Mesh plug versus onlay mesh repair of umbilical and paraumbilical hernia

Samy M. Osman, Tarek A. Mostafa, Mahmoud R. Shehata, Amgad A. Bakhet

Department of General Surgery, Faculty of Medicine, Assiut University, Assiut, Egypt

Correspondence to Amgad A. Bakhet, MSc, Department of General Surgery, Faculty of Medicine, Assiut University, Assiut, Egypt.
Tel:+201095487030;
Postal Code: 71641;
e-mail: amgadatta@yahoo.com

Received 29 November 2018
Revised 17 December 2018
Accepted 18 December 2018
Published 20 November 2020

Journal of Current Medical Research and Practice
2020, 5:412–416

Objectives
The aim of the study was to compare between two techniques of mesh placement in umbilical and paraumbilical hernias, that is, onlay (mesh on external oblique) versus mesh plug (in the defect), to establish the standard technique for treatment of such cases.

Background
Hernias through the umbilical ring (umbilical hernia) and hernias adjacent to the umbilical ring (paraumbilical hernia) are common in the adult population, accounting for ~10–14% of all hernias. In spite of that, the optimal approach for umbilical and paraumbilical hernias is still under discussion.

Patients and methods
This prospective study included 40 consecutive adult patients with uncomplicated umbilical and paraumbilical hernias. The patients were divided into two groups. Group A ($n = 20$) was operated upon following the onlay mesh repair technique, and group B ($n = 20$) was operated upon by means of the mesh plug technique. All patients were evaluated regarding operative time and postoperative complications. Results were documented and statistically analyzed.

Results
In this study, mesh plug technique in the treatment of umbilical and paraumbilical hernias reduced seroma formation after drain removal (which was higher in the onlay mesh group; $P = 1.000$), and postoperative recurrence (which was higher in the onlay mesh group; $P = 1.000$) in comparison with onlay mesh repair.

Conclusion
Mesh plug repair is better than onlay hernioplasty according to the postoperative complications.

Keywords:
mesh, onlay, paraumbilical, plug, umbilical

J Curr Med Res Pract 5:412–416

2357-0121

Introduction

Umbilical hernias and paraumbilical hernias are common in the adult population, accounting for ~10–14% of all hernias [1,2]. Paraumbilical hernia is more common in females, whites, and the obese [3]. The repair with prosthesis varies from primary closure with onlay mesh reinforcement, onlay mesh placement only, inlay mesh placement, mesh plug, to intraperitoneal mesh placement [4].

An onlay mesh repair has the disadvantages of repair under tension, seroma formation, and mesh infection [5]. Mesh plug repair can be performed with minimal postoperative complications and achieving excellent patient satisfaction [6].

Patients and methods

The study frame is 1 year, starting from October 2016 to October 2017, in the General Surgery Department at Assiut University Hospital. A total of 40 adult patients who were scheduled to undergo hernioplasty were included. Patients were familiar with the potential hazards and benefits of both options (onlay mesh and mesh plug technique), and they provided a fully informed written consent for participation in the study. Ethics committee of Assuit university hospital approved the study.

Patients was divided into two groups:
(1) Group A (20 patient) was subjected to onlay mesh repair.
(2) Group B (20 patient) was subjected to mesh plug repair.
(a) Material of mesh: polypropylene mesh.
(b) Types of mesh plugs: cigarette stub-like plug and cone-shaped plug.

Inclusion criteria:
The following were the inclusion criteria
(1) Age: 18–70 years old.

(2) Patients with umbilical hernia and paraumbilical hernia.

Exclusion criteria

The following were the exclusion criteria:
(1) Patients with recurrent hernias.
(2) Patients with extremes of age.
(3) Patients who refusing mesh repair.
(4) Patients with chronic liver disease with ascites.
(5) Patients with morbid obesity.
(6) Complicated paraumbilical hernia.

Preoperative evaluation

Complete history was obtained from all patients included in this study, including occupation, smoking, past history of chronic bronchitis, chronic constipation, difficulty in micturition, and previous operation.

Physical examination: pulse; blood pressure; temperature; abdominal, chest, and cardiac examination; and hernia examination.

Investigations: full routine laboratory investigations, including complete blood count, prothrombin time and concentration, urea, creatinine, electrolytes, liver function tests, and blood sugar, as well as imaging, including abdominal ultrasound, preoperative fitness, chest radiograph, and ECG.

Operative technique

All operations were carried out under general anesthesia with intubation or under spinal anesthesia in both groups, with a prophylactic dose of antibiotic, ceftriaxone 1 g intravenous, given at induction of anesthesia.

The operative technique included the following steps in group A (onlay mesh repair):
(1) A skin incision was made directly over the hernia defect.
(2) Dissection was performed at the subcutaneous plane 4–6 cm around the defect.
(3) The sac was dissected, the contents were reduced back into the abdomen, and the sac was excised for anatomical repair.
(4) The anterior abdominal wall layers were closed using continuous Vicryl 2 with repeated interrupted sutures.
(5) The mesh was stretched over the whole dissected abdominal aponeurosis until 5–7 cm around the defect and was fixed to the anterior rectus sheath with a polypropylene 2/0 suture. The sutures were taken with good bites of the aponeurosis and the mesh. Multiple scattered simple sutures were used for fixation of the mesh.
(6) A suction drain was left in front of the mesh. The subcutaneous tissue was closed with vicryl 3/0.
(7) The skin was closed with interrupted silk 3/0, and the drain was removed when the amount of drainage reached less than 30 ml/day for 3 days.

Group B underwent mesh plug repair in the following steps:
(1) The incision (3–4 cm) was made either supraumbilically or infraumbilically, depending on the location of PUH.
(2) The hernial sac was dissected from the surrounding tissue until the hernial ring was identified circumferentially. Once this was done, the contents of the sac could be reduced, followed by the sac itself.
(3) A prolene mesh plug was then prepared like a cigarette stub from a 2.5 cm × l0 cm mesh sheet. If the hernial defect was more than 2 cm in diameter, a double layer was used (Figs. 1-2).
(4) The stub was then inserted into the defect with its external margin flush with the hernial ring and fixed with 3/0 Prolene sutures in four quadrants (Fig. 3).
(5) A Mini-vac drain was used in all cases.
(6) The incision was closed with a subcuticular suture.

Postoperative management and follow-up:

Patients have been allowed to rest in bed in the first 6 h post operatively, and then all patients are encouraged for early movement, and to start regular light daily exercise in form of walk. Postoperative pain has been controlled by injectable NSAIDS in the form of ketorolac amp, and then diclofenac 75 mg every 12 h according to patient requirement. Postoperative observation and monitoring included vital signs, complications (wound infections, seroma, and recurrence), hospital stay, and drains to be removed. No strenuous effort was allowed for at least 3 months.

The follow-up data were obtained during return visits at 3, 5, and 8 months after the operation, or when the patient had a complaint.

Statistical analysis

Statistical analysis was performed using SPSS software, version 16 (SPSS Inc. Released 2007. SPSS for Windows, Version 16.0. Chicago, SPSS Inc.). Characteristics were presented as mean ± SD or median for continuous data according to statistical distribution (assumption or normality assessed using Shapiro–Wilk test) and as number and proportions for categorical variables. Comparison between the independent groups was made using

χ^2 test for categorical variables and Student *t* test or Mann–Whitey test for quantitative variables. *P* values of less than 0.05 were regarded as statistically significant.

Results

A total of 20 patients underwent (onlay) mesh repair of umbilical and paraumbilical hernias and 20 patients underwent mesh (plug) repair during 1 year, from October 2016 to October 2017. The youngest patient was 18 years old and the oldest was 70 years old. Overall, 75% of the patients (*n* = 30) were females, which outnumbered the 25% (*n* = 10) male patients.

The female to male ratio was 3: 1, showing that incidence of paraumbilical hernia is higher in females (Table 1, Fig. 4).

Regarding postoperative complications, after onlay and mesh plug technique, the postoperative complications are shown in Table 2 and Fig. 5.

Regarding wound infection, in group A, wound infection occurred in one (5%) case, but in group B, wound infection occurred also in one (5%) case (*P* = 1.000).

Regarding seroma, in group A, seroma developed in two (10%) cases, but in group B, only one (5%) case had seroma (*P* = 1.000).

Regarding recurrence, two (10%) patient of group A developed hernia recurrence, and there was only one (5%) case of recurrence in group B during the follow-up period of 4 months, in which wound infection occurred (*P* = 1.000).

Regarding hospital stay, the mean duration of hospital stay in both groups was about 2 days. Regarding operative time, the mean total time taken to perform surgery in the onlay group was 70–90 min compared with 40–100 min in the mesh plug group.

Table 1 Age-sex distribution of patients

Age	Male	Female	*n* (%)
18-30	2	6	8 (20)
31-50	4	8	12 (30)
51-70	4	16	20 (50)
Range		18-70	
Mean±SD		46.78±16.38	

Table 2 Onlay mesh versus mesh plug repair

	Onlay mesh [*n* (%)]	Mesh plug [*n* (%)]	*P*
Wound infection	1 (5)	1 (5)	1.000
Seroma	2 (10)	1 (5)	1.000
Recurrence	2 (10)	1 (5)	1.000
Hospital stay	48 h	48 h	
Operative time	70-90 min	40-100 min	
Drains	4-9 days	1-9 days (2)	

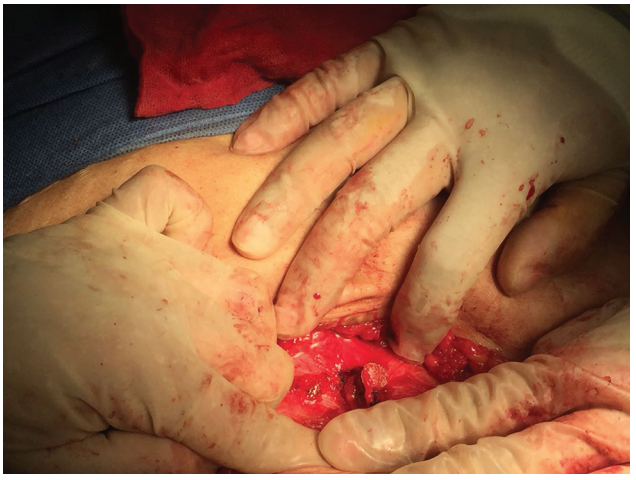
Figure 1

Mesh sheet before rolling.

Figure 2

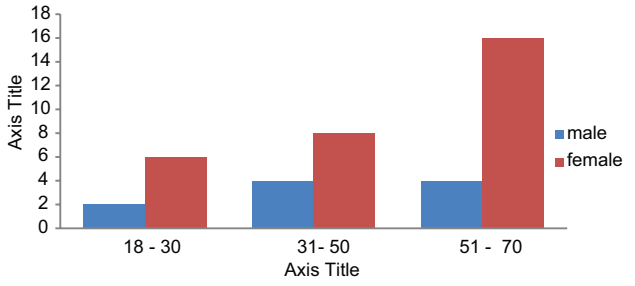
Mesh plug (like a cigarette stub).

Figure 3



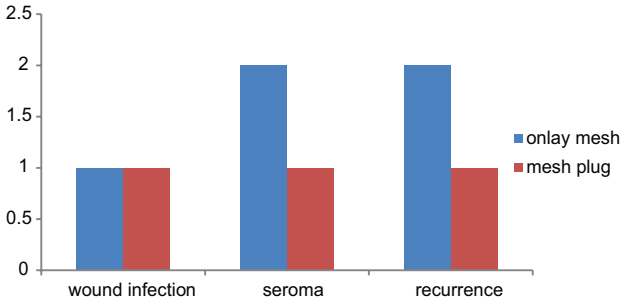
Mesh plug within the defect.

Figure 4



Age–sex distribution.

Figure 5



Postoperative complications.

Discussion

Numerous studies have been conducted to understand the hernial mechanism and the methods of repair. All studies accepted managing hernial defects as a part of generalized abdominal wall disorders [6].

Careful evaluation of the patient who presents with an abdominal defect reveals predisposing factors for herniation, including obesity, chronic pulmonary disease, malnutrition, sepsis, anemia, corticosteroid dependency, and/or current malignant process [7–10].

Repair of umbilical and paraumbilical hernias is an ongoing challenge in surgery. A wide spectrum of surgical techniques have been developed and recommended, ranging from direct suture techniques to the use of various types of prosthetic mesh. All of them aim to close the defect and strengthen the musculofascial tissues to avoid recurrence [11].

Local repair without the use of a mesh results in many recurrences. The abdominal wall is destroyed and weakened further, making future attempts at repair more difficult. Many surgical techniques have been advocated. However, there is still doubt about the ideal and best method that provides the least incidence of recurrence and high patient satisfaction [12].

The use of sheets of nonabsorbable mesh prosthesis placed across the defect and fixed to the abdominal wall has rendered most of the older types of operations obsolete. The use of a surgical mesh leads to a dramatic reduction in the incidence of recurrence, reaching 1.8% in some studies.Various prosthetic materials are available; the most popular is the monofilament polypropylene mesh. A series of laboratory and clinical investigations have reported that polypropylene stimulates a strong fibroblastic response and has a dramatic resistance to infection [13].

The duration of surgery in patients treated with onlay mesh repair (group A) ranged from 75 to 90 min, which is longer than that reported by other studies, in which the duration of surgery ranged from 30 to 90 min. We recorded the duration of surgery in patients treated with mesh plug repair (group B) as ranging from 40 to 100 min, which is slightly longer than that reported by Sinha and Keith [3].

In our study, the drain was removed in patients treated with onlay mesh repair (group A) after a period of 4–9 days, which is slightly longer than that reported by previous studies, in which the period of drainage ranged from 2 to 7 days. However, in patients treated with mesh plug technique (group B), the drain was removed after a period of 1-9 days, which is comparable to that reported by Sinha and Keith [3].

Seroma is one of the most common complications following the open technique and is particularly likely to occur when large skin flaps are developed during the surgical procedure. Although small seromas frequently resolve within 6–8 weeks without sequelae, a large symptomatic or persistent seroma occasionally requires multiple aspirations with subsequent increased risk for secondary infection.

In this study, seroma formation after drain removal was observed in two (10%) patients treated with onlay mesh repair (group A), which is similar to that reported by previous studies, in which 11.5% of cases developed wound seroma. In group B patients, seroma formation after drain removal occurred in one patient, which amounted to 5% of cases. This proportion is comparable to that reported by Taher [14], in which seroma occurred only in 3% of patients (P = 1.000).

Obesity, wide areas of dissection, and presence of devitalized tissues are conditions favoring infection, which is a real threat to successful repair. When suppuration occurs in the wound, drainage and proper antibiotics are essential. Among patients treated with onlay mesh repair (group A), one (5%) patient developed wound infection, which is lower than that reported by other studies, in which wound infection occurred in

23% of cases. Among patients treated with mesh plug technique (group B), one (5%) patient developed minor wound infection, which is similar to that reported Taher, in which infection occurred in 3% of cases (P = 1.000).

The length of hospital stay following treatment of paraumbilical hernia by onlay mesh repair (group A) was about 2 days, which is similar that reported by other studies, which showed a mean hospital stay of 2 days, and also repair with mesh plug (group B) was about 2 days.

Hernia recurrence is distressing to the patient. Tension-free repair using a prosthetic mesh has decreased recurrence to a negligible proportion. In patients treated with onlay mesh repair (group A), two (10%) patients developed hernia recurrence (after ~11 months) following operation, which is similar to that reported by other studies, in which the recurrence rate was ~9.8%. In patients treated with mesh plug repair (group B), although only one patient developed recurrence (during the period of follow up that was continued for 8 months), the proportion was 5%, which is the same as that reported by Sinha and Keith (P = 1.000).

Conclusion

We have found that mesh plug repair is better than onlay hernioplasty according to the postoperative complications, such as recurrence, seroma formation, wound infection, and postoperative chronic abdominal discomfort.

Mesh plug repair can be performed with minimal postoperative complications and minimal postoperative pain, and it achieves excellent patient satisfaction.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Musca AA. Umbilical and ventral herniorrhaphy: a review of 1000 cases. Part 1: characteristics which predict surgical results and predisposing factors. Int Surg 1967; 48:169–179.
2. Rosenthal RA. Small-bowel disorders and abdominal wall hernia in the elderly patients. Surg Clin N Am 1994; 74:261–291.
3. Sinha SN, Keith T. Mesh plug repair for paraumbilical hernia. Surgeon 2004; 2:99–102.
4. Millikan KW. Incisional hernia repair. Surg Clin N Am J 2003; 83:1223–1234.
5. Jenkins TPN. Incisional hernia repair, a mechanical approach. Br J Surg 1980; 67:335–336.
6. Jenkins TPN. Incisional hernia repair, a mechanical approach. Br J Surg 2003; 67:335–336.
7. Read RR. Ventral, epigastric, umbilical, spigelian and incisional hernias. In: Cameron JL, editor. Current Surgical Therapy. 5th edition. Philadelphia, Pa, USA: Mosby; 1995. p. 491–496.
8. Larson GM, Vandertoll DJ. Approaches to repair of ventral hernia and full-thickness losses of the abdominal wall. Surg Clin N Am 1984; 64:335–349.
9. Hurwitz DJ, Hollins RR. Reconstruction of the abdominal wall and groin. In: Cohen M, editor. *Mastery of plastic and reconstructive surgery*. Boston: Little Brown; 1994:1349–1359.
10. Lowe JB, Garza JR, Bowman JL, Rohrich RJ, Strodel WE. Endoscopically assisted 'components separation for closure of abdominal wall defects. Plast Reconstr Surg 2000; 105:720–729.
11. Ibrahim AH, El-Gammal AS, Mohamed Heikal MM. Comparative study between 'onlay' and 'sublay' hernioplasty in the treatment of uncomplicated ventral hernia. Menoufia Med J 2015; 28:11–16.
12. Ponka JL. *Hernias of the abdominal wall, incisional hernia*. Philadelphia, Toronto: W.B. Saunders Co.; 2003.
13. McLanahan D, King LT, Weems C, Novotney M, Gibson K. Preperitoneal prosthetic repair for midline abdominal hernias. Am J Surg 2005; 173:445–449.
14. Taher FH. Paraumbilical hernial repair by mesh plug under local anesthesia. Al-Qadisiah Med J 2013; 9:180–188.