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Improving Prosthetic Hernioplasty Techniques in The Surgical Management of Anterior Abdominal Wall Hernias

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ABSTRACT

This article presents the findings of a comparative clinical study evaluating the efficacy of different prosthetic hernioplasty techniques for anterior abdominal wall hernias. A total of 114 patients were enrolled and allocated to two cohorts: the first underwent the conventional onlay technique, while the second received an enhanced sublay repair with retromuscular mesh placement. The results demonstrate that sublay hernioplasty is associated with a significantly lower incidence of postoperative complications (seroma, surgical-site infection), a shorter length of hospital stay, and a trend toward reduced hernia recurrence. The proposed technique can therefore be recommended as an effective alternative to traditional onlay hernioplasty

Keyword: *anterior abdominal wall hernia; hernioplasty; mesh implant; onlay; sublay; postoperative complications*.

1. INTRODUCTION:

Background. Anterior abdominal wall hernias are among the most common conditions encountered in general surgery. Epidemiological data indicate that external (ventral) abdominal hernias occur in approximately 2–5 % of women and 6–7 % of men. Each year up to 1.5 million hernioplasty procedures are performed worldwide—about 20 % of all abdominal operations. The high prevalence of this pathology and its marked impact on patients' quality of life make the search for optimal surgical techniques highly relevant.

Historically, primary suture repair without mesh (so-called tension hernioplasty) was associated with an unacceptably high recurrence rate—up to 60–63 % according to the literature. The introduction of synthetic mesh implants revolutionised herniology: prosthetic (tension-free) repair has reduced recurrences to 1–24 % within a three-year follow-up and is now regarded as the gold standard for treating anterior abdominal wall defects.

Nevertheless, even with mesh reinforcement several problems remain unresolved: postoperative complications (seroma, wound infection, chronic mesh infection), persistent pain at the implant site, and late recurrences. Reported wound-related complication rates in alloplastic repair reach 10–20 %. Mesh infection can necessitate explantation—in 68 % of infected cases when the prosthesis has been placed in an onlay (suprafascial) position—leading to poor functional outcomes and a high risk of re-herniation.

Technique selection also remains controversial. The principal mesh positions are: Onlay – over the anterior aponeurosis (suprafascial); Sublay – retromuscular or pre-peritoneal; Inlay – bridging the defect inside the aperture; Underlay/IPOM – intraperitoneal, on the peritoneum.

Each option has strengths and drawbacks. Onlay repair is technically straightforward but requires wide skin-subcutaneous dissection, increasing the risk of seroma and infection. Sublay techniques (e.g., Rives–Stoppa) are considered the open "gold standard", offering robust mesh fixation between muscular layers, but demand more extensive dissection and longer operating time. Pure inlay repair is now seldom used because of extreme recurrence rates (up to 85.7 %). Underlay placement is popular in laparoscopic surgery, yet direct mesh–viscera contact mandates costly composite meshes with anti-adhesive barriers.

Minimally invasive hernia surgery has advanced rapidly—laparoscopic repairs (IPOM, eTEP, etc.) reduce surgical trauma and wound complications. However, in large or complex hernias (multiple recurrences, wide defects, dense postoperative scars) laparoscopy may be infeasible, and refinements of open prosthetic techniques remain essential.

Optimising mesh hernioplasty therefore aims to lower postoperative morbidity and recurrences while preserving or enhancing abdominal-wall strength. The present clinical study compares outcomes of a standard versus an improved prosthetic repair in patients with anterior abdominal wall hernias.

Objective. To improve the efficacy of surgical treatment for anterior abdominal wall hernias by developing and implementing an enhanced mesh hernioplasty technique and comparing its results with the conventional approach. The authors hypothesised that the new method would reduce postoperative complications and recurrences without increasing operative trauma.

2. MATERIALS AND METHODS

The study was conducted in the Abdominal Surgery Clinic in accordance with the Declaration of Helsinki. Between 2019 and 2024, 114 patients with anterior abdominal wall hernias (postoperative ventral hernias, primary linea-alba hernias, and medium-sized umbilical hernias) were enrolled. Inclusion criteria were a ventral hernia 5–15 cm in diameter (EHS types II–III), absence of active infection at the hernia site, and informed consent. Exclusion criteria were giant defects (> 15 cm), uncontrolled severe comorbidities, and strangulated hernias requiring emergency surgery.

Patients were prospectively allocated into two groups: Comparison group (n = 55) – conventional open onlay mesh repair. Study group (n = 59) – improved sublay mesh repair

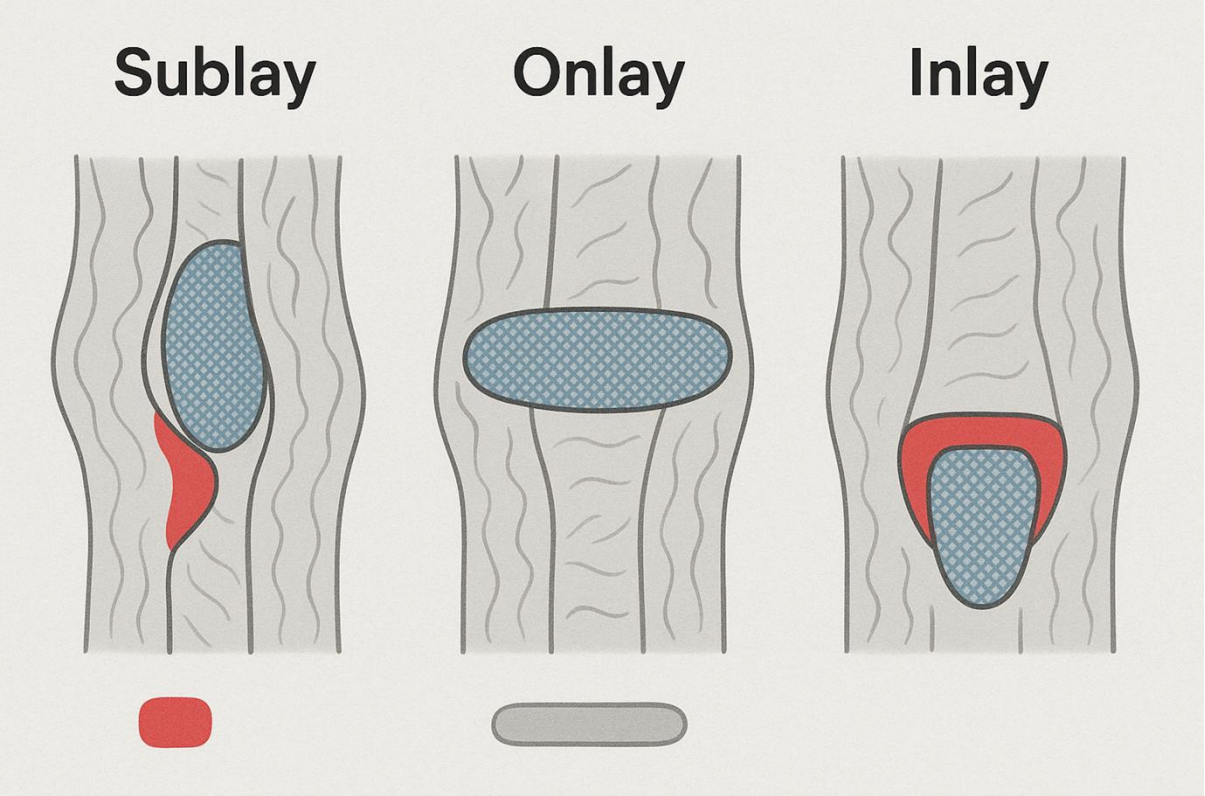

Figure 1. Schematic representation of mesh placement in the

principal open hernioplasty techniques.

Left: Sublay — retro-rectus (pre-peritoneal) positioning of the mesh (hernia defect shown in red, aponeurosis in grey). Centre: Onlay — suprafascial mesh laid over the anterior aponeurosis. Right: Inlay — "bridging" of the defect without re-approximating aponeurotic edges. The improved technique evaluated in this study belongs to the sublay type, whereas the standard approach corresponds to onlay repair.

Allocation was chronological: the first 55 consecutive patients underwent the standard method; the subsequent 59 received the modified technique. Groups were comparable for sex, age, and hernia characteristics (mean defect diameter 8.4 ± 2.1 cm

vs 8.7 ± 2.3 cm; $p > 0.05$).

Standard onlay technique. After open dissection and excision of the hernia sac, the aponeurotic edges were approximated and a medium-weight monofilament polypropylene mesh (e.g., Prolene®) was placed over the aponeurosis and circumferentially sutured. Drains were used as indicated. Subcutaneous tissue was closed in layers and the skin with interrupted sutures.

Improved sublay technique. Following sac dissection, content reduction, and anatomical restoration of the linea alba, a retromuscular space was created (Rives–Stoppa principle) by mobilising the rectus muscles from the posterior sheath. In cases of significant diastasis, limited medial myofascial release (component separation) was added. A large-pore polypropylene mesh (e.g., Parietene®) was placed in the retromuscular plane with at least a 5 cm overlap onto healthy tissue. Fixation was achieved with interrupted sutures or by the "sandwich" effect of the surrounding muscles without additional sutures, relying on intra-abdominal pressure. The anterior rectus sheath was closed with a continuous suture. The subcutaneous layer was drained under vacuum for 1–2 days, and the skin was closed intradermally (fig.1).

Operative Technique and Post-operative Management. All procedures in both groups were performed by the same surgical team, proficient in both techniques, under general endotracheal anaesthesia. Standard prophylactic antibiotic therapy was administered—single-dose second- or third-generation cephalosporins given immediately before skin incision. Post-operative care included on-demand analgesia, early mobilisation starting on post-operative day 1, and ultrasound examination of the mesh site on days 5–7 to detect seroma. Skin sutures were removed on days 10–12. At discharge, patients received elastic abdominal binders to be worn for one month and were advised to avoid heavy physical exertion for three months (fig.2).

Outcome Measures. The following variables were evaluated: operating time (minutes), intra-operative blood loss (mL), early post-operative complications (wound infection, seroma, haematoma), length of post-operative hospital stay (days), and hernia recurrence rate during follow-up. Recurrence was assessed clinically and by ultrasound at 3, 6 and 12 months after surgery. Statistical analysis was performed using the χ^2 test for categorical data and Student's t-test for continuous variables; a p-value < 0.05 was considered statistically significant.

3. RESULTS

In the comparison group (standard onlay repair) the mean operating time was 62 ± 11 minutes, whereas in the study group (refined sublay repair) it was 78 ± 13 minutes—a statistically significant difference ($p < 0.01$). The longer duration in the sublay cohort reflects the more demanding creation of the retro-rectus space and multilayer mesh coverage. Importantly, the additional 15–20 minutes remained clinically acceptable given appropriate anaesthetic management.

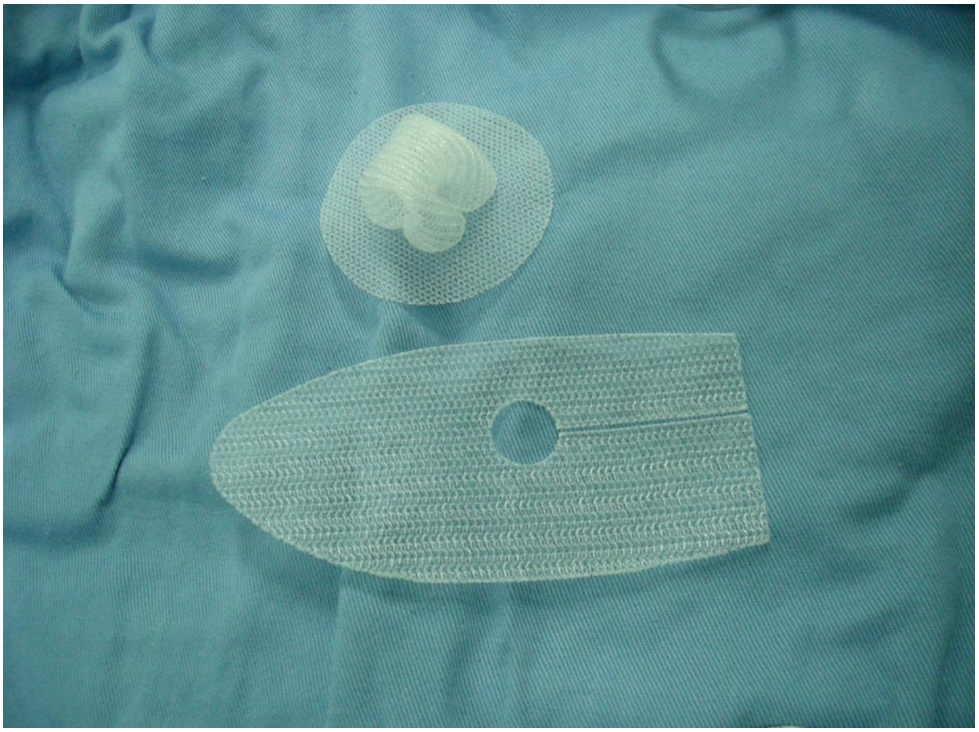

Figure 2. Examples of modern mesh endoprostheses

used in hernioplasty.

Top: Three-component composite "plug-and-patch" implant for inguinal hernia repair. Bottom: Flat monofilament polypropylene mesh routinely employed for ventral hernias. Both cohorts in the present study received flat monofilament polypropylene meshes of comparable configuration.

Intra-operative blood loss showed no meaningful between-group difference, ranging from 50 to 150 mL (median ≈ 100 mL; $p > 0.05$). Thus, the extra dissection required for retromuscular placement did not translate into clinically significant haemorrhage compared with the conventional technique.

Marked disparities emerged in postoperative morbidity. In the onlay group, seroma developed in 11 patients (20 %), whereas only 3 patients (5 %) in the sublay group experienced seroma formation ($p < 0.05$) (fig.3). Surgical-site infection (mesh-related wound infection) occurred in 8 patients (14.5 %) in the comparison cohort versus 2 patients (3.4 %) in the study cohort—a statistically significant reduction ($p < 0.05$). All infections arose in individuals with class II–III obesity and were managed by wound opening, drainage, and antibiotics; explantation of the mesh was unnecessary in every case.

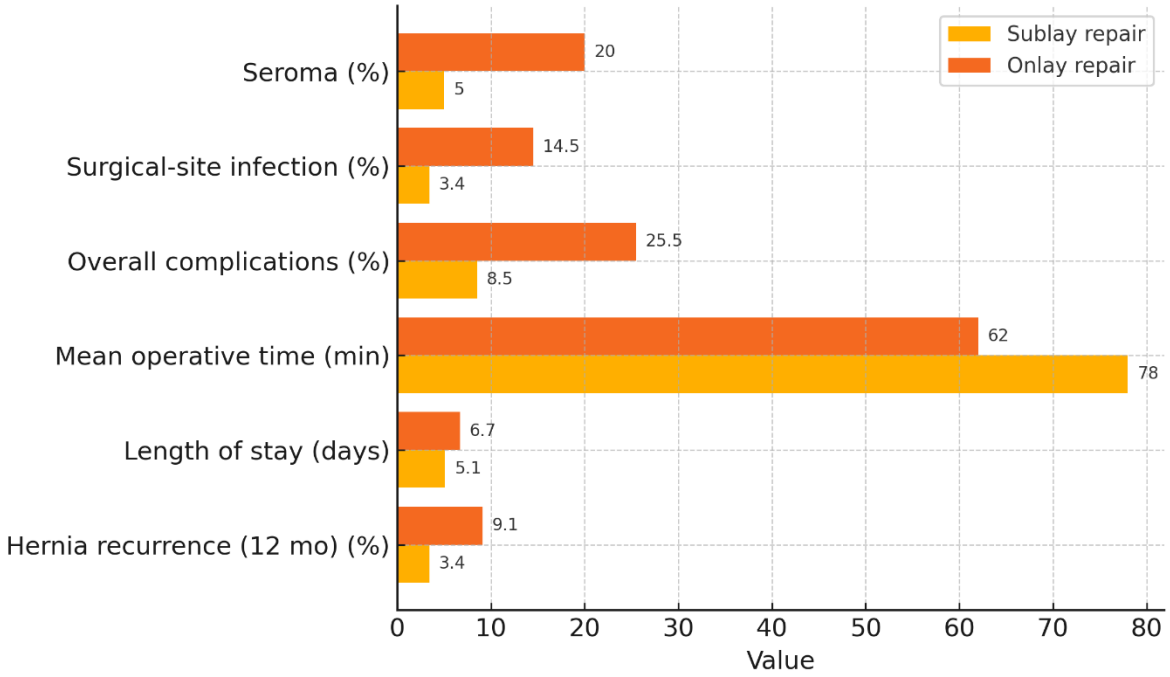

Figure 3. Incidence of early postoperative complications

in the two groups.

Sublay repair was associated with markedly fewer events (seroma 5 %, infection 3 %) compared with onlay repair (seroma 20 %, infection 15 %).

Consequently, the aggregate rate of early postoperative complications (seroma and/or infection) was 25.5 % in the onlay group compared with 8.5 % in the sublay group, underscoring a markedly more favourable early postoperative course with the enhanced retromuscular technique.

4. DISCUSSION

The differences reported above were statistically significant ($p < 0.05$). Mean postoperative hospitalisation was 6.7 ± 1.5 days in the comparison group versus 5.1 ± 1.2 days in the study group ($p < 0.05$). Every sublay patient was discharged by day 6, whereas 10 onlay patients (18 %) remained > 7 days because of complication management (seroma drainage, wound-infection therapy, etc.).

During 12-month follow-up, hernia recurrence occurred in 5/55 comparison patients (9.1 %) and in 2/59 study patients (3.4 %). Although the difference (9.1 % vs 3.4 %) did not reach statistical significance ($p = 0.18$), it shows a clinically relevant downward trend (Table 1). Both recurrences in the sublay cohort involved large (> 12 cm) postoperative hernias in obese patients and were detected at month 12; re-repair with component separation and a larger mesh achieved durable closure. In the onlay cohort three recurrences arose within six months (typically at the cranial or caudal mesh edge) and two

between six and twelve months.

Our findings align with published reports. Raghuver et al., for example, recorded wound infection in only 4.35 % of sublay repairs versus 19.2 % with onlay, and seroma in 6.5 % versus 21.3 %, respectively—values comparable to ours. Retromuscular placement minimises dead space, benefits from superior perfusion, and promotes rapid mesh integration, all of which curb seroma and infection. Suprafascial meshes lie beneath a broad skin-fat flap, encouraging exudate accumulation and enjoying poorer vascularity, hence higher contamination risk.

Table 1. Twelve-month hernia-recurrence rates in the two groups.

Parameter	**Onlay (n = 55)**	**Sublay (n=59)**	**p-value**
Operating time, min (mean ± SD)	62 ± 11	78 ± 13	< 0,01
Intra-operative blood loss, mL (median)	95 ± 30	100 ± 35	< 0,05
Seroma, n (%)	20% (11/55)	5% (3/59)	< 0,05
Wound infection, n (%)	14,5% (8/55)	3,4% (2/59)	< 0,05
Early complications (seroma ± infection), n (%)	25,5%	8,5%	< 0,05
Hospital stay, days (mean ± SD)	6,7 ± 1,5	5,1 ± 1,2	< 0,05
Recurrence ≤ 12 months, n (%)	9,1% (5/55)	3,4% (2/59)	0,18

With respect to recurrence, the biomechanical superiority of retromuscular repair is well documented: intra-abdominal pressure presses the mesh uniformly against the aponeurosis, and the restored linea alba bears load over its full surface. By contrast, onlay fixation depends solely on perimeter sutures; raised abdominal pressure (coughing, constipation, heavy lifting) can cause suture pull-through and mesh detachment, especially when overlap is inadequate. In our series every onlay recurrence originated at a mesh edge, whereas sublay failures reflected systemic connective-tissue weakness rather than fixation loss.

Sublay repair yielded a smoother midline scar without palpable mesh edges; 92 % of study patients rated abdominal appearance as “good” compared with 75 % in the comparison group ($p < 0.05$).

The enhanced technique required no additional equipment or more expensive implants; the modestly longer operating time is offset by lower complication-management costs and earlier discharge.

The 3 % rate in the sublay group versus 9 % in the onlay group mirrors published trends, although statistical significance was not reached within the current sample size and follow-up duration.

Interpretation of Findings. The presented data show that the improved prosthetic hernioplasty (sublay) yields a statistically significant reduction in postoperative complications, shortens hospital stay, and—although not yet statistically confirmed—appears to lower the risk of hernia recurrence. Its sole drawback is a modest increase in operative time, which does not adversely affect outcomes when appropriate anaesthesia and surgical expertise are available. These results mirror the global trend in herniology: a shift from technically simpler but more traumatic operations toward technically demanding techniques that deliver superior clinical results. Reducing complications after hernioplasty directly improves patients’ quality of life and lowers healthcare expenditures for hernia care.

5. CONCLUSIONS

1. **Lower complication rate.** The refined sublay technique significantly decreases postoperative complications. Compared with traditional onlay repair, retromuscular mesh placement reduced the incidence of seroma from 20 % to 5 % and wound infection from 14.5 % to 3.4 % ($p < 0.05$).
2. **Shorter hospital stay.** Use of the sublay method shortened inpatient treatment: mean length of stay fell from approximately 6.7 days to 5.1 days ($p < 0.05$) owing to a smoother postoperative course and fewer complications requiring intervention.

Trend toward fewer recurrences. Sublay repair showed a lower 12-month recurrence rate (3.4 % vs 9.1 %). Although the difference did not reach statistical significance in the present sample ($p = 0.18$), the improved technique provides clinically more reliable reinforcement of the anterior abdominal wall. A larger cohort and longer follow-up are expected to confirm a significant reduction in recurrence

REFERENCES

[1] Bittner R., Montgomery M.A., Arregui M.E., et al. Update of guidelines on laparoscopic (TAPP) and endoscopic (TEP) treatment of inguinal hernia (International Endohernia Society) // Surgical Endoscopy. – 2015. – Vol. 29, №2. – P. 289–321.

[2] den Hartog F.P.J., Sneiders D., Darwish E.F. et al. Favorable outcomes after retro-rectus (Rives-Stoppa) mesh repair for non-complex ventral hernia: a systematic review and meta-analysis // Annals of Surgery. 2022; 276(1): 55-65. DOI: 10.1097/SLA.0000000000005422

[3] Elhadidi A., Shetiwy M., Al-Katary M. Comparative analysis of laparoscopic, retro-muscular, and open mesh repair techniques for ventral and incisional hernias: a comprehensive review and meta-analysis // Updates in Surgery. 2025; 77(1): 217-229. DOI: 10.1007/s13304-024-02049-1

[4] Eriksen J.R., Rosenberg J., Bisgaard T. Surgical treatment for incisional hernia // Ugeskrift for Laeger. – 2010. – Vol. 172, №50. – P. 3457–3460.

[5] Hassan F., Gaurav K., Kumar K. et al. A comparative study of elective sublay versus onlay repair for non-complex incisional hernia: postoperative complications in a tertiary hospital in Ranchi, India // Cureus. 2024; 16(5): e59593. DOI: 10.7759/cureus.59593

[6] Henriksen N.A., Bisgaard T., Assaadzadeh S., et al. Randomized clinical trial on the long-term recurrence rates after incisional hernia repair with onlay versus sublay mesh position // British Journal of Surgery. – 2017. – Vol. 104, №5. – P. 519–528.

[7] Holihan J.L., Nguyen D.H., Nguyen M.T., et al. Mesh location in open ventral hernia repair: a systematic review and network meta-analysis // World Journal of Surgery. – 2016. – Vol. 40, №1. – P. 89–99.

[8] Muysoms F.E., Antoniou S.A., Bury K., et al. European Hernia Society guidelines on the closure of abdominal wall incisions // Hernia. – 2015. – Vol. 19, Suppl. 1. – P. S1–S24.

[9] Omarov N., Uymaz D.S., Kaya M. et al. Outcomes of component separation technique versus no component separation in large ventral hernia repair: a multicenter retrospective cohort study // Annals of Surgical Treatment and Research. 2024; 107(3): 178-185. DOI: 10.4174/astr.2024.107.3.178

[10] Sanders D.L., Pawlak M.M., Simons M.P. et al. Midline incisional hernia guidelines: the European Hernia Society // British Journal of Surgery. 2023; 110(2): 123-166. DOI: 10.1093/bjs/znad284

[11] Simons M.P., Aufenacker T., Bay-Nielsen M., et al. European Hernia Society guidelines on the treatment of inguinal hernia in adult patients // Hernia. – 2009. – Vol. 13, №4. – P. 343–403.

[12] Wang M., Chen W., Chu X. Totally extraperitoneal sublay vs intraperitoneal onlay mesh for small-to-medium ventral hernia: quality-of-life analysis // Scientific Reports. 2025; 15: 3179

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