

ORIGINAL ARTICLE

DOUBLE MESH REPAIR (SANDWICH TECHNIQUE) WITH ABDOMINOPLASTY FOR COMPLEX VENTRAL HERNIAS: A NOVEL TECHNIQUE WITH PROMISING RESULTS

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INTRODUCTION

Complex ventral midline hernias include hernias with large defect (>10 cm) and multi-orifice and recurrent anterior abdominal wall hernias. Treatment of such hernias remains a surgical challenge due to the high incidence of hernia recurrence and surgical complications.^(1,2)

Suture repair of such hernias carries unacceptably high recurrence rates (>50%), so it is currently discouraged. On the other hand, prosthetic mesh repair, currently the standard treatment, carries much less, but still unsatisfactory, recurrence rates (8-27%) and high rates of morbidity, both local and systemic (12-42%). Hence, conservation (through the use of abdominal corset) for such hernias might be alluring.^(3,4)

Nevertheless, these hernias do enlarge with time, making their repair more difficult, and many of them cause complications (e.g. intestinal obstruction, abdominal pain and aesthetic problems that usually disturb patients' quality of life).⁽⁵⁾

Multiple mesh materials (e.g., absorbable and non-absorbable, prosthetic and biologic) and multiple methods of mesh insertion have been tried (e.g., onlay, inlay and sublay mesh repairs) but no single method is satisfactory nor become the standard for treatment.^(5,6)

Risk factors for hernia recurrence after surgery include the size of hernia defect, type of mesh material (absorbable versus nonabsorbable), obesity, multiparity, old age, diabetes, and chronic pulmonary disease.⁽⁷⁾

The aim of this study is the prospective evaluation of a

novel technique for complex ventral midline hernia repair that involves repair of the hernia defect in between two layers of prosthetic mesh (sandwich technique) with the use of the remaining free edges of the hernia sac as a barrier between the intestine and the inner mesh. The evaluation will consider feasibility of the technique, incidence of hernia recurrence and postoperative complications.

PATIENTS AND METHODS

Patients with complex ventral midline abdominal wall hernias with large defects (>10 cm), multiple orifices, and recurrent hernias, who were admitted to the Surgery Department, Assiut University Hospital, between November 1st 2009 and May 31st 2012 were included in this study.

The study was approved by the Medical Research Ethics Committee of the Faculty of Medicine, Assiut University and informed consent was taken from all participants.

All patients were booked for elective hernia repair in the Surgery Department, Assiut University Hospital and had been assessed for operative fitness. Exclusion criteria were emergency presentation with complicated hernia, poor surgical fitness and small defect ventral hernias (< 10cm).

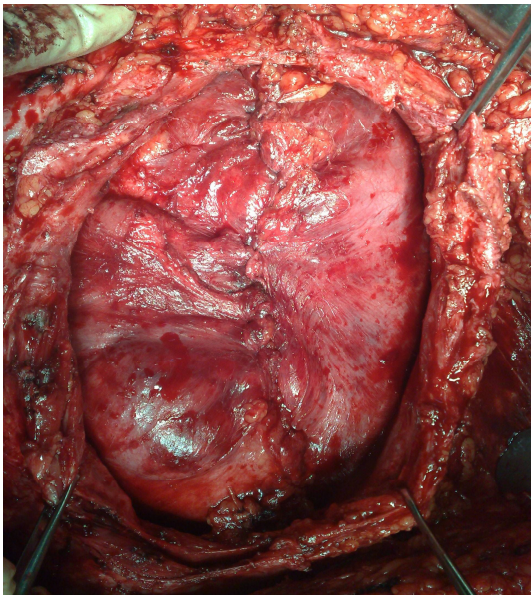
All patients received mechanical and chemical bowel preparation the day before surgery in the form of only-fluids feeding together with oral metronidazole 500 mg and neomycin 500 mg tablets every 8 hours, and the night before surgery in the form of repeated sodium phosphate enemas.



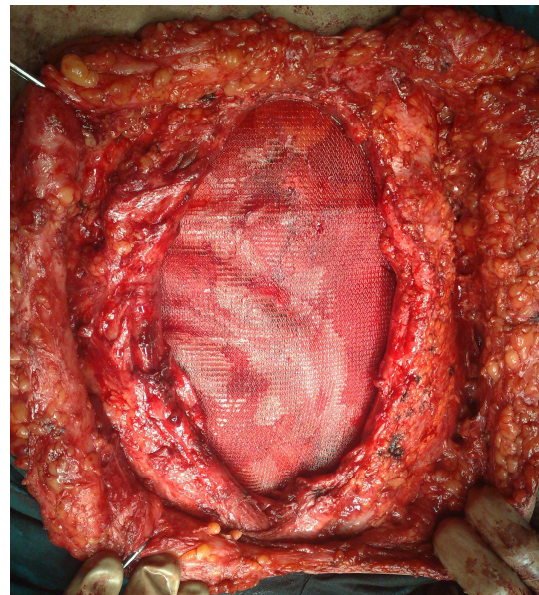
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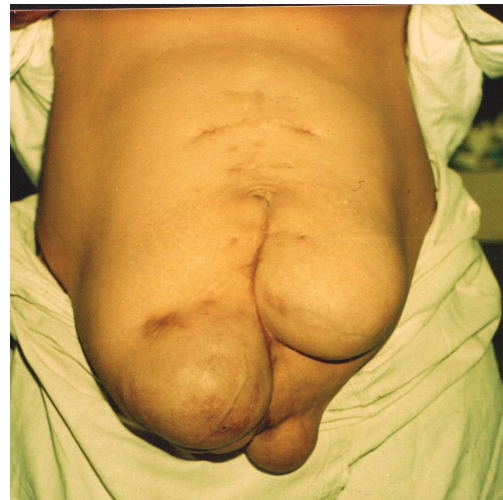
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Fig 1. Female patient with a large ventral hernia. A; lateral view. B; anterior view. C; the sac (peritoneum) closed without tension so that it separates the inner mesh layer from intestine. D; the inner mesh layer spread underneath the rectus abdominis muscle.

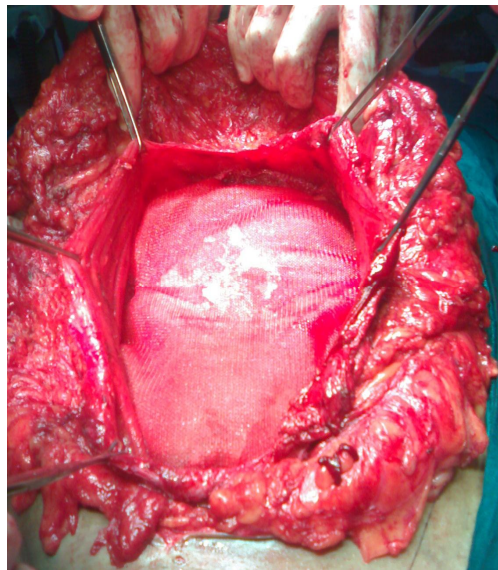
All patients received preoperative antibiotics (1gm /IV 3rd generation cephalosporin) at the time of induction of anesthesia. Measures to prevent deep venous thrombosis (e.g., elastic stocking and prophylactic low molecular weight heparin) were also applied.



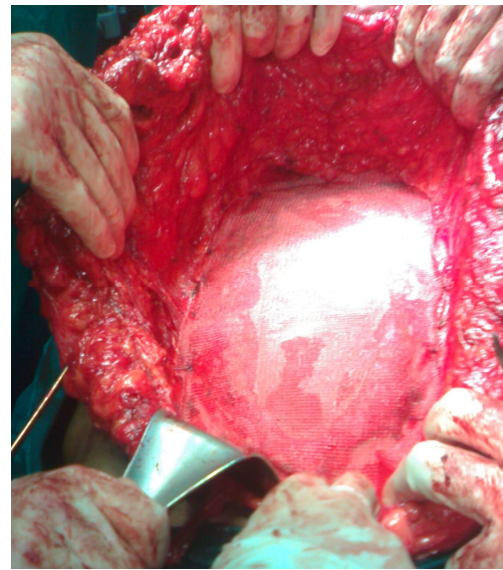
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Fig 2. Female patient with a large ventral incisional hernia. A; lateral view. B; anterior view. C; the inner mesh layer spread underneath the recti abdominis muscles. D; the outer mesh layer sutured to the rectus sheath after approximation of the underlying recti muscles.

Patient age, gender, body mass index (BMI), previous abdominal operations and hernia repairs were recorded. Also size of the defect, type of the mesh used, operative time, operative blood loss, early postoperative complications (systemic and local), hospital stay and hernia recurrence were all recorded.

Surgical Technique: All operations were done under general anesthesia with endotracheal intubation. After skin preparation and draping the skin was incised, the hernia sac was then exposed, and adjacent abdominal wall fascia cleared of subcutaneous tissues for at least 6 cm from the edge of the hernia defect. As possible, preservation of the perforator arteries to the skin was

done to decrease ischemia at the edges of the skin flaps.

The sac was then opened and adhesolysis performed as indicated. After reduction of the hernia contents the greater omentum was spread as possible to separate the intestine from the hernia defect.

The sac was then partially excised so that its edges can be brought together without tension and its edges sutured together by absorbable sutures (No. 0 polyglactic Acid). This is supposed to work as another barrier that separates the intestine from the first (inner) mesh to decrease incidence of adhesions and their sequelae.

Then, separation of the recti muscles from the posterior rectus sheath was carried out for at least 6 cm from the fascial edge of the hernia defect. At that time, the first mesh layer was spread out under the muscle for at least 5 cm from the fascial edges in all directions and fixed to the fascial edges of the hernia defect using continuous nonabsorbable sutures (2/0 polypropylene) Fig. (1).

The recti muscles were then approximated together to cover the first mesh without sutures. The second mesh layer was then fixed to the anterior rectus sheath fascia at least 5 cm from the edges of the defect with interrupted nonabsorbable sutures (2/0 polypropylene) taken 2cm apart and 1 cm from the edge of the mesh Fig. (2).

Redundant skin and subcutaneous tissue were excised (abdominoplasty), so that unhealthy skin at and around any previous operation scar was removed and a cosmetic appearance was achieved after wound closure.

Then a No. 18 double tube suction drain was applied to the large subcutaneous space and exited the skin through two small openings. Finally, the subcutaneous tissue was approximated with No. 2/0 polyglactic acid sutures and skin was sutured with interrupted No. 3/0 polypropylene sutures.

Postoperative care and follow up: All patients were closely observed for adequate urine output, normal respiration and stable hemodynamics. All patients received adequate analgesic treatment; IV fluids until normal intestinal sound were audible, prophylactic doses of subcutaneous anti-thrombotic therapy until patients were freely mobile, and IV 3rd generation cephalosporin antibiotic for an average of 3 days.

Suction drains were removed when discharge was less than 30 mL/ 24 Hs. This averaged 5 days (2-10 days). Hospital stay averaged 6 days (3- 18 days).

Patients were seen 15 days after discharge from hospital for wound inspection and skin stitch removal. Patients were then instructed to regularly visit our outpatient clinic every 2 months. Hernia recurrence was assessed by clinical examination.

RESULTS

This study involved 50 patients with complex ventral midline hernias. We used the term complex for ventral hernias with large defect (>10 cm), recurrent hernias, and hernias with multiple orifices. These patients were admitted to and operated upon in the Surgery Department, Assiut University Hospital, between November 1st 2009 and May 31st 2012.

Thirty six (72%) patients are females and 14 (28%) are males. Their ages ranged from 40 to 70 years (mean age 52 years). Table 1 shows demographic and surgically relevant patient data.

Eight patients had De Novo hernia while the remaining 42 patients had either incisional or recurrent ventral hernia. Details are shown in Table 2.

Ten (20%) patients had previous onlay polypropylene mesh repair at the hernia site. In these patients dissection of the sac from the mesh was difficult, but all meshes were removed even when part of the sac was to be excised with the mesh. One patient had previous intraperitoneal repair with expandable PTFE mesh. In this patient, adhesions between the mesh and bowel loops were found and lysed.

During our surgeries, one limited small bowel injury occurred and was repaired with primary suturing. As planned, our double mesh repair technique was used in this patient who was then kept nil per mouth for three days after surgery. No surgical site infection had occurred in the patient.

Overall postoperative complications occurred in 12 patients (24%). Table 3 shows the type and frequency of postoperative complications.

Superficial wound infection was treated with infected stitch removal, twice daily wound dressing with Bovidone Iodine solution and antibiotic ointment, until complete disappearance of infection. This was started in the hospital and completed at home.

The hematoma was small and treated conservatively with topical recombinant Hirudin preparations for 15 days and oral antibiotics for a few days. No infection occurred and hematomas resolved over time.

Seromas were aspirated under completely sterile conditions followed by the application of local pressure using multiple dressings over the seroma site compressed by adhesive tape left for 5 days.

Two patients developed deep wound infection down to the mesh site. The first patient had a limited area of his superficial (2nd layer) mesh infected, for which, the infection site was laid open completely and only the exposed part of the mesh excised. Repeated twice daily dressing together with the use of oral (7 days) and topical (15 days) antibiotics was successful to clear off the infection and save the remaining mesh. Delayed primary repair was then done and sound wound healing occurred.

The other patient (diabetic) had large area of his two meshes infected. The wound was laid open and the infected meshes removed completely. The wound was left exposed with the repaired edges of the hernia sac being the only layer that covered the intestine. Abdominal binder was used to help prevent progress to complete abdominal burst. This was followed by twice daily dressing using vaselized gauze soaked with Bovidone Iodine and topical antibiotics until sound wound healing occurred. Systemic antibiotics were used until infection was controlled (15 days). This patient

stayed in the hospital for 18 days, until healthy granulation tissue showed up in the whole wound surface and he completed wound care at home. Control of diabetes with regular insulin was carried out until complete wound healing occurred (6 weeks). This patient was expected to have a hernia recurrence and definitely had it.

Patient follow up ranged from 6 to 32 months with a mean of 21 months. During this period, one patient suffered an adhesive intestinal obstruction episode. He

was treated successfully by conservation (nil per os, nasogastric tube insertion and IV fluids) until the passage of stools that indicated resolution of the obstructive episode.

Hernia recurred in 3 patients. The single early recurrence was in the form of partial abdominal wound burst after complete removal of the two meshes to treat deep wound infection. The other 2 recurrences occurred 3 and 12 months respectively after surgery.

Table 1. Demographic and surgically relevant patient data.

Male/female ratio	2/5
Age (range, mean)	(40-70, 52 years)
Obese pts (BMI 25-30)	6 (12%)
Morbidly obese pts (BMI > 30)	32 (64%)
Diabetic pts	16 (32%)
Defect length (range, mean) in cm	(10- 25, 16 cm)
Mesh type used	(30 X 30 cm polypropylene)
Operative time (range, mean) in min.	(95-180, 125 min.)
Blood loss in mL	(150- 800, 300 mL)
Postoperative hospital stay (range, mean)	(3- 18, 6 days)

Table 2. Indications for the primary surgery that resulted in incisional/recurrent ventral hernia development.

Indication	No. of patients
Gynecological	3
Hepatobiliary	2
Emergency exploration for acute abdomen	20
Elective bowel conditions	5
Ventral midline hernia	12
Total	42

Table 3. Type and frequency of postoperative complications.

Complication	Frequency (%)
Superficial wound infection	3 (6%)
Hematoma	1 (2%)
Seroma	2 (4%)
Deep wound infection at mesh site	2 (4%)
Hernia recurrence	3 (6%)
Adhesive intestinal obstruction	1 (2%)
Total	12 (24%)

DISCUSSION

Repair of complex ventral hernias remains a challenge. Repair without prosthetic meshes carries unacceptable rate or hernia recurrence. The variable techniques of ventral repair (e.g., onlay and sublay), with prosthetic meshes, significantly decrease the rate of recurrence but don't eliminate it. On the other hand, the use of such meshes increases the rate of post-operative complication, especially those related to infection and seroma formation. It is well known that contact between the mesh and abdominal viscera results in adhesion formation and the liability for intestinal obstruction and fecal fistula formation.⁽⁸⁾

Moreover, the big volume of contents inside large hernias makes primary reduction of contents into the abdominal cavity and edge to edge hernia defect repair risky. It carries the risk of dehiscence (repair under tension) and abdominal compartment syndrome (high intra-abdominal pressure that impedes venous return to the heart and blood flow to abdominal organs especially, the kidneys).

To overcome this problem, musculoskeletal flaps and pneumoperitoneum are described. Pneumoperitoneum is an invasive procedure with occasional complications, such as viscera perforation, air embolism, peritonitis, and hematoma of the abdominal wall.⁽⁹⁾ Musculoskeletal flaps require much dissection with the possibility of significant blood loss, flap necrosis and donor site related complications.^(10,11)

Others perform the components separation technique that increases the capacity of the abdominal cavity. But this still carries the risk of hernia development at the lateral edges of the rectus sheath.^(3,4,12)

Another method to avoid closure of the hernia defect under tension is to use a biologic (e.g., small intestinal submucosa graft and acellular human dermis) or an inert (PTFE) material to bridge the gap between the edges of the hernia defect. However, these materials are quite expensive and result in a lower, not zero, incidence of adhesion formation.

In this study, we avoided repair under tension by using the remnant of the hernia sac and the greater omentum (as possible) to bridge the hernia defect and separate the inner polypropylene mesh from intestine. This, in agreement to the study published by Amar (2009)⁽¹³⁾ resulted in low rate of obstructive episodes with no additional expenses. In our study, only one patient suffered an obstructive episode that was treated conservatively.

The results of double layer mesh repairs have been described earlier by Moreno-Egea et al, 2010, Broker et al, 2011, and Baradaran et al, 2008.⁽¹⁴⁻¹⁶⁾ They reported low rates of recurrence, wound infection and wound dehiscence. Patients' characteristics and defect sizes in our study were comparable with these studies. Also, the outcome of our study was close to them.

In conclusion, this study tried to overcome some of the problems that face the surgeon while repairing a complex large ventral midline hernia. We used the hernia sac (peritoneum) to bridge the defect and prevent adhesion formation between the intestine and the inner mesh layer without any additional cost. On the other hand, we performed a double layer (Sandwich) technique with the two meshes separated by the approximated recti muscles. This is supposed to give more strength to the repair. Actually this technique appears to be promising with good results regarding deep wound infection and hernia recurrence.

	Our study	Moreno-Egea et al, 2010 ⁽¹⁴⁾	Broker et al, 2011 ⁽¹⁵⁾	Baradaran et al, 2008 ⁽¹⁶⁾
No. of pts	50	50	9	25
Mean age	52		62	52
BMI	32 (64%) > 30			1 > 35
Mean hernia defect size	16 cm		20 cm	12.7 cm
Post op. complications	6 (12%)	7 (14%)	6 (66%)	(16%)
Deep wound infection	2 (4%)	1 (2%)	3 (33%)	
Mean follow up	21 months	-	13 months	16 months
Hernia recurrence	3 (6%)	0	1 (10%)	4 (16%)

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