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ORIGINAL ARTICLE

Double mesh repair in management of abdominal wall reconstruction for rectus diastasis and or ventral hernia repairs

Ahmed Salah Arafa [1*], ***Gamal Osman*** [1], ***Hassan Awad Saad*** [1]
General surgery department, Faculty of medicine, Zagazig university, Zagazig, Egypt.

Corresponding author: Ahmed Salah Arafa *
E-mail: ahmedarafaa237@gmail.com

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ABSTRACT

Background: For severe cases of rectus diastasis with or without ventral hernia, standard rectus plication methods may not be appropriate. Sublay mesh and onlay mesh may provide good outcomes for the correction of severe rectus diastases, especially if they are coupled with ventral hernia, according to our research. We discovered a significant rate of unaccepted recurrence. To lower the number of recurrences in the component separation technique, we strive to apply double mesh repair to reinforce the defect and so avoid or reduce the recurrence rate. **Patients and methods:** Thirty-two patients underwent abdominal wall restoration with polypropylene mesh in a row. A technique for using mesh in a sublay manner deep to the rectus muscles above the posterior sheath without anterior dissection of the rectus abdominus from the anterior sheath to avoid damage to the blood supply and damage to the umbilical perforators during that dissection while onlay mesh is used on the anterior rectus sheath. After using the double mesh approach, problems and follow-up data were discovered. **Results:** We had 32 patients underwent abdominal repair, either for a ventral hernia or rectus diastasis repair with mesh, from May 2019 to January 2021. Only three patients exhibited isolated rectus diastasis. The patients were 55 years old on average, with ages ranging from 35 to 75. Females made up 92 percent of the patients. The patients' average body mass index was 35 kg/m2 (range: 31 to 42 kg/m2). We did not have any surgical-site infections, but we did have three surgical-site occurrences as seromas, which were treated in the outpatient clinic with simple drainage. None of the patients had a recurrence of any bulge or hernia after an average of one year of follow-up. **Conclusion:** This study used a double mish reinforcement approach to reduce the rate of recurrence and occurrences. As a result, augmentation using polypropylene on-lay mesh and sublay combined resulted in reduced recurrence rates than using each approach separately.

Keywords: Sublay mesh , onlay mesh , rectus diastasis and ventral hernia .

INTRODUCTION

Abdominal wall defects produced by laparotomies, chronic increases in intra-abdominal pressure trauma, causing ventral hernia or rectus divergence are a common and difficult problem **[1].** Patients with diastasis or divergence of the rectus abdominus muscles (DRAM) have essentially identical complaints to those with ventral hernias, such as cosmetic impairment and back pain, despite the fact that DRAM is rarely worsened by strangulation **[2].** Because of chronic elevated abdominal pressure with complex outcomes and problems, the total rate of evidence addressing DRAM treatment has increased in recent years.

For patients with a big ventral hernia and significant rectus diastasis, no single procedure is likely to be sufficient. The lack of a clear classification scheme makes comparison analysis problematic in all papers **[3].** In the absence of contamination, there were less data for an ideal excellent prosthetic for high-risk individuals (obese, chronic obstructive lung disease, diabetics, and smokers).

For the correction of moderate to large hernias, we have used prosthetic mesh. We anticipated that if paired with abdominoplasty in the same treatment, prosthetic mesh would be more suitable for severe rectus diastasis in both men and women, as well as ventral hernias **[4].**

Without a standard generic definition, the rectus diastasis may be recognized **[5],** but the rectus diastasis is not considered a true hernia because it is caused by biomechanical changes in the abdominal wall's strength due to increased intra-abdominal pressure, which causes tissue expansion of the abdominal wall, particularly at the linea alba, making patients uncomfortable **[6].** Some factors (such as ageing, chronic obstructive pulmonary disease, ascites, genetic predisposition, and smoking) enhance the likelihood of rectus muscle separation and diastasis. Most women experience rectus muscle diastasis following many pregnancies, especially with large infants**[6].**

Female type rectus diastasis usually starts at the umbilicus and progresses up to the xiphoid and then down to the symphysis pubis (may take all levels). However, male pattern rectus diastasis **[7]** occurred more frequently in the supra-umbilical region, in the 5th. to 6th. decades of life **[8].**

Muscle fatigue and back discomfort are all linked to significant ventral hernias because of lateral displacement of the rectus muscle and increased abdominal wall. The scar tissue (rather than the linea alba) generated by a previous laparotomy incision that has moved away from the midline **[9]** is a major difference between rectus muscle diastasis defect and weakness in the linea alba. Another distinction is the increased likelihood of complications such as imprisonment and strangulation-related ventral hernias **[10].**

METHODS

Type of study: A prospective observational study.

Study setting and time:

This study was carried out in the General Surgery Department, faculty of medicine, Zagazig university from May 2019 to January 2021,The participants in this study were 32 individuals who had two or more meshes installed in their abdomen walls. Only rectus divarication or diastasis was present in three individuals. Abdominoplasty was paired with either rectus diastasis or a prosthetic ventral hernia repair with mesh in 16 individuals. Patient characteristics, operating aspects, and postoperative course, including surgical-site infections and surgical-site occurrences, were all examined. The last clinic visit or round is considered follow-up.

Study population:

Inclusion criteria: The inclusion criteria were patients 35 to 75 years old, having weakness in the rectus muscles, previous midline incision laparotomy, incisional hernia , primary ventral hernia with rectus diastasis. **Exclusion criteria:** The exclusion criteria were patients with poorly controlled DM, advanced age , anemia, cancer, cytotoxic drugs, malnutrition, jaundice, uremia, chronic cough and chronic obstructive pulmonary disease.

Preoperative evaluation and preparation :

Written informed consent was obtained from all participants, the study was approved by the research ethical committee of Faculty of Medicine, Zagazig University. The study was done according to The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Pelvi-abdominal ultrasound routine done preoperative for all patients.

Preoperative routine laboratory studies as complete blood count , coagulation profile, liver function tests,

kidney profile and blood sugar level were done for all patients.

The patients were given one shot of antimicrobial prophylaxis (1.0 g Ceftriaxone intravenously 30 min before surgery). Spinal anesthesia or less commonly general anesthesia was used according to the patient's preference or anesthetist's opinion. The surgical site was prepared using chlorhexidine solution.

Surgical Technique:

I- Divercation of recti

Nasogastric tubes only if necessary. Urinary catheters were inserted to monitor urine output. General anesthesia, patients mainly in flat position. Incision done and the Skin flap elevated to expose the linea alba at the anterior rectus sheath on both sides (bilaterally) **(Figure 1)**.

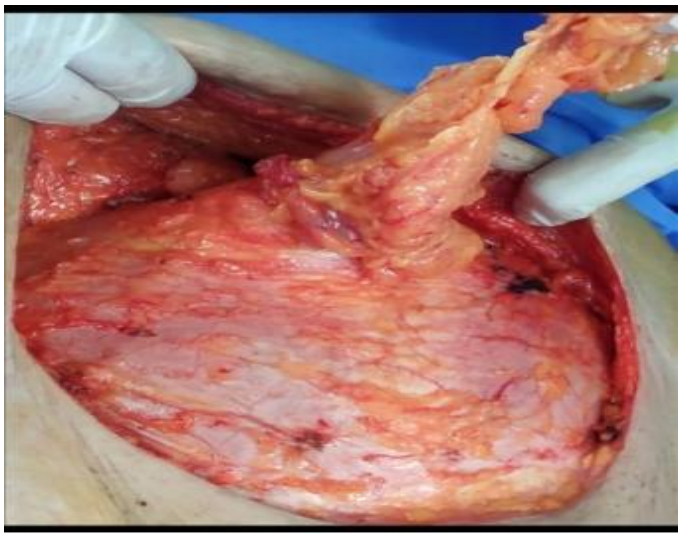

Figure 1: showing omental content of the hernia .

Division of the external oblique aponeurosis was performed about 2-3 cm lateral to the medial border of the rectus muscle sheath both sides (2-3 cm away from medline). Ellipse of midline skin removed then The retrorectus space is created by cutting the anterior rectus fascia 2-3 cm from the midline along the medial rectus muscle boundary **(Figure 2)**.

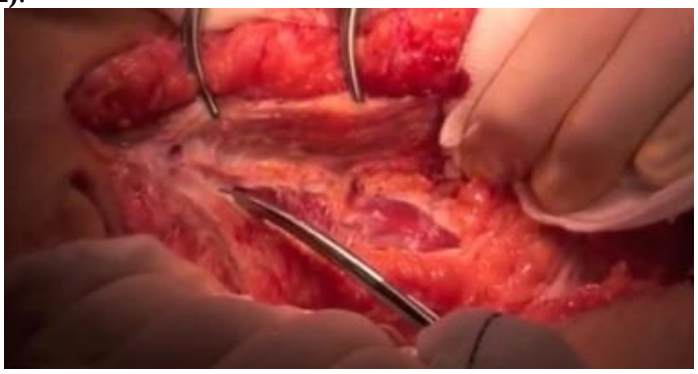

Figure 2: showing patient with rectus diastasis with incision of medial border of anterior rectus sheath.

With blunt dissection, the rectus muscle is separated from the underlying posterior rectus sheath, preventing vascular injury (like a pedicle transverse rectus abdominis myo-cutaneous flap) **(Figure 3 & 4)**.

Figure 3: showing contuing dissection and appearance of the rero-rectus space.

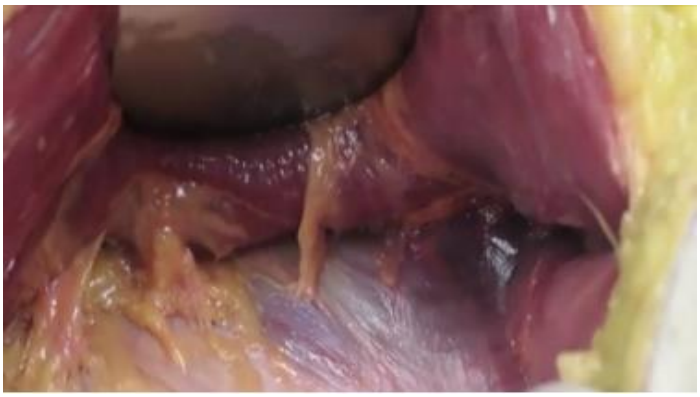

Figure 4: showing the rero-rectus space after the dissection.

The anterior rectus sheath, on the other hand, is left linked to the rectus muscle in order to preserve its vascularity and avoid dissection. The plane of dissection for the majority of patients extends from the xiphoid to the symphysis, especially in females because hernias are usually large. However, in some cases, particularly in men with isolated supra-umbilical rectus muscle diastasis, the rectus muscles were dissected to just below the umbilicus above the arcuate line. Polypropylen mesh was employed (**Figure 5).**

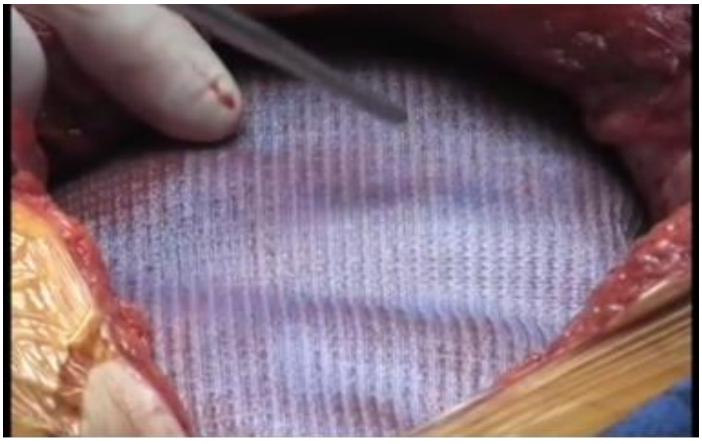

Figure 5: showing the mesh inserted in the rero-rectus space.

Up to 30-35 interrupted sub-rectus sheath 0 polypropylene sutures are used to secure the 7 cm transverse dimension (plication of the posterior rectus sheath is done in some situations). Each of these sutures is spaced around 3 cm apart. The rectus muscles and overlying anterior rectus fascia are then approximated in the midline with interrupted 0 polypropylene sutures (releasing incision of external oblique sheath 1-2 cm lateral to lateral

border of rectus sheath done if needed) to achieve a direct supported repair with polypropylene onlay mesh (**Figure 6)**, the most common size we used was 15 x 15cm.

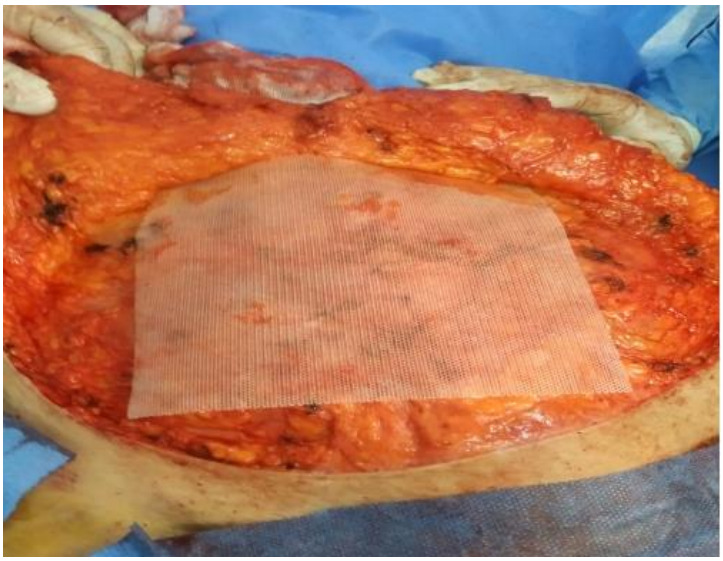

Figure 6: showing onlay mesh positioning.

II- **Ventral abdominal hernia** (**Figure 7)**.

The adhesions from the surrounding to the posterior face of the sac and the abdominal contents are taken down bluntly inside after the hernia sac content exposure and release. The retro-rectus space is entered bilaterally on both sides with the same previous stages by sublay mesh, which is followed by onlay mesh after anterior rectus fascia approximation.

Figure 7: showing female patient with divercation of recti with umblical hernia.

III- Skin incision and handling

In male pattern rectus diastasis correction, the most common incision was vertically midline from the xiphoid to the umbilicus. Female rectus diastasis correction, on the other hand, is more commonly accomplished using a horizontal abdominoplasty incision. To obtain good sublay above the posterior rectus sheath mesh fixation, approach the retr- rectus sapce through good blunt dissection on all sides. Suture placement and onlay mesh fixation above the anterior rectus sheath require a broad skin elevation above the anterior rectus sheath. A vertical or horizontal incision, or a vertical meeting horizontal incision (both) can be used for simultaneous ventral hernia repair with abdominoplasty (with vertical sub-umblical midline incision after horizontal abdominoplasty). Excess tissue was removed from the skin and subcutaneous tissue, which was subsequently closed with two closed suction drains, one subcutaneous above the onlay mesh and the other sub-rectus above the sublay mesh . In some

circumstances, a third subcutaneous suction may be required. At the time of skin closure leaving the cosmetic amount necessary for closure.

IV- Neoumbilicus creation

The umbilicus is circumferentially incised and then rebuilt. "Pumpkin teeth" flaps are constructed along the medial portion of the planned skin excision based on its blood supply from inside (Figure 8) , then tacked down to the abdominal wall to generate a new umbilicus. The umbilicus is repaired using 4 to 5 different stitches .

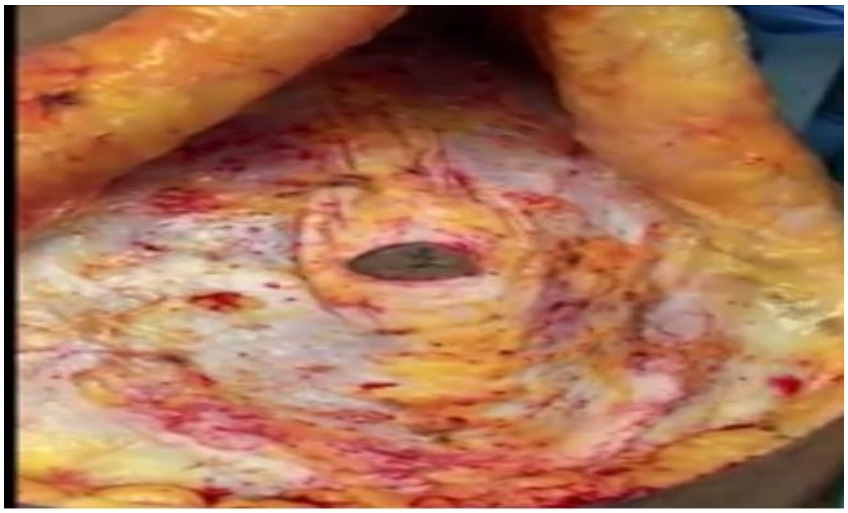

Figure 8: showing another case subcutanous dissection of the skin to expose the anterior rectus sheath for onlay mesh fixation with preservation of the umbilicus (neoumblicus).

Statistical Analysis

Normally distributed (quantitative) data were tested with the t-test and described by the mean and SD. For categorical (qualitative) data, number and percentage were reported and the differences between groups were assessed by the Pearson's $\chi 2$-test or by Fisher's exact test. Differences were considered statistically significant at a P value of less than 0.05. All the statistical calculations were done using the Statistical Package for the Social Sciences program Science for Windows Version 20.0 (SPSS Inc., Chicago, Illinois, USA).

RESULTS

We had a total of 32 patients at the Zagazig University surgical department from May 2019 to January 2021. The patients were 55 years old on average, with a range of 35 to 75 years old. There were 29 females and three males among the patients. The patients' average body mass index was 35 kg/m2 (range: 31 to 42 kg/m2). With 16 of patients undergoing cosmetic abdominal repair, either for a ventral hernia repair or rectus diastasis by mesh fixation repair. Without ventral hernia, three individuals developed (isolated) rectus diastasis. The patients were 55 years old on average, with a range of 35 to 75 years old. Females made up 92 percent of the patients. The patients' average body mass index was 32 kg/m2 (range: 25 to 40 kg/m2). Diabetes (n = 11) and hypertension (n = 6) were the most prevalent co-morbid diseases, followed by smoking (n = 1) and. The average distance between the rectus complexes measured was 6.5 cm (range, 3.5 to 9.5 cm). The average time spent in the operation room from entering to departing with the dressings on was 162 minutes (range, 80 to 240 minutes). The more complicated ventral hernia repairs took longer to complete. Abdominal wall operations were paired with additional, bowel adhesion, or resection in the three patients who had operational times > 210 minutes. The patient was observed at the hospital late at night. The pain was well-managed. After two weeks, the drains over the sublay mesh, those in the subcutaneous plane, and those in the onlay position were all removed. The subcutaneous layer is routinely removed within one week, and the patient recovered quickly. At 15 months, there was no evidence of a hernia recurrence.

Early follow up

Surgical-site occurrences for abdominal wall surgery as an infection, a seroma, a wound dehiscence, or the development of an entero-cutaneous fistula following the ventral hernia group

during the first 30 days of follow-up. Also, three patients suffered surgical-site complication that necessitated another drainage under local anaesthesia and re-draining for six days. One patient's lower skin flap showed partial localized skin gangrene, which was managed with local wound debridement. One patient was readmitted to the hospital three days after being discharged for a peptic ulcer attack with mild bleeding thought to be related to the use of nonsteroidal anti-inflammatory analgesic drugs (no transfusion required), and another patient was diagnosed by duplex as having deep venous thrombosis and treated with heparin infusion for ten days. All of the other patients had a smooth postoperative recovery.

Late follow up

Eighteen patients were followed up for 8 months through regular visits in the outpatient clinic. There was no recurrence, bulging, infection, wound dehiscence or any problem related to both meshes and 14 patients were followed-up, for more than one year. there was no recurrence, bulge or abdominal wall complications need reoperation. 4 patients needed liposuction for refining of the abdominal contour or skin.

DISCUSSION

Although there is general agreement that hernias should be repaired using mesh rather than basic suturing procedures, there is less agreement on how to correct severe cases of rectus diastasis. Mesh overlay had previously been used to stabilize the midline following plication in individuals with severe diastasis. A posterior rectus sheath plication with rectus muscle advancement and mesh fixation has been advised by certain surgeons**. [11]**

A laparoscopic mesh-reinforced approach with rectus diastasis but without ventral hernia or defect" has been approved by general surgeons **[12].** Others, on the other hand, do not believe that such repair is contraindicated, particularly in the case of massive fatty abdomens or abnormalities. **[13]**

Both hernias and rectus diastases require cosmetic decisions and procedures for reconstruction. It has been proven that mesh repair of ventral hernias is more accepted and permanent than suture plication repair alone, however many surgeons traditionally avoided prosthetic mesh because of the danger of infection that necessitated mesh removal. High rates of surgical-site complications are detrimental to the cosmetic outcome. The author suggests that plication with a long lifespan and a reinforced, non-tight mesh repair may be more appropriate for satisfactory results with no or minimal recurrence**. [14]**

Hickey et al**.[15]** found high variable evidence for recurrence following simple plication without mesh in a systematic literature review. This ranged from 0% after follow-up of 12 women in a research by Nahas et al. at an average of 81 months after plication alone on CT evaluation17 to 40% in sixty-three women at an average of 64 months on US evaluation by van Uchelen et al. **[16]**

The simple plication frequently fails because the running, interrupted sutures, when placed under tension, might cut through the anterior rectus fascia, resulting to hernia recurrence and weakness of stretched rectus diastasis treatments. However, the best aesthetic abdominoplasty treatment is undoubtedly the one that uses a mesh that is held in place by a number of sutures inserted in three vertically oriented lines to produce the highest tension distributed support without cutting through (different plane). As a result of the increased number of sutures, the total tension of the repair is reduced, and the force of each stitch is dispersed across multiple planes, preventing pull-through and tension. **[6]** Montgomery's review backs up our belief that placing mesh in the retro-muscular sublay position is the safest, most effective, and longest-lasting option. **[7]** Iqbal et al. published long-term results for the modified Rives-Stoppa approach, which had only a 3% prosthesis infection rate with ventral hernias. **[17]** Rives-Stoppa hernia repair through using large meshes, and the area of retro-rectus space position from psoas muscle (on one side) to psoas muscle (on the other side) had perfect positioning and long-lasting outcomes. The meshes are usually held in place by a series of anchoring sutures positioned 1-2cm distant from the midline **. [18]**

To achieve a permanent repair without pull through or pain, our approach uses a fine mesh 7-8 cm wide with a narrow suture line distributed in multiple planes. Three lines of vertical plication of rectus diastasis are supported by the mesh that overlays the mesh. They monitored 18 women for at least 8 months and found no signs of dehiscence, infection, rejection, or extrusion with either mesh. They recommended using a different mesh overlay position in patients with severe muscle weakness because it provided good and long-lasting healing.

The use of a pre-peritoneal (intra-abdominal approach) mesh and another onlay mesh for the

closure of big incisional hernias sandwich resulted in long-term results. Primary hernia repair with biologic materials is still being studied in the case of infected or even contaminated fields, but the Ventral Hernia Working Group's evidence-based recommendations continue to emphasize the growing role of absorbable meshes in the reconstruction of a wide variety of abdominal wall defects**. [4]**

Pauli et al. reported on their experience with three alternative polypropylene mesh strip position patterns (overlay, sublay, and inlay prei-peritoneal) for abdominal wall strengthening in 20 women with rectus diastasis with or without midline ventral hernias. **[19]** There were no recurrences or infectious site problems in any of the patients after an average of 36 months of follow-up.

Horndeski and Gonzalez present a midline hernia repair that involves a horizontal abdominoplasty incision for access**. [10]** They then cover the anterior abdominal wall with a thick overlay mesh to minimise midline force shearing and to prevent recurrence of "biomechanical failure causes." There were no recurrences, bulges, or infections in any of their 14 patients. All of the prior research, including Marques et al., use a mesh overlay and sublay the placement of. The approach reported in this paper employs a mesh sublay, which preserves the natural muscular outline seen through the red ened skin flap. Furthermore, overlay mesh provided both durability and muscle strength.

The appearance of the abdominal wall following surgery is of the utmost importance, as it allows for both functional and cosmetic restoration as well as safe skin contouring. More than one mesh is required for this procedure to provide assurance in giving support to the abdomen wall. With the construction of a new umbilicus, the vertical abdominoplasty allows for a good and thin waistline appearance. The typical horizontal abdominoplasty incision is a good accessible approach for severe rectus diastasis and excellent postoperative shape in patients with severe rectus diastasis. Reinforcement of tension midline repair of incisional hernia with intraperitoneal (pre-peritoneal) mesh combined with onlay one mesh repair has no recurrence, according to a previous study by J. A. Martin-Cartes et al. **[4]** It's likely that the low recurrence rates in the prior trial were due to a solid mix of both material and surgical technique.

CONCLUSION

The disclosed double mesh repair is both safe and durable for patients with substantial rectus diastasis, with or without concomitant ventral hernias, without infection, recurrence, or considerable postoperative pain. Despite the fact that this procedure necessitates additional dissection and prosthetic mesh replacement in the retro-rectus plane (sublay position) and another onlay position, it can be successfully paired with regular horizontal or vertical approach or incision. For ventral hernia and severe rectus diastasis, the double mesh approach provided safety, durability, and cosmetic benefits. The employment of family combination in this surgery allows for a long-lasting approach and effective repair within operative periods that are suitable to most surgeons.

Conflict of interest: None.

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