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RESEARCH ARTICLE

EVALUATION OF LICHTENSTEIN MESH HERNIOPLASTY FOR ACUTELY COMPLICATED INGUINAL HERNIA AS AN EMERGENCY PROCEDURE

*Ahmed M Sharaky, Dr. Amr Abu Ella and Dr. Abdelrahman Kamal

Departments of General Surgery, AL Ahrar Teaching and EL – Sahel Teaching Hospital, Egypt

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ABSTRACT

Background: To prevent recurrence, mesh repair is the optimum choice for elective hernia repair, however the application of mesh herinoplasty in the acutely complicated inguinal hernia in emergency sitting is still controversial especially when omentum and intestinal resection is required. **Patients and methods:** This study was multicenter study conducted in the departments of surgery at AL Ahrar and EL –Sahel teaching hospitals during the period from December 2014 to June 2019. Polypropylene mesh herinoplasty was performed to 100 male patients included in this study and presented with acute complicated inguinal hernia. Prospectively patients were divided into two groups: Group (I) included 72 patients who didn't required intestinal resection and Group (II) 28 patients required intestinal resection. **Results:** The operative time and hospital stay were longer in Group (II) ($P < 0.001$). There was no significant difference between the two groups regarding postoperative complications. All cases of surgical site infection (SSI) were superficial and successfully managed with drainage and local wound care. There was no deep wound infection or mesh rejection, no postoperative mortality and there was 1 case of hernia recurrence during 1 year follow up. **Conclusion:** The current study approved that mesh herinoplasty in acutely complicated inguinal hernia can be accomplished safely with favorable outcome even if associated with omentum and intestinal resection assuming that the wound was maintained in clean –contamination condition during surgery.

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INTRODUCTION

Complicated inguinal hernia, because of patient negligence, lack of awareness and delayed diagnosis has become a commonly encountered surgical emergency. Acute incarceration that progress to intestinal obstruction and strangulation are the most frequent complications (Kulah, 2001). The main objective in such condition is urgent management the patient serious clinical condition, release the entrapped bowel before it become permanently ischemic and to repair the hernia defect with the best technique that prevent immediate or delayed recurrence. To prevent recurrence mesh herinoplasty according to Lichtenstein technique has become the optimum and standard technique of elective inguinal hernia repair in adults (Bisgaard *et al.*, 2010; Simons, 2009). However due to risk of deep wound infection and mesh rejection, the use of mesh herinoplasty in the setting of incarcerated or obstructed inguinal hernia is still a subject of debate (Derici, 2010). In the last few years, there is a slowly altering this concept and many studies reported that mesh herinoplasty can be safely

performed with favorable outcome in urgent hernia surgery when small intestinal resection is not required (Elsebae, 2008; Kiss *et al.*, 2014; Faridi, 2016). Only few studies recommend mesh repair for patients requiring intestinal resection as well (Ragab, 2014; Tatar *et al.*, 2016). The objective of this study is to evaluate the safety and outcome of mesh herinoplasty in acutely complicated inguinal hernia as an emergency procedure in cases associated with omentum and small intestinal resection.

PATIENTS AND METHODS

This multicenter study was conducted at Al–Ahrar and Al–Sahel Teaching Hospitals, Egypt from December 2014 to June 2019. A total number of 121 patients presented with acutely complicated inguinal hernia to the emergency and accident units of the general surgery departments. A mesh repair herinoplasty utilizing Lichtenstein technique was planned to be performed for all patients, however 21 patients were excluded from the study.

The exclusion criteria included

- Patients with general or local risk factors such as long standing uncontrolled diabetes, liver disease with ascites,

*Corresponding author: Ahmed M Sharaky,
Department of General Surgery, AL Ahrar Teaching Hospital.

chronic renal failure, clinical features of generalized peritonitis and patients with intraoperative finding of intestinal perforation. These associated factors may predispose to poor clinical outcome mostly deep wound infection and mesh rejection.

- Patients who were lost during the period of follow up. In this prospective non randomized study, informed written consent for surgery was taken from all patients. The patients were divided into two groups: Group (I) included 72 patients who didn't not required intestinal resection and Group (II) included 28 patients who required intestinal resection for irreversible ischemic omentum or small intestine. All patients were locally and systemically evaluated before surgery, they were clinically presented with painful incarcerated inguinal hernia with or without clinical features of intestinal obstruction. No manual reduction is attempted since manipulation may cause intestinal perforation. Time passed from the onset of symptoms caused by incarceration and hospital admission was estimated. Full chemistry in the form of complete blood picture, coagulation profile, random blood sugar, liver and kidney functions, electrolyte assay, abdominal plain X-ray erect and abdomino- inguinal ultrasound were urgently performed. Chest X-ray and electrocardiography (ECG) were performed to access the patients anesthetic risk.

Urgent surgery was planned to be performed within 4-6 hours after hospital admission. During this time optimization of the patients general condition with intravenous fluid therapy to correct dehydration, Ryle tube for intestinal decompression, rapid control of blood sugar in diabetic patients ,correction of electrolyte and acid- base balance disturbance was achieved. Preoperative sedation and prophylactic antibiotics, intravenous third-generation cephalosporin and metronidazole were given to all patients. The type of anesthesia was decided by the anesthesia specialist. Surgical intervention began with an inguinal incision, the hernia sac was approached and the operative field was protected from contamination by towels socked in diluted povidone-iodine. The fundus of the sac was explored, the toxic fluid was aspirated to avoid spilling into the operative field and for bacteriological assessment, the constricting ring was divided and the bands of adhesions within the sac was released. The contents of the hernia sac was examined, the gangrenous omentum is resected (Fig. 1) and the loops of the small intestine are checked so as not to miss a strangulated Maydl's hernia. Bowel appearance is noted including color, congestion, movement and contractility, intestine that was viable or restore viability after application of hot saline fomentations was reduced back gently into the abdominal cavity. Gangrenous intestine was resected and anastomosis was done using two layer sutures. Occasionally the inguinal incision was extended laterally by dividing only the skin and external oblique aponeurosis with retracting the internal oblique and transversus abdominis muscles laterally ,this provides further exposure thus intestinal resection and anastomosis can be performed with simplicity.

In all patients the following steps are applied to minimize the risk of operative field contamination:

- Gentle handling and dissection of tissues ,the use of diathermy is kept to minimal.
- The intestinal resection- anastomosis was done away from the site of hernia mesh repair which is protected by towels

- Removal of any necrotic debris and frequent irrigation of the operative field with gentamycin 160 mg dissolved in 500 ml of normal saline solution.
- Exchange of the gloves, surgical towels and instruments after intestinal resection.

Once the hernial defect was closed, a tension free herinoplasty according to Lichtenstein technique was undertaken by applying polypropylene monofilament mesh over the fascia transversalis and behind the spermatic cord with splitting of the superior end of the mesh to wrap around the spermatic cord thus creating a new deep internal ring just admit the tip of the little finger, the inferior end of the mesh was extended to overlap the pubic tubercle for 2cm medially and fixed to the pubic aponeurosis. To avoid hematoma formation, 14-French vacuum suction drain was inserted in front of the mesh. Silk is not used to close the wound as it may cause stitch abscess and the wound is closed by interrupted monofilament proline 2/0 sutures

Postoperative course and assessment of outcome: All patients started to take oral fluids after resuming normal intestinal movement usually at the 2nd – 3rd postoperative day. Intravenous antibiotics were continued till the day of hospital discharge however in Group (II) the antibiotic therapy was shifted in the 3rd postoperative day according to the results of bacteriological assessment. The vacuum drains where removed when the amount of serous discharge was less than 20 ml/day with prescription of oral antibiotics to all patients at the time of discharge .The patients were followed up in the surgical clinic and the first visit was after 3days of discharge, wounds are dressed and observed for SSI and seroma formation. Removal of the sutures was done 12-14 days after operation. Clinical follow up every 3 months up to 1 year was performed to all patients for any clinical features of recurrence. In this study ,the primary outcome points were the rate of incidence of postoperative SSI, mesh rejection and the recurrence. The secondary outcome points were the operative time, length of hospital stay, morbidity and mortality. Statistical evaluation: Data were checked and analyzed by using (SPSS version 22).Data were expressed as frequency and percentage for categorical variables, Mean± SD for quantitative variables. Chi-squared test and T test were used to find the difference between those with and without bowel resection. P<0.05 was considered statically significant.

RESULTS

Mesh herinoplasty was planned to be applied for 121 patients in the study. However 21 patients were excluded, 6 patients due to peritonitis, 3 patients due to end stage hepatic failure with ascites, 2 patients with chronic renal failure, 2 patients with prolonged uncontrolled diabetes and 8 patients were lost during the period of follow up. 100 male patients included in this study. Patient's age ranged from 24-78 years. The mean age was (59.9 ±10.1). There was no statistical significance in relation to age as a factor affecting intestinal resection in complicated hernia(P0.07). Patients age and type of hernia are summarized in table (1). Clinically all patients had localized pain and tenderness at the hernia site. Abdominal and inguinal ultrasound was done for delineating the contents of the hernia sac, however it can not assess the viability of the intestinal contents. Table (2) show the pathology and the organs found during intraoperative intervention.

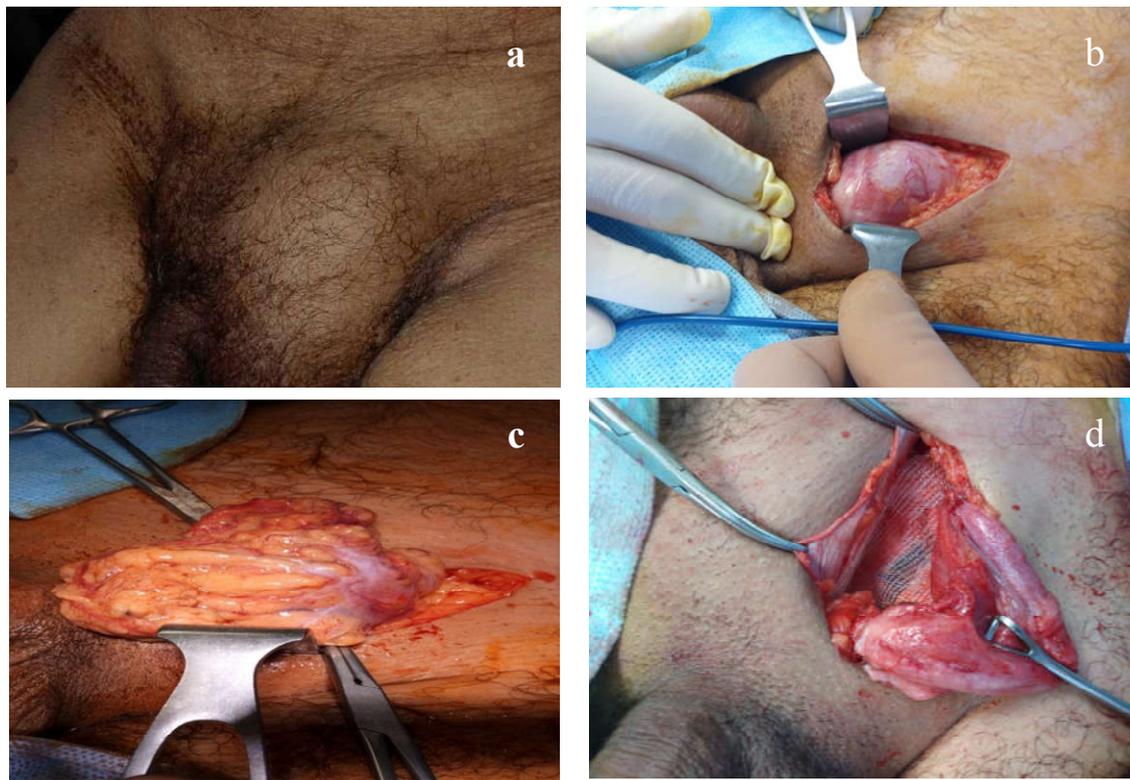


Fig 1. (a) Preoperative photograph of a patient with acutely incarcerated inguinal hernia. (b): Intraoperative photograph of the hernial sac. (c): Incarcerated omentum. (d): Hernia repair using polypropylene mesh.



Fig. (2): (a) Photograph showing strangulated bowel loops. (b): Photograph of the same patient showing normal bowel appearance after release of the constricting agent

Table 1. Patients age and type of hernia in both groups of patients

	Group (I) no bowel resection N =72	Group(II) bowel resection N = 28	P value
Age(mean SD)	56.1±10.0	60.0±9.1	0.07
Type of hernia			
Indirect	62	24	0.95
Combined	7	4	0.75
Direct	3	0	0.73

Table 2. Intraoperative pathological findings among both groups of patients.

	Group (I) no bowel resection		Group (II) bowel resection		P value
	N	%	N	%	
Type of hernia					
-Incarcerated	26	36.1	0	0.0	<0.001
-Obstructed	40	55.6	0	0.0	<0.001
-Strangulated	6	8.3	28	*100.0	<0.001
Contents of the hernial sac					
-omentum	6	8.3	2	7.1	0.84
-omentum & small intestine	30	41.7	6	21.4	0.058
-small intestine	34	47.2	20	*71.4	0.029
- sigmoid colon	2	2.8	0	0.0	0.92

Table 3. Time passed from the onset of symptoms of incarceration and admission to hospital

Time passed from the onset of symptoms of incarceration and admission to hospital	Group(I) no bowel resection		Group (II) bowel resection		P value
	N	%	N	%	
6 hours	46	63.9	0	0.0	<0.001
6-12hours	20	27.8	4	14.3	0.15
12-24hours	4	5.6	*10	35.7	<0.001
More than 24 hours	2	2.8	*14	50.0	<0.001

Table 4. Operative time and length of hospital stay in both groups of patients

Operative time	Group (I) no bowel resection		Group (II) bowel resection		P value
	%	N	%	N	
1 hour	43	59.7	3	10.7	<0.001
1 and half hour	29	40.8	6	21.4	0.07
2 hours	0	0.0	19	67.9	<0.001
Hospital stay(days)	3-4 days		5-7days		<0.001
X ± SD	3.5 ± 0.4		6.1 ± 0.8		

Table 5. Shows the complications of emergency herinoplasty

Complications	Group(I) no bowel resection N=72		Group(II) Bowel resection N=28		Total N=100	Percentage %	P
	N	%	N	%			
Superficial surgical Site infection (SSI) Cellulitis	2	2.8	2	7.1	4	4%	0.66
Purulent exudate	1	1.4	2	7.1	3	3%	0.38
Wound seroma	3	4.2	4	14.3	7	7%	0.17
Scrotal edema	2	2.8	2	7.1	4	4%	0.66
Mesh rejection	0	0	0	0.0	0	0%	1.0
Hernia recurrence	0	0.0	1	3.6	1	1%	0.62

During surgery, in Group I incarcerated omentum was found in 36 patients. In 64 patients ischemic changes was observed in the small intestine which gradually returned to normal color and contractility within 5-10minutes after release of the constricting agent and application of hot saline fomentation. Incarcerated sigmoid colon was found in 2 patients as a part of sliding hernia, after release of the adhesive bands they restore viability and reduced back into the abdominal cavity. In Group II the 28 patients had necrotic omentum and small intestine without perforation but with irreversible ischemic changes that required resection anastomosis. As shown in table(3)the time passed from the onset of symptoms of incarceration and admission to hospital was an important factor in determining the need for omentum and intestinal resection and the difference was statistically significant ($P<0.001$). The operative time was significantly longer in Group II and this is explained by the time needed for resection and anastomosis. Also there was a significant difference between duration of hospital stay which was found significantly shorter in Group I (3-4 days) with no intestinal resection as compared to Group II (5-7 days) with omentum and intestinal resection which had longer hospital stay ($P<0.001$) Table (4). A total number of 18 patients had early postoperative complications which occurred in 8 patients in Group I (8%) and in 10 patients in Group II (10%). No anastomotic leakage was reported, there was no mesh rejection and no patient needed mesh removal. Late postoperative complications occurred in 1 patient in Group II (1%) in the form of hernia recurrence. There was no significant statistical difference in both groups in terms of postoperative complications ($P>0.05$) Table (5).

DISCUSSION

Complicated inguinal hernia is a common surgical entity in the low and middle socio-economic patients.

This is mainly attributed to patient negligence and lack of awareness or delayed diagnosis. The presentation is usually in the emergency clinic with acute incarceration, intestinal obstruction or strangulation and almost require urgent surgical intervention (Kulah, 2001). It is well known that the various types of primary tissue hernia repair are usually associated with high incidence of recurrence (Bisgaard *et al.*, 2010). Every recurrence carry high risk of re-recurrence and specific complications like male sub-infertility and ipsilateral testicular atrophy due to prolonged compression of the cord structures by adhesions (Kulacoglu, 2011; Dudek-Warchol, 2018). To avoid recurrence, it is clear now that mesh herinoplasty is the optimum and standard technique for elective inguinal hernia repair where infection should be uncommon (Simons *et al.*, 2009). On the other hand, for fear of infection there is still a discussion regarding the safety of mesh application during emergency surgical procedures (Dericci *et al.*, 2010). Many studies reported that mesh herinoplasty can be safely performed with favorable outcome in urgent hernia surgery when small intestinal resection is not required (Elsebae *et al.*, 2008; Kiss *et al.*, 2014; Faridi *et al.*, 2016). Only few studies have recommended mesh use in emergency setting, where there is often surgical field contamination due to bowel involvement (Ragab, 2014; Tatar *et al.*, 2016). In the current study we investigated the outcome of mesh herinoplasty in complicated inguinal hernia when there is omentum and small intestinal resection. In the study of Ragab (Ragab, 2014) mesh repair was done for 115 patients presented with acute strangulated inguinal hernia. The patients were divided into 2 groups, 84 patients who did not required bowel resection and 31 patients who underwent bowel resection. He found no significant statistical difference in regard to wound infection and the study concluded that in strangulated inguinal hernia intestinal resection can not be considered a contraindication for mesh repair.

Similar to the current study, Tatar *et al.* (2016) compared a resection group (15 patients) and a non-resection group (97 patient) using mesh repair of acutely incarcerated inguinal hernia, there was no statistical difference in regard to wound infection and seroma formation. Also in the study of Hentati *et al.* (2017) they found a similar results of SSI in mesh repair in both groups of no bowel resection and in bowel resection. In the current study the SSI occurred in 7 patients (7%), 3 patients in Group I and 4 patients in Group II with no significant difference between the two groups ($P > 0.05$). SSI was superficial and successfully managed with drainage and local wound care. No mesh infection and there was no mesh needed to be removed through the study period. The studies of Ragab (Ragab, 2014), Tatar *et al.* (2016) and Prakash *et al.*, (2017) found nearly the same low incidence of SSI which was matching with our study. Based on many medical literature reports, the administration of antibiotic therapy to patients with incarcerated inguinal hernia with intestinal strangulation and/or concomitant bowel resection decrease the risk of SSI associated with mesh implant (Yerdel *et al.*, 2001; Arianna Birindelli *et al.*, 2017). In the current study preoperative intravenous antibiotics were given to all patients and continued till the day of hospital discharge with prescription of oral antibiotics to all patients till stitch removal. Deysine (Deysine, 2017) reported that 1 gram of intravenous cefazolin administered 1 hour before surgery plus frequent irrigation of the operative field with a 80 mg gentamycin dissolved in 250 ml of normal saline solution yielded a remarkably low infection rate in elective inguinal hernia repair. In the current study, during surgery instillation of gentamycin locally into the wound with frequent saline irrigation was applied.

Mesh repair for the patients with bowel resection is not contraindicated as long as the clean-contamination of the wound was maintained during surgery (Sawayama *et al.*, 2014). In our study the operative field is protected from contamination by towels soaked in diluted povidone iodine and the resection anastomosis was done away from the operative field. The monofilament sutures are associated with lower surgical site infection rate (Isrealsson, 2013). In the current study to minimize the risk of infection, closure of skin was done using monofilament prolene. Malik and Rather (Altaf Ahmed Malik, 2018) stated that mesh herinoplasty is a safe option for incarcerated inguinal hernia repair, however patient selection is an important factors for the outcome. In the current study we excluded patients with general risk factors and patients with peritonitis or bowel perforation with frank contamination of the operative field. All of the above contributing factors may be responsible for the accepted final result of the SSI rate. Prolonged interval between the onset of incarceration and referral to the hospital increases the requirement of bowel resection significantly (Mustafa Ozbagriacik *et al.*, 2015; Kulah, 2001). The duration of incarceration more than 24 hours appears to be significant risk factors for performing intestinal resection (Ivan Peši, 2015). The current study also demonstrated that late presentation to the hospital has a significant effect on the rate of intestinal resection. Time passed from incarceration till the hospital admission was significantly higher in Group II compared to that of Group I ($P < 0.001$). We observed that late presentation to the hospital was attributed to patients unawareness, initial admission in local clinics or small hospitals that lack a specific specialist. Clinically recurrence is presented as a palpable swelling with doughy or gurgling sensation or a defect in the abdominal wall at the site of previous surgical operation.

Unfortunately recurrence means a clear failure to cure and every effort should be made to avoid this complication. During the premesh era, it was estimated that tissue inguinal hernia repairs had a 10%-30% recurrence rate and it is clear that mesh repair is superior to tissue repair (Sri Vengadesh Gopal, 2013). Recent studies revealed that the use of prolene mesh in the emergency management of strangulated inguinal hernias with bowel resection is safe with no evidence of recurrence. In the study of Hariprasad and Teerthanath Srinivasin in 2017 (Hariprasad, 2017) emergency mesh herinoplasty was performed for 38 cases of complicated inguinal hernia and there was no evidence of recurrence during 6 month months follow up. In the study of Tatar (Tatar, 2016) applied to 112 patient relapse occurred in 1 patient after 1 year. In the current study the recurrence rate was 1% and occurred in 1 patient after 1 year who was presented with a recurrent small asymptomatic hernia however he was satisfied with the final outcome. A recent study published by Shengjun *et al.*, in 2018 stated that the use of prosthetic mesh repair in the management of acutely strangulated hernias is a rational choice based on the degree of bowel necrosis and operative field contamination and concluded that the use of prosthetic mesh seems to be safe in patients with strangulated bowel without perforation (Shengjun, 2018). This is matching with the current study. Conclusion: The current study approved that mesh herinoplasty in acutely complicated inguinal hernia can be accomplished safely with favorable outcome even if associated with omentum and intestinal resection assuming that the wound was maintained in clean –contamination condition during surgery.

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