Abdominoplasty and sutureless retrorectus prosthesis for medium-sized and large-sized ventral hernia: assessment of outcomes

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Aim
The primary objective of this prospective cohort study was to assess the outcomes of aesthetic abdominal wall reconstruction with repair of associated hernia utilizing a sutureless retromuscular technique.
Materials and methods
A single-center follow-up study of 67 consecutive patients with medium-sized ventral hernia and pendulous abdomen was conducted between January 2016 and May 2019. A detailed classification of degree of herniation, surgical complications, postoperative pain analysis, and patient satisfaction were analyzed.
Results
The study revealed that the overall hernia recurrence rate was quite low; only one (1.5%) patient had to undergo reoperation for recurrence. The postoperative infection rate was noted as 4.5%. Overall, 73% patients reported that they were extremely satisfied with the surgery.
Conclusion
Although there are many alternatives for repair of medium-sized to large-sized ventral hernia, we found retromuscular repair especially if associated with aesthetic abdominal wall reconstruction to be safe with fewer complications and good patient satisfaction.

Keywords:
abdominoplasty, retromuscular mesh, ventral hernias

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Introduction

Ventral hernias create considerable damages in the abdominal wall with little protection of the abdominal viscera which associated with different physical manifestations [1].

The main purpose of ventral hernia repair is to strengthen the structural integrity of the abdominal wall by repositioning the contents of the hernia sac and also to close the hernia defect [2]. At present, various techniques are available for repairing ventral hernia. However, there are discrepancies regarding the best repair technique [3], the type of material to be used for repair, as well as whether the repair should be reinforced and the probable outcome of the repair [4]. Moreover, repair of small ventral hernia is a common practice with low complication rates; early and late postoperative hernia recurrence and muscle laxity were somewhat high and can causes significant morbidity in large ventral hernia [5]. So, many authors agree with mandatory prosthetic repair, especially in medium-sized and large-sized hernias, for restoring the contour and function of the abdominal wall [6,7]. However, use of synthetic mesh is associated with several mesh-related complications, including infection, exposure, extrusion, enterocutaneous fistula formation, bowel injury, bowel adhesions, as well as chronic pain because of the feeling of firmness and foreign body reaction to the mesh, which all lead some surgeons for preferences of suture repair over mesh reinforcement [8–10].

Newer synthetic mesh models have been evolved over time with advanced manufacturing features [9], such as tensile strength, pore size, and infection resistance type [11,12]. The most favorable consequences of ventral hernia repair are the absence of pain and recurrence [4]. Besides, recurrence and pain, evaluation of patient satisfaction following hernia repair surgery is considered to be an important aspect to assess the surgical outcome.

In this study, we evaluated a newer technique for ventral hernia repair with sutureless prosthetic mesh

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implantation to assess the outcomes of the surgery in terms of complications, relapse, chronic pain, patient satisfaction with aesthetic approach, as well as the functional status of the patients in terms of the time lapsed till starting normal activities and the time needed to resume work.

Materials and methods

A prospective study of 67 patients with medium-sized and large-sized ventral hernias according to European Hernia Society classification undergoing a standardized abdominoplasty combined with a retromuscular prosthetic repair was conducted between January 2016 and May 2019 in Mansoura University Hospital and Suez Canal University Hospital. This study was approved by the Institutional Review Boards [13].

The inclusion criteria of the study were only the patients having ventral hernia with pendulous abdomen and hernia diameter equal or more than 2–10 cm. Patients with recurrent hernia, pendulous abdominal wall with rectus diastasis only, or approved abdominal wall infection, sinuses, or fistula were excluded from the study.

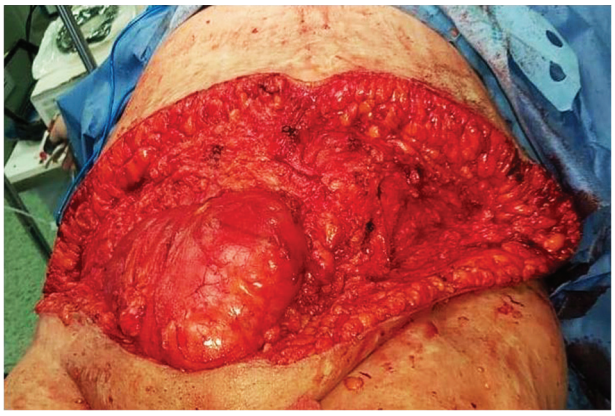
Patients' demographics, details of operative features, along with postoperative infections, such as surgical-site infection (SSI) and surgical-site occurrences were recorded. The definition of SSI was ascertained by the Centers for Disease Control and Prevention [14]. Surgical complications were classified as grades I–V according the Dindo–Clavien classification [15].

Operative technique

All patients were operated upon under general anesthesia and received perioperative prophylactic antibiotics, such as third-generation cephalosporin or vancomycin for a known or suspected allergy. A vertical or lower transverse incision was performed according to preoperative markings and direction of contour abnormalities. The hernia sac was dissected and excised, and the hernia contents were then allowed to reduce intra-abdominally with the bowel protected by clean towel and isolated (Fig. 1).

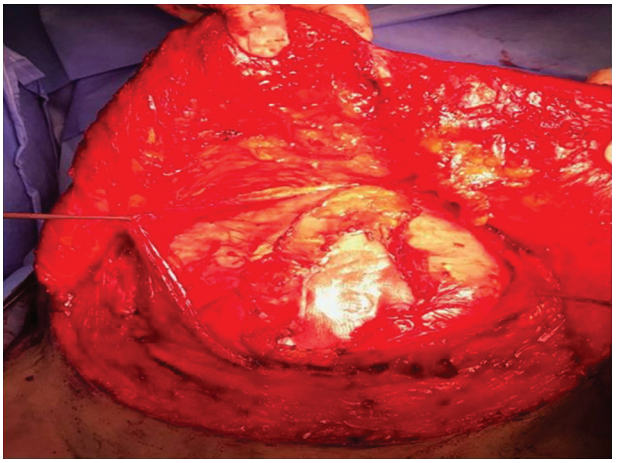
The retromuscular space was developed laterally through the incision of anterior rectus sheath (6–8 cm lateral space on each side of the midline) (Fig. 2), and for most patients, the plane of dissection continues from symphysis pubis to the xiphoid process. The peritoneum and posterior rectus sheath were closed in the midline with an absorbable running 0 Vicryl multifilament suture, recreating the appearance similar to the patients with rectus diastasis (Fig. 3). A unique lightweight, polypropylene monofilament mesh known as Adhesix BARD (Cousin Biotech 8, Wervicq-Sud, France) was

Figure 1



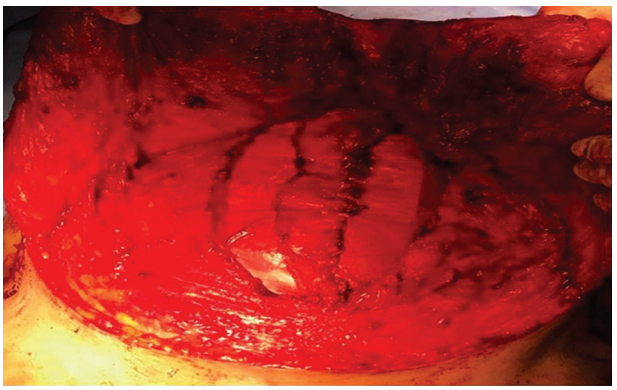
Large ventral hernia in a female patient.

Figure 2



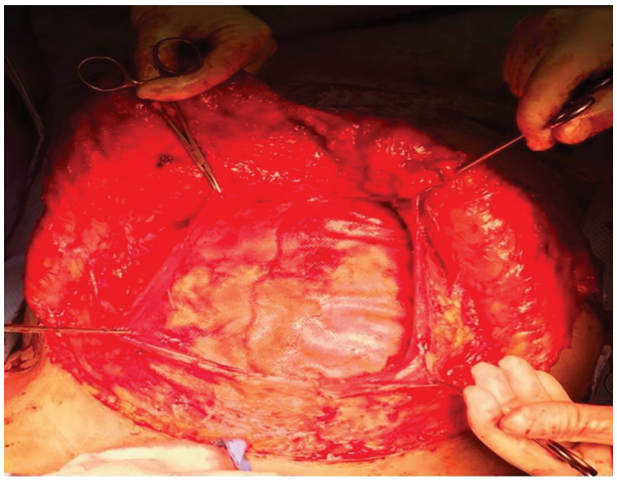
Creation of lateral retromuscular space with raised skin flaps to the mid portion of rectus sheath.

Figure 3



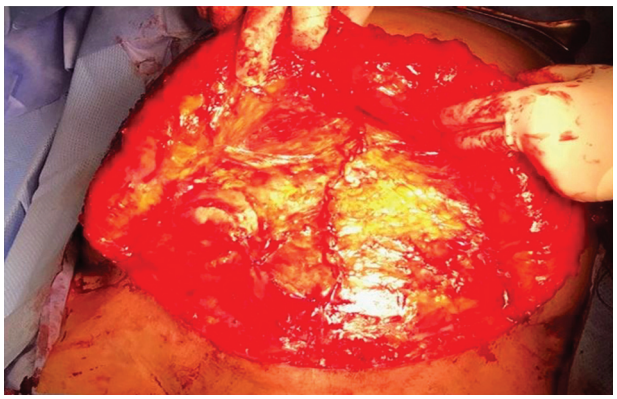
Closing of peritoneum and posterior rectus sheath.

Figure 4



Postion of the mesh in retrorectus space without any type of fixation.

Figure 5



Closure of anterior rectus sheath following mesh implantation.

placed in the retrorectus plane. The mesh was surrounded by self-adhering gel-coating of polyvinylpyrrolidone and polyethylene glycol, which help in proper implantation and positioning of mesh and also provide a flexible, long-term, tension-free hernia repair (Fig. 4). Adhesix mesh is available in different sizes. The length and width of the mesh was selected according to the defect size to be repaired, which was ~5 cm from the defect edge. The anterior rectus sheath was closed over the mesh with continuous 0 Prolene (polypropylene sutures) to obtain a direct supported repair (Fig. 5). The excess skin flap to be excised was estimated; transposition of the umbilicus was done in all patients.

Postoperative care

Suction drains were placed in the subcutaneous space through separate incisions, and the skin was estimated in subcuticular fashion. Standard postoperative care was conducted including early mobilization, resuming oral intake once intestinal sounds was heard. Third-generation cephalosporin was continued in early postoperative period for 5 days. Regular analgesia with paracetamol infusion in the first 2 days was initiated according to patient's pain score. Additional NSAID can be added according to patient's pain score.

Table 1 Patient demographics and hernia characteristics

Age (years)	47 (46±7.6)
Sex [*n* (%)]	
Male	25 (37.3)
Female	42 (62.7)
BMI (kg/l^2)	29.6±4.4
Associated risk factors [*n* (%)]	9 (13.4)
Diabetes mellitus [*n* (%)]	2 (2.9)
Chronic obstructive pulmonary diseases [*n* (%)]	
Smoking	5 (7.5)
Hypertension	8 (12)

Follow-up to study surgical outcomes and assess patient satisfaction

Regular follow-up in the outpatient's clinic for assessment and data registry was conducted. Routine clinical follow-up is described as postoperative clinic visit or telephone calls. Postsurgical pain scores were obtained at a later stage of follow-up (≥6 months from surgery) where the level of worst pain experienced was assessed on a 10-point Likert-type scale (1=least pain and 10=most pain). Overall patient satisfaction regarding surgery and the cosmetic results was also recorded using a 10-point Likert-type scale (1=least satisfied and 10=most satisfied). The functional status of patients was evaluated in two forms: first, time elapsed before starting normal activities (home usual activities and shopping) and second, the time required returning to work.

Results

A total of 67 consecutive (42 women, 25 men) patients were enrolled in the study with age ranging between 33 and 57 years (mean: 46±7.7 years), with an average BMI of 29.6±4.3452 kg/m^2. Patient demographics and hernia characteristics are presented in Table 1. Overall, 22.4% of the patients had diabetes mellitus, 13.4% had chronic obstructive pulmonary disease, 25.4% had hypertension. Moreover, 16.4% of the patients were smokers; all are in the male group. The type of abdominal incision (vertical and horizontal), along with time for surgery and length of hospital stay following surgery, is mentioned in Table 2. The mean length of hospital stay following surgery was 8 ±2.7 days, and the time taken for surgery was ~151 min

Table 2 Type of abdominoplasty, operation time, and period of hospital stay

Type of abdominal incision [*n* (%)]	
Vertical abdominoplasty	10 (14.9)
Horizontal abdominoplasty	57(85.1)
Operative time (min)	151 (149.5±32.8)
Hospital stay (days)	8 (8±2.7)
Follow-up period (months)	19 (18.7±7)

Table 3 Postoperative complications in terms of wound infection, chronic pain, and recurrence

Wound complication [*n* (%)]	
Surgical site infection	3 (4.5)
Superficial	0 (0)
Deep [*n* (%)]	
Flap necrosis	0 (0)
Total	2 (3)
Localize	4 (6)
Seroma [*n* (%)]	
General complications	1 (1.5)
Pulmonary embolus	1 (1.5)
Myocardial infarction	2 (3)
Pneumonia [*n* (%)]	
Chronic pain	3 (4.5)
Recurrence and reoperation for recurrence	1 (1.5)

(149.5±32.8). No postoperative mortality was reported. The description of postoperative complications, including infection rate, readmission owing to recurrence, and chronic pain is described in Table 3. Rate of postoperative infection was found in three (4.5%) patients; all of them were in the smoker group. No deep infection occurred in this case series, and therefore no need for mesh removal was required in our study. Two (3%) patients experienced pneumonia (two smoker male patients and one diabetic female patient on long history of insulin therapy), only one (1.5%) patient experienced myocardial infarction and was treated by thrombolytic therapy and ICU admission for two days, and one (1.5%) had pulmonary embolus. Three (4.5%) patients reported to have chronic pain. Clinical recurrence was detected at a later stage (minimum 6 months after surgery) by physical examination. Only one (1.5%) case of recurrence was reported, and the patient required surgical correction of his recurrence. Recurrence occurred in a female patient with two combined comorbidities (chronic obstructive pulmonary disease and diabetic on oral medicine) and was noticed at left lateral margin of repair. The rate of patient satisfaction and functional status following hernia surgery is presented in Table 4. Of 67 patients reporting the outcome, 49 (73%) patients stated that they were extremely satisfied, 16% reported they were satisfied, and only 10.5% reported that they were dissatisfied about the surgery. The patients' functional status, or in other words, the time required for the patients to start overall activities, was assessed in two forms, such as time required to return to normal activities at home and shopping and time required to return to work, and it was detected that the patients mostly started normal activities at home and started usual shopping around 16–20 days of surgery (with a mean of 16.3±3) and returned to work in about 27–32 days after surgery (with a mean of 26.6±5.2).

Table 4 Patient satisfaction and functional status

Patient satisfaction [*n* (%)]	
Excellent	49 (73.1)
satisfied	11 (16.4)
Dissatisfied	7 (10.5)
Time for return to normal activities	16 (16.3±3)
Time for return to work	27 (26.6±5.2)

Discussion

Large and complex ventral hernias remain a challenging problem for reconstructive surgeons. Besides, aesthetic deformity and physical symptoms due to hernia, the defects of the anterior abdominal wall lead to poor protection of internal organs and loss of domain. Thus, it is imperative to have aesthetically sensitive and enduring abdominal wall reconstructions for patients with large ventral hernias [11]. Usually hernia repair surgery has two objectives. The primary aim is preventive, such as inhibition of increasing size of hernia, and prevention of incarceration, strangulation, and obstruction. The second objective is the enhancement of patients' quality of life [16]. Nonetheless, remedy of hernia by open surgery resulted in significant pain along with other complications, including eventration, seroma formation, and poor cosmetic outcomes, leading to the reduction of patient's quality of life and functional status [16]. In case of surgical mesh repair of hernia, postoperative pain occurs mostly owing to mesh fixation materials, rather than the hernia itself [17]. Besides pain, recurrence is another limitation of hernia repair as it indicates failure of the repair and formation of new hernia at the surgical site [16]. The risk of recurrence increases with each additional surgery [4]. In fact, a study conducted by Luijendijk and colleagues reported about the recurrence of ventral hernia within 3 years of repairing with synthetic mesh in approximately one-fourth of the patients [4]. Hence, evaluation of surgical outcome through long-term patient follow-up is essential for ventral hernia repair. Previously,

outcomes were measured typically by recurrence and infection of wound, rather than patient's satisfaction. However, the patient-reported outcome is nowadays considered to be one of the vital measures for evaluating medical and surgical treatments [18]. Evaluation of patient satisfaction is a subjective assessment, which can be influenced by several factors including preoperative expectations, hospital care, surgical outcomes, and improvement of the quality of life [19]. Chronic pain and recurrence of hernia usually have a negative effect on patient satisfaction.

The current study demonstrated improved primary outcomes for the prosthetic mesh support with concomitant abdominoplasty to repair moderate to large ventral hernias. In fact, prosthetic mesh repair of ventral hernia is a popular and more robust technique compared with the suture repair alone. The study data indicated that following abdominoplasty and concomitant mesh implantation technique, postoperative complications were quite low, with reduced hernia recurrence rate (1.5%). Recurrences might occur owing to mesh-related infections, mesh overlap, or inadequate mesh fixation [11]. This finding is in accordance to the review by Montgomery, who stated that mesh placement in the retromuscular space is the safest position and results in most durable repair [11]. Furthermore, previous studies showed that use of self-adhering Adhesix mesh resulted in atraumatic repair of hernia with a reduction in operative time, decrease in postsurgical complications, patients' discomfort, and pain, and speeding the recovery rate, thus enhancing the quality of life [20]. The use of self-adhering Adhesix mesh in this study might account for reduced postoperative complications and speedy recovery. Generally open abdominoplasty results in deep SSI and seromas [16]. However, in this study, only four patients developed SSI; of them, three had superficial infection and only one patient developed mesh-related deep infection, and four patients developed seroma, indicating that wound-related complications are not very high as expected from open surgery for hernia repair. The wound complication rate is better than most other publications with similar complex open ventral hernia repair patient groups. One possibility for these results is the low rate of comorbidities in this patient group. The percentages of patients with diabetes mellitus, current smokers, and many of the ones listed are low compared with other published studies. Hence, these are the potential factors that may have resulted in low complication rate in this study.Open abdominoplasty to repair ventral hernia is associated with mild, moderate, to severe pain. The qualitative measurement of moderate to severe pain usually varies among studies [10]. To keep the pain measurement fairly constant, quantitative measurement is recommended. In this study, a 10-point Likert type scale is used for pain assessment, which is similar to the 10-point numerical rating scale used by Langbach [10]. Overall, 15% of the patients reported chronic pain; this is in agreement with the previous studies involving open surgery for ventral hernia repair. Besides, surgery-related issues, pain can also be affected by multiple factors, such as age, tolerance level of the patient, other complications of the patient, and cultural issues [21,22]. Any one or some of these factors might influence the sensation of pain in the study group.

The overall patient-satisfaction assessed at follow-up visit was significantly high; nearly 74% patients indicated extreme satisfaction and only 10% were dissatisfied about the surgery. This can be owing to the fact that overall patient satisfaction is associated with different factors, such as presurgical expectation, aesthetic improvement, postoperative reduction of pain sensation, lesser wound infection, and relapse of hernia. Another important aspect of this study is the evaluation of postoperative functional status of the patients. This was estimated by two parameters: first, the number of days required to return to certain normal household activities and going out for shopping and second, the number of days before returning to workplace. The study data revealed that there was a marked subjective improvement in the functional status of the patients, as the patients started normal activities within two to three weeks of surgery and could resume their work in about 4 weeks of surgery. In fact, the present study showed that assessment of subjective experiences of patients on numerical scale is a valuable tool to measure the surgical outcomes in the postoperative period.

However, there are certain obvious limitations of this study. First, there is a lack of comparison between different type of mesh and also with suture technique in the view of postoperative pain. Second, the study population was relatively low, and third, patients with recurrent hernia and patients with only rectus diastasis were excluded, representing a considerable number of patients with great morbidity.

Conclusion

Ventral hernia remains one of the predominant complications following abdominal surgery. In

summary, the current study proposes that abdominoplasty with concurrent prosthetic ventral hernia mesh repair is a reliable, efficient, and successful technique to treat large, complicated ventral hernias. This is because this surgery poses lower risk of postoperative complications and results in improved quality of life in patients. The patients reported subjective improvement in terms of overall satisfaction, chronic pain, recurrences, and cosmetic satisfaction. Additionally, the number of days taken to start normal activities and return to work was significantly shorter following this surgery compared with other published studies.

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Conflicts of interest
There are no conflicts of interest.

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