive hernias were noted in the comparison group, 2.0% in the study group ( $\chi^2=2.957$ ; Df=1;  $p=0.086$ ). After plasty of giant hernias, 12.9% of complications were noted in the comparison group, 3.9% - in the study group ( $\chi^2=4.869$ ; Df=1;  $p=0.028$ ).

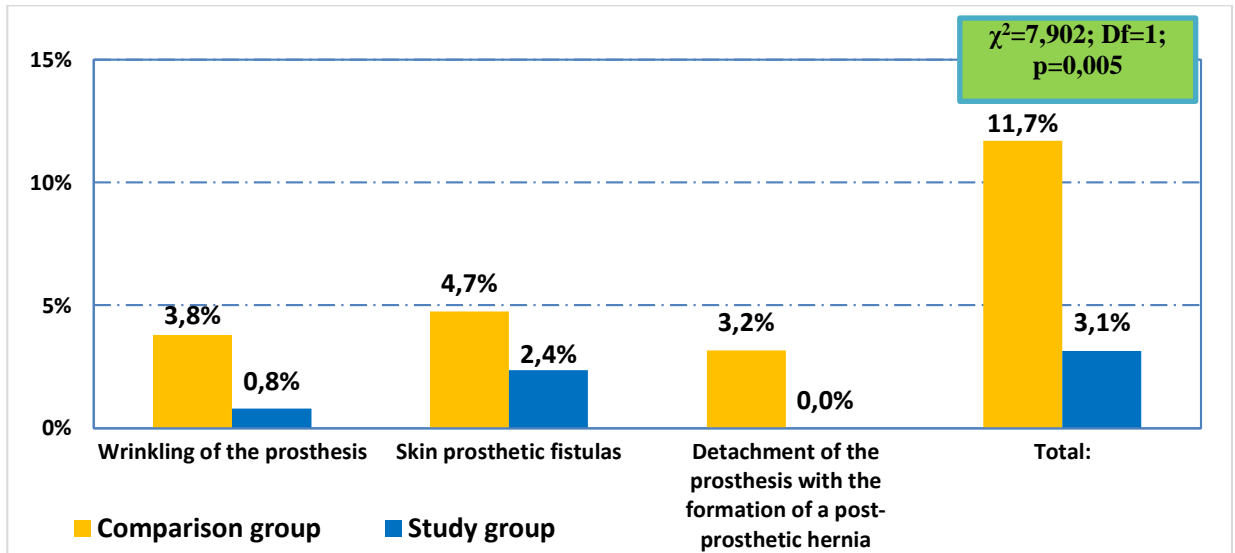


Fig. 1. Summary incidence of long-term wound complications

The following graph clearly shows the significant difference in the groups in terms of the summary incidence of long-term complications (Fig. 1). The total number of long-term complications decreased significantly from 11.7% to 3.1% ( $\chi^2=7.902$ ; Df=1;  $p=0.005$ ) in the study group, both due to a decrease in the wrinkling of prosthesis 1 (0.8%) case, skin-prosthetic fistulas 3 (2.4%) cases, and due to the absence of detachment of the prosthesis.

When comparing the incidence of long-term wound complications depending on the size of the aponeurosis defect, the picture becomes clearer. It becomes clear that the incidence of long-term complications is directly related to the size of the aponeurosis defect and increases from W2 to W4 (Table 2). If with W2 the above-mentioned long-term complications were detected in 8.6% of patients in the comparison group and in 1.6% in the study group, with W3 - 13.4% and 4.4%, respectively, then with W4 it was already 20.0% and 5.3% respectively.

Table 2

Comparative incidence of long-term wound complications depending on the size of the aponeurosis defect

| Complications               | Comparison group |      | Study group |      |
|-----------------------------|------------------|------|-------------|------|
|                             | abs.             | %    | abs.        | %    |
| W2                          |                  |      |             |      |
| Wrinkling of the prosthesis | 8                | 4,6% | 0           | 0,0% |
| Skin prosthetic fistulas    | 5                | 2,9% | 1           | 1,6% |

|   |    |       |   |      |
|---|----|-------|---|------|
| Detachment of the prosthesis with the formation of a post-prosthetic hernia | 2  | 1,1%  | 0 | 0,0% |
| Total:  | 15 | 8,6%  | 1 | 1,6% |
| W3  |    |       |   |      |
| Wrinkling of the prosthesis   | 2  | 2,1%  | 1 | 2,2% |
| Skin prosthetic fistulas  | 6  | 6,2%  | 1 | 2,2% |
| Detachment of the prosthesis with the formation of a post-prosthetic hernia | 5  | 5,2%  | 0 | 0,0% |
| Total:  | 13 | 13,4% | 2 | 4,4% |
| W4  |    |       |   |      |
| Wrinkling of the prosthesis   | 2  | 4,4%  | 0 | 0,0% |
| Skin prosthetic fistulas  | 4  | 8,9%  | 1 | 5,3% |
| Detachment of the prosthesis with the formation of a post-prosthetic hernia | 3  | 6,7%  | 0 | 0,0% |
| Total:  | 9  | 20,0% | 1 | 5,3% |

We identified all patients with recurrent hernias and analyzed long-term complications among them (Table 3).

Table3  
Comparative incidence of long-term wound complications  
after recurrent herniasplasty

| Complications   | Comparison group               |       | Study group |      |
|---|--------------------------------|-------|-------------|------|
|   | abs.                           | %     | abs.        | %    |
| Extensive recurrent hernias   |                                |       |             |      |
| Wrinkling of the prosthesis   | 3                              | 4,7%  | 0           | 0,0% |
| Skin prosthetic fistulas  | 3                              | 4,7%  | 1           | 3,8% |
| Detachment of the prosthesis with the formation of a post-prosthetic hernia | 2                              | 3,1%  | 0           | 0,0% |
| Total:  | 8                              | 12,5% | 1           | 3,8% |
| Statistical difference  | $\chi^2=1,538$ ; Df=1; p=0,215 |       |             |      |
| Giant recurrent hernias   |                                |       |             |      |
| Wrinkling of the prosthesis   | 6                              | 5,8%  | 1           | 2,4% |
| Skin prosthetic fistulas  | 8                              | 7,7%  | 1           | 2,4% |
| Detachment of the prosthesis with the formation of a post-prosthetic hernia | 5                              | 4,8%  | 0           | 0,0% |
| Total:  | 19                             | 18,3% | 2           | 4,9% |
| Statistical difference  | $\chi^2=4,258$ ; Df=1; p=0,040 |       |             |      |

Specific complications were noted in 8 (12.5%) of 64 patients with extensive recurrent hernias in the comparison group and 1 (3.8%) of 26 patients ( $\chi^2=1.538$ ; Df=1; p=0.215) in the study group. There were by an order more giant recurrent hernias, so the difference was significant ( $\chi^2=4.258$ ; Df=1; p=0.040): specific complications were noted in 19 (18.3%) of 104 patients in the comparison group and 2 (4.9%) of 41 patients in the study group.

The graph shows an even higher difference in the groups in terms of the summary incidence of long-term wound complications after recurrent hernia plasty (Fig. 2). The total number of long-term complications significantly decreased in the study group from 16.1% to 4.5% ( $\chi^2=7.902$ ; Df=1;  $p=0.017$ ), both due to a decrease in the incidence of prosthesis wrinkling from 9 (5.4%) to 1 (1.5%), skin-prosthetic fistulas from 11 (6.5%) to 2 (3.0%), and due to the absence of detachment of the prosthesis.

Specific complications were noted in 8 (12.5%) of 64 patients with extensive recurrent hernias in the comparison group and in 1 (3.8%) of 26 patients ( $\chi^2=1.538$ ; Df=1;  $p=0.215$ ) in the study group. There were by an order more giant recurrent hernias, so the difference was significant ( $\chi^2=4.258$ ; Df=1;  $p=0.040$ ): specific complications were noted in 19 (18.3%) of 104 patients in the comparison group and 2 (4.9%) of 41 patients in the study group.

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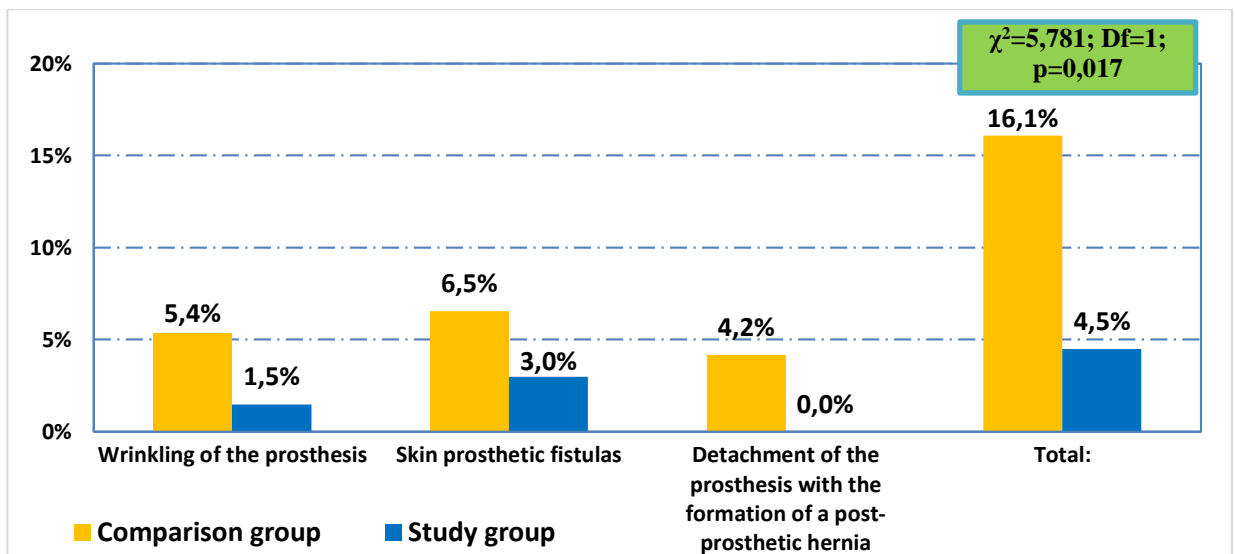


Fig. 2. Summary incidence of long-term wound complications after recurrent hernia plasty

It is noteworthy that in the primary plasty in the comparison group, complications were noted in 10 (6.8%) cases out of 148 patients, while in the study group, it was only 1 (1.7%) case out of 60 patients. To summarize, it is possible to obtain a summary incidence of long-term complications in the comparison groups (Fig. 3).

Taking into account the size of the hernia: the number of complications was reduced from 9.6% to 2.0% ( $\chi^2=2.957$ ; Df=1;  $p=0.086$ ) in extensive hernias, and from 12.9% to 3.9% ( $\chi^2=4.869$ ; Df=1;  $p=0.028$ ) in giant hernias.

Taking into account the size of the aponeurosis defect, it was possible to reduce the number of complications from 8.6% to 1.6% ( $\chi^2=3.635$ ; Df=1;  $p=0.057$ ) in W2, from 13.4% to 4.4% ( $\chi^2=2.611$ ; Df=1;  $p=0.107$ ) in W3, and from 20.0% to 5.3% ( $\chi^2=2.201$ ; Df=1;  $p=0.138$ ) in W4. There were no significant differences in the groups considering the degree of obesity, and the size of the aponeurosis.

Significant difference was defined in the plasty of recurrent hernias in the form of a decrease in long-term complications from 16.1% to 4.5% ( $\chi^2=5.781$ ; Df=1;  $p=0.017$ ). Also, in general, we can state a significant difference among the groups ( $\chi^2=7.902$ ; Df=1;  $p=0.005$ ): the number of all long-term complications was 37 (11.7%) in the comparison group and 4 (3.1%) in the study group.

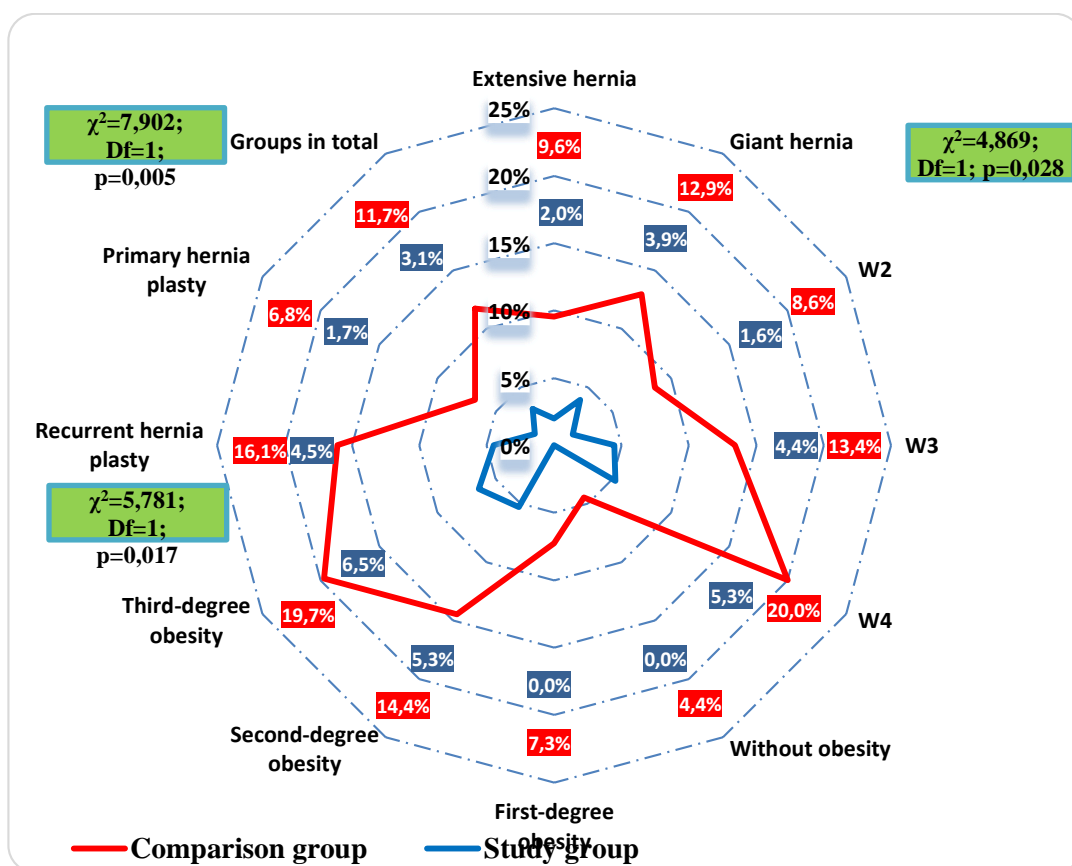


Fig. 3. Summary incidence of long-term complications in the comparison groups

## Conclusion

Conducted clinical studies have convincingly proved the advantages of using the proposed technical aspects of prosthetic plasty, and tactical aids for preventing

the development of wound complications in the immediate and long-term postoperative period in the most challenging situations (extensive and giant IVH). The introduction of an improved technique of tension-free prosthetic plasty of IVH in combination with the use of the proposed option for preventing the development of wound complications made it possible to reduce the incidence of long-term complications from 11.7% (in 37 out of 316 patients in the comparison group) to 3.1% (in 4 out of 127 patients in the study group;  $\chi^2=7.902$ ; Df=1;  $p=0.005$ ), including wrinkling of the prosthesis from 3.8% (in 12 patients) to 0.8% (in 1 patient), formation of skin prosthetic fistulas from 4.7 % (15) to 2.4% (3), as well as to neutralize the risk of detachment of the prosthesis with the formation of a paraprosthesis hernia (from 3.2% (10) to 0%). At the same time, there was a significant decrease in the risk of developing these complications in the most challenging situations, in particular, in allohernioplasty of giant hernias from 12.9% (in 26 out of 201 patients in the comparison group) to 3.9% (in 3 out of 77 patients in the study group;  $\chi^2=4.869$ ; Df=1;  $p=0.028$ ) and after plastic surgery of recurrent IVH from 16.1% (in 27 out of 168 patients in the comparison group) to 4.5% (in 3 out of 67 patients in the study group;  $\chi^2=5.781$ ; Df=1;  $p=0.017$ ).

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