

Development And Implementation Of A Method Of Tension-Free Hernialloplasty Using Π -Shaped Sutures For The Treatment Of Ventral Hernias In Obesity Patients

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Abstract: The aim of the study is to improve the results of surgical treatment of ventral hernias in obese patients by improving the technical aspects of hernialloplasty. Materials and methods of research. The study is based on clinical and laboratory examination of 121 patients with ventral hernias who were operated on in the surgical department of the Samarkand branch of the RSCMP for the period from 2016 to 2025. Study results. The improved technique of tension-free hernialloplasty in obese patients significantly reduced the incidence of postoperative complications (8.9% vs 14.8%, $p = 0.045$) and completely eliminated recurrence of ventral hernias in the late period. Conclusions. The developed method of tension-free hernioalloplasty using Π -shaped sutures and an "on lay" endoprosthesis significantly reduces complications and recurrences of ventral hernias in obese patients, accelerates recovery and improves clinical results.

Keywords: Ventral hernias, obesity, tension-free hernioalloplasty, "on lay" endoprosthesis.

Introduction: Obesity significantly increases the risk of both the development and recurrence of ventral (incisional) hernias. A U.S.-based study demonstrated that recurrence rates in obese patients range from 12% to 50%, whereas in individuals with normal body weight, the recurrence rate is approximately 10% [6, 9, 10]. Surgeons in Russia, the United States, and the United Kingdom concur that obesity is a major factor complicating anterior abdominal wall reconstruction and is associated with a higher incidence of postoperative complications following hernioplasty [5, 7, 8].

International clinical experience supports the efficacy of the open onlay mesh repair approach in obese patients. A study conducted in the United States [10]

reported a low recurrence rate (3.6%) and a minimal rate of postoperative complications (8.9%) when employing a modified onlay technique in patients with obesity (BMI >30) and large fascial defects (>5 cm) [9]. These outcomes are comparable to those achieved with sublay (retro-rectus) mesh placement, which, according to systematic reviews, is associated with the lowest rates of recurrence and surgical site infections, albeit requiring a more complex surgical approach [3].

A South Korean study (199 patients, 2009–2018) proposed the "Slim-Mesh" technique — a sutureless laparoscopic method — which demonstrated favorable clinical outcomes in patients with obesity and morbid obesity, including short hospital stays (2–3 days), reduced operative time (approximately 100 minutes),

low recurrence rates (4%), and a low incidence of complications [2, 4, 5, 7, 8]. These findings underscore the feasibility and clinical effectiveness of tension-free repair techniques, including onlay mesh placement and sutureless fixation, in the management of hernias in obese patients.

Taken together, these data highlight the importance of optimizing open tension-free hernia repair using P-shaped sutures and an onlay mesh prosthesis. This approach, grounded in international best practices and aligned with current clinical standards, offers reliable surgical outcomes and contributes to reducing recurrence rates and postoperative complications in this challenging patient population.

AIM

To improve surgical outcomes in the treatment of ventral hernias in patients with obesity by refining the technical aspects of hernia alloplasty.

METHODS

This study is based on the clinical and laboratory evaluation of 121 patients with ventral hernias who underwent surgical treatment at the Department of Surgery of the Samarkand Branch of the Republican Center for Emergency Medical Care between 2016 and 2025. Patients were operated on in both emergency and elective settings.

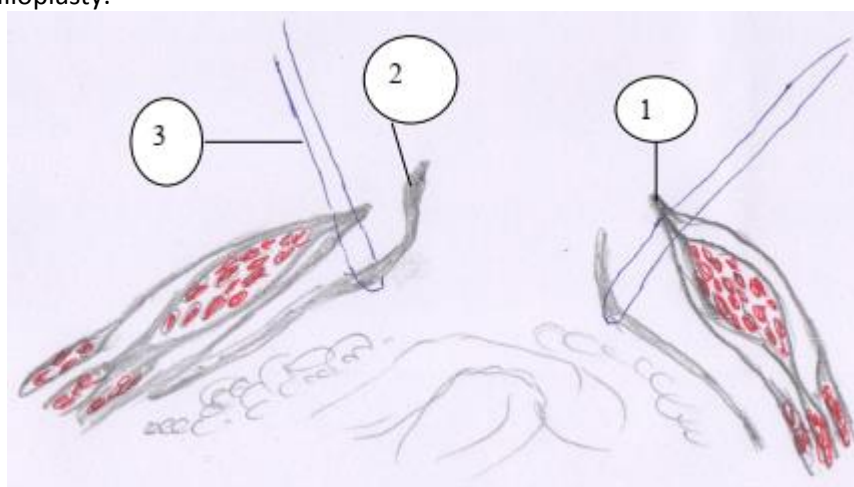
Depending on the chosen treatment strategy, patients were divided into two groups. The first group, the comparison group, consisted of 54 patients who underwent hernioplasty using the Devlin technique modified by Zhebrovsky [1]. The second group, the main group, included 67 patients who underwent hernioplasty using our newly developed method of tension-free hernia alloplasty.

Preoperative evaluation was performed with the involvement of a cardiologist and pulmonologist. The following parameters of external respiration were assessed using standard methodologies: Stange's test, respiratory rate, tidal volume, minute ventilation, vital lung capacity, and maximal voluntary ventilation.

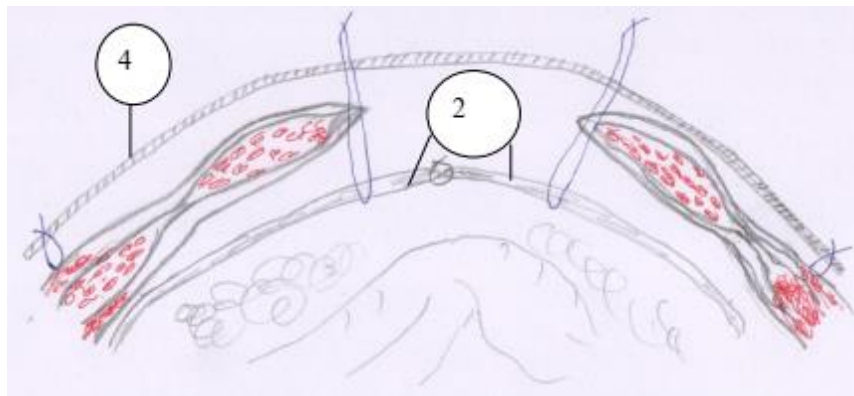
The Devlin technique as modified by Zhebrovsky presented certain limitations. During fixation of the endoprosthesis at the hernia defect site, the needle is inserted above the mesh with engagement of the aponeurosis (i.e., the edge of the hernia defect). The surgeon performs this maneuver without direct visualization, increasing the risk of inadvertent perforation of hollow organs located beneath the aponeurosis and peritoneum.

To address this issue, we developed a new method of tension-free hernia alloplasty aimed at minimizing the risk of accidental injury to intra-abdominal organs. The technique involves the following steps: after exposing the peritoneum near the hernia defect and dissecting the aponeurosis approximately 5 cm from its edge, but before closing the hernia sac, the margin of the hernia defect is sutured using P-shaped (U-shaped) sutures. The number of sutures depends on the size of the defect (Fig. 1A).

After closing the peritoneal cavity using either the peritoneum itself or the wall of the hernia sac, without suturing the aponeurosis, the endoprosthesis is fixed to the pre-placed P-shaped sutures along the edge of the defect in an onlay fashion. Additional fixation of the endoprosthesis is performed using interrupted sutures placed into the aponeurosis at a distance of 5 cm from the defect margin (Fig. 1B).



A.



B.

Fig. 1. Technique of tension-free hernia alloplasty for postoperative ventral hernias. 1 – Edge of the hernia defect (aponeurosis); 2 – Parietal peritoneum, wall of the hernia sac; 3 – Pre-placed P-shaped (U-shaped) suture; 4 – Polypropylene mesh placed in an onlay position.

RESULTS

The refinement of the surgical technique for ventral hernia repair had a direct positive impact on the immediate postoperative outcomes in this patient population.

Postoperative gastrointestinal function remained normal in 119 patients (98.4%). Only 2 patients (1.6%) — one from each group — developed transient intestinal paresis, and 1 patient (0.8%) in the comparison group experienced urinary retention, which was managed conservatively with medication.

Pulmonary complications were observed in 3 cases (2.5%). Abdominal compartment syndrome (ACS) developed in 1 patient (1.8%) from the comparison group, requiring prolonged mechanical ventilation and respiratory therapy; the condition was successfully managed conservatively.

Cardiovascular complications were observed in 2 patients (1.6%). Both respiratory and cardiovascular complications were associated with increased intra-abdominal pressure due to hernioplasty of large ventral defects.

Among wound-related complications, postoperative hematomas were recorded in 2 patients (3.7%) in the

comparison group and 1 patient (1.2%) in the main group; seromas occurred in 2 patients (3.7%) and 1 patient (1.5%) respectively; lymphorrhea was noted in 3 patients (2.5%)—2 in the comparison group and 1 in the main group. Wound infection occurred in 1 patient (1.8%) in the comparison group, and marginal skin flap necrosis was documented in 2 (3.7%) and 1 (1.5%) patients in the comparison and main groups, respectively.

Notably, patients in the comparison group experienced an average of 2–3 complications per patient, often combining pulmonary and/or cardiovascular issues with wound-related complications. In total, 8 patients (14.8% of 54) in the comparison group developed complications, including 6 patients (11.1%) with wound complications and 4 (7.4%) with systemic, non-abdominal complications (see Fig. 2).

In the main group, complications were observed in 6 patients (8.9% of 67), with wound complications in 3 patients (4.5%) and systemic complications in another 3 patients (4.5%).

Statistical comparison revealed a significant reduction in the overall complication rate in the main group (Chi-square test: $\chi^2 = 4.043$; Df = 1; $p = 0.045$).

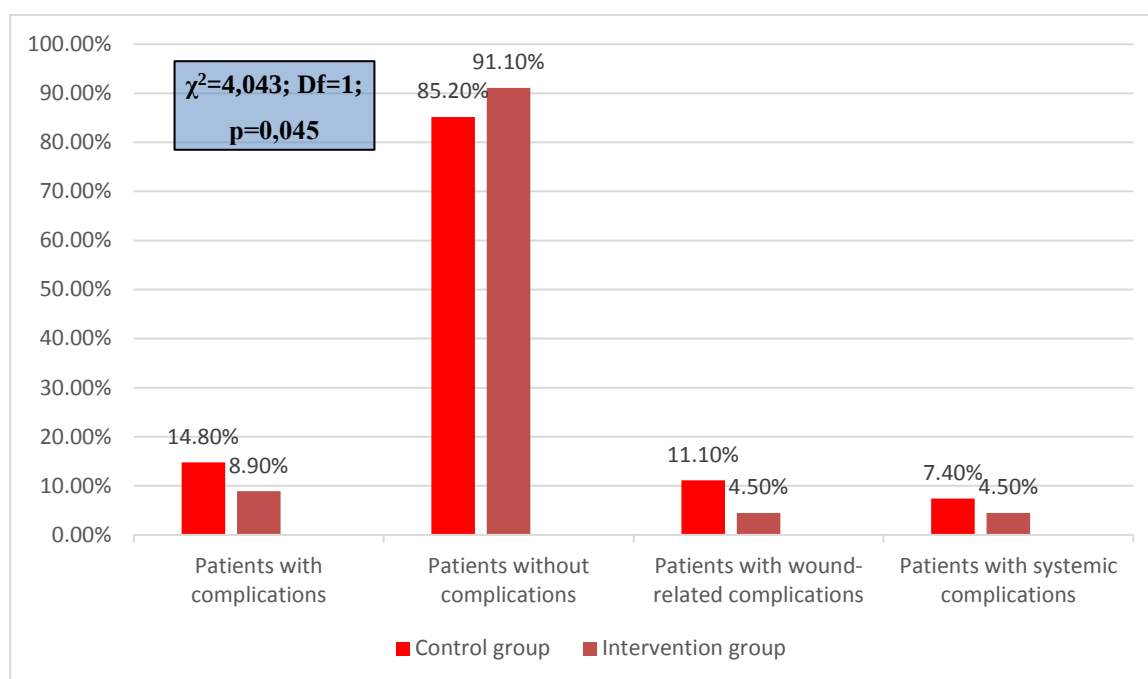


Fig. 2. Distribution of patients by the frequency of complications following hernioplasty.

Long-Term Outcomes

Long-term outcomes were analyzed in 98 out of 121 operated patients with obesity (76.8%) who underwent surgical treatment for ventral hernias. To assess these outcomes, patients underwent comprehensive follow-up, including detailed questionnaires, as well as outpatient and inpatient examinations. The follow-up period ranged from 1 to 5 years.

Overall, the improved method for the prevention and treatment of ventral hernias in patients with obesity — based on the pre-placement of P-shaped sutures along the edge of the hernia defect — resulted in no recorded cases of hernia recurrence during the follow-up period.

DISCUSSION

One of the key advantages of the proposed hernioplasty technique lies in the minimization of tissue trauma through careful dissection and precise placement of P-shaped (U-shaped) sutures along the edges of the hernia defect. This significantly reduces the risk of injury to adjacent anatomical structures, including intestinal loops, and consequently lowers the incidence of intraoperative and postoperative complications.

High reliability of mesh fixation is achieved by securing the prosthesis firmly along the defect margins, followed by additional fixation to the aponeurosis. This ensures stable positioning of the mesh and substantially reduces the likelihood of hernia recurrence.

Furthermore, the technique contributes to a lower risk of infectious complications by eliminating the need for

tissue tension during aponeurosis closure, thereby minimizing potential sites for microbial contamination. The tension-free nature of the repair allows for physiological restoration of the anatomical structures without exerting excessive pressure on surrounding tissues. This not only decreases the risk of postoperative defects but also helps reduce the intensity of postoperative pain during the early recovery period.

In addition, the firm fixation of the mesh at an appropriate distance from the hernia defect margins provides enhanced long-term stability and reduces the risk of recurrence over time.

Collectively, these factors lead to a significant reduction in the duration of postoperative rehabilitation, accelerated wound healing, and shorter hospital stays — all of which contribute to faster recovery of functional capacity and earlier return to normal daily activities.

CONCLUSIONS

The conducted study confirms the high efficacy of the developed tension-free hernia alloplasty method in patients with ventral hernias against the background of obesity. The use of P-shaped sutures for fixation of the hernia defect edges combined with onlay implantation of the endoprosthesis significantly reduced the incidence of postoperative complications. In the main group, complications occurred in 8.9% of patients, compared to 14.8% in the comparison group ($p = 0.045$), indicating a statistically significant advantage of the new technique in terms of safety and risk minimization of adverse outcomes.

Moreover, the improved technique allowed for a substantial reduction in the risk of ventral hernia recurrence. No recurrences were observed in the main group, confirming the high reliability of endoprosthesis fixation and adequate restoration of the anatomical integrity of the anterior abdominal wall. In contrast, recurrences were noted in the comparison group, indicating insufficient stability of the traditional hernioplasty method. This advantage is especially crucial for patients with obesity, who have an increased risk of hernia recurrence due to both tissue characteristics and associated comorbidities.

Overall, the proposed tension-free hernia alloplasty method not only reduces postoperative tissue trauma and infectious complications but also accelerates rehabilitation processes. Shortened hospital stays and reduced pain contribute to a faster return of patients to an active lifestyle. Thus, the implementation of this technique in clinical practice can significantly improve surgical outcomes for ventral hernia repair in obese patients, enhancing quality of life and reducing healthcare costs related to treatment and rehabilitation.

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