



Posterior Inguinal Wall Reinforcement after Mesh Removal for the Infected Mesh

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Authors' contributions

This work was carried out in collaboration between both authors. Author WAS designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author SY managed the analyses of the study, managed the literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

Background: Repair of an inguinal hernia either laparoscopic or open repair is one of the most common procedures worldwide. Prosthetic mesh for repair of an inguinal hernia is widely used, it decreases the rate of recurrence, and however, infection of the mesh remains one of the challenging surgical management. Definitive treatment of infected mesh is the removal of the infected mesh; the posterior inguinal wall is reinforced using cremasteric apparatus; which is used as autogenous flap reconstruction for the posterior inguinal wall.

Patients and Methods: Twelve patients were included in the study, between January 2014 to January 2018. Those patients with refractory mesh infection after open repair of an inguinal hernia, with either a sinus discharging pus or exposed mesh.

Results: All twelve patients (100%) recruited in our study get rid of their infection. Eleven patients (91%) had no recurrence after 3 years follow up, while one patient (0.08%) had a recurrence after 2 months; which was supra vesical type of an inguinal hernia. Operative time was 70±10 minutes, bleeding was minimal and no major complication was recorded.

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Conclusion: Infected mesh removal and reinforcement of the posterior inguinal wall by cremasteric apparatus as the autogenous flap is a safe and effective one-step surgical treatment for infected mesh post repair of an inguinal hernia.

Keywords: Cremasteric apparatus; inguinal hernia; reinforcement.

1. INTRODUCTION

Open versus laparoscopic repair of an inguinal hernia is one of the most common surgical procedures performed worldwide. The inguinal canal is 3.75-4 cm long, directed anteroinferiorly and medially as a cylinder at the lower abdominal wall [1]. Understanding of the anatomy and physiology of the inguinal canal improves the surgical techniques and outcomes. The synthetic mesh of various materials is widely used in the repair of inguinal hernias, it has a lower recurrence rate than primary repair, however, complications related to mesh use includes; infection, extrusion, and enterocutaneous fistula. [2] postoperative infection of the mesh is a difficult and challenging surgical task, it is usually refractory to medical treatment, and always the definite treatment necessitates mesh removal. Use of cremasteric apparatus after removal of an infected mesh is a new procedure for reinforcement of the posterior inguinal wall and decreases the rate of recurrence.

The cremasteric muscle is involuntary muscle, however, it can be contracted voluntarily, during pelvic floor exercise, or by flexing and tightening the abdominal muscles.

2. PATIENTS AND METHODS

From January 2014 to January 2018, this prospective study was conducted in Zagazig university hospitals and Saudi German hospital. Ethical committee approval and a written consent for surgery and possible complications were done. Twelve patients were recruited in our study. Those patients presented with features of persistent mesh infection; either a sinus discharging pus, or exposed mesh, however, no enterocutaneous fistulae were recorded in our study post inguinal hernia repair. Medical treatment was tried for several weeks by different antibiotics according to culture and sensitivity tests, and multiple swaps from the infected mesh. Failure of medical treatment necessitates a definitive management in the form of mesh removal. Abdominal computed tomography (CT) with oral contrast was done to exclude bowel fistulae. Prophylactic antibiotic, and in four cases

antifungal was decided by a microbiologist, who also decided follow up with antimicrobial drugs as per guidelines.

2.1 Surgical Intervention

All patients had a radiological investigation in the form of abdominal computed tomography (CT), to exclude bowel fistulae. Antibiotic is given one hour before the operation, antifungal is given for four patients and all were decided by a microbiologist. Intra operative; patients were in supine position, under general anaesthesia, the wound is reopened, gentle dissection through infected granulation tissue. Careful dissection of the cord from the infected mesh, now, the cord is freed from the underneath infected mesh. Careful removal of the stitches fixing the infected mesh to the posterior wall, gentle and blunt dissection of the infected mesh far from the posterior inguinal wall, now the infected mesh is dissected and removed.

Debridement of the necrotic tissue located in the superficial fascia, and necrotic tissue of external oblique fibres. Irrigation of the wound with isotonic solution. Now, care is taken to the cord; great care is needed during dissection of cremasteric muscle along the whole length of the cord in the inguinal canal, now the cremasteric muscle and fascia (cremasteric apparatus) are freed from cord structures, (Figs. 1- 4). Cremasteric apparatus is then incised at the distal part of the inguinal canal, at the level of external ring. Narrowing of the internal ring using one or two simple stitches by 2/0 prolene. Now the sheet of cremasteric apparatus is fixed by 2/0 prolene to the posterior inguinal wall. Closure with suction drain.

2.2 Patient's Outcome and Statistical Analysis

All values are presented as mean, median, (range), or percentage. The primary outcomes of this study were to evaluate the success and complication rates after mesh removal and cremasteric apparatus use for reinforcement of posterior inguinal wall. Continuous data were compared using the unpaired *t*-test or Mann-Whitney tests. A categorical variable was

evaluated using Chi-Square. Survival analysis was not performed, as the lesion was not life threatening condition. Statistical significance was determined a prior at ≤ 0.05 .

2.3 Microbiological Studies

Mesh related infections is one of the mesh related complications that has become

increasingly important such other mesh-related complications (seromas, adhesions, chronic severe pain, migration and rejection of the mesh) [3]. Mesh –related infections incidences after hernia repair have been reported up to 8% [4]. Swabs were taken from infected mesh sites for culture and sensitivity. Specimen swabs are cultured on ordinary bacteriological media (Blood agar, Chocolate agar and McConkey agar).



Fig. 1. Mesh dissection



Fig. 2. Cremasteric apparatus



Fig. 3. Cremasteric apparatus



Fig. 4. Cremasteric apparatus

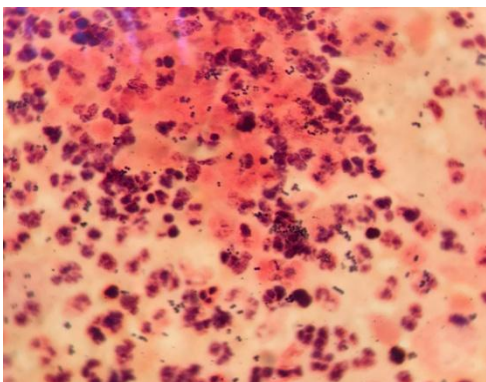


Fig. 5. Gram-stained smear showing pus cells, gram-positive cocci (*Staphylococcus aureus*)

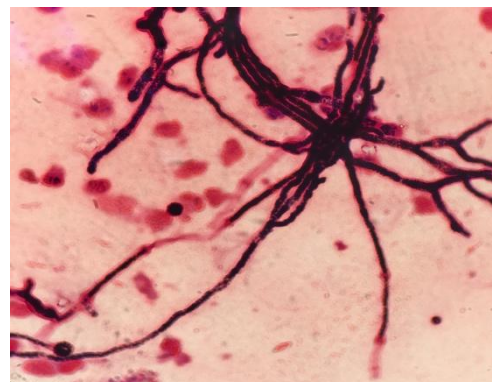


Fig. 6. Gram-stained smear showing pus cells, budding yeast cells with pseudohyphae

Two sets were made for each sample swabs. One incubated aerobically at 37°C, 5% Co2 for 48 hours, other incubated anaerobic ally at 37°C for 5 days. The growth is identified by ordinary bacteriological methods (colony morphology, gram stain s, biochemical tests like catalase (Oxoid) and oxidase (Oxoid), Staphytec latex agglutination kit (Oxoid), and Streptococcal grouping latex kit (Biometry). Antibiotic sensitivity was done for isolated organisms by modified Kirby Bauer method using CLSI guidelines 2017. Staphylococcus aureus isolated from 5 patients (42%) (Fig. 5), three of them were methicillin-resistant Staphylococcus aureus (MRSA). Beta haemolytic streptococci group B were isolated from 2 patients (16%). Klebsiella pneumoniae isolated from 1 patient (8%). Mixed infection with anaerobic peptostreptococci isolated from 1 patients (8%). Candida albicans were isolated from 3 patient(25%) (Fig. 6).

3. RESULTS

Table 1 demonstrates demographic data. Male to female ratio show significant, however, no significant difference regarding the age of the patient, and the site of a hernia (right or left). Operative time was 70 ± 10 minutes (P = 0.07), bleeding was minimal, and no major complication reported, except for three patients had mild scrotal oedema for two weeks (P = 0.09). Postoperative hospital stay was 2 ± 1 days, during patients stay; follow up of the wound, scrotal edema, antimicrobial drugs, and suction drain. Drain is removed for all patients by 3rd postoperative day. After discharge; all patients had regular follow up every week for the first month, every month for three months, every three months for the first year, and every year for 2-4 years. Of our twelve patients; only one patient (0.08%) had a recurrence at the same side of the previous hernia two months after the operation, by local examination; it was supravescial type (P = 0.069).

Table 1. Preoperative patient's characters

| Sex | Male (11) | Female (1) | P value |
|-------|------------|------------|--------------|
| | | | 0.031 |
| Age | 22-58 | 32 | 0.064 |
| Right | 7 patients | 1 patients | 0.057 |
| Left | 4 patients | 0 patients | 0.059 |

4. DISCUSSION

Our study demonstrates the feasibility of one step surgical procedure to get rid of the

prosthetic infected mesh and a surgical manoeuvre using autogenous muscle flap to decrease the rate of recurrence. Infected mesh always necessitates mesh removal, bowel resection as needed, however, using a new prosthetic mesh at the same sitting for reconstruction carries infection rate 50% to 90% due to heavily contaminated wound [5].

10% to 15% of all surgical procedures is inguinal hernia repair, this means that it is the most frequent procedure [6]. Use of prosthetic mesh for reinforcement of inguinal wall significantly reduces the number of recurrences, yet it carries a number of complications; infection, exposure, and bowel perforation with enterocutaneous fistulae [7].

Little attention in literature was given to the management of infected mesh, and repair of an incisional hernia after removal of infected mesh, patients all had a wound discharging pus, with the continuous failure of medical treatment.

Hernioplasty using a prosthetic mesh aims at reinforcement of the posterior inguinal wall, so, we did not face with overlay mesh, nor mesh extrusion, this explains why we did not enter the peritoneum, with no chance of bowel injury, this is contrary to the study done by Steven R (2003), who faced a mesh extrusion, entry into peritoneum, with bowel resection [8].

Laparoscopic repair of a hernia nowadays has increased prevalence of open repair. There is doubt if the rate of infection is similar or it has a lower rate of infected mesh, yet it has a little role regarding operations for infected mesh, and for bowel fistulae [9].

Being of high incidence among surgical procedures, inguinal hernia repair has a considerable impact on quality of life, healthcare expenditure, and working disability, so, if the complication is found, we have to think about the best solution.

5. CONCLUSION

Removal of prosthetic infected mesh with the use of cremasteric apparatus as an autogenous flap for reconstruction and reinforcement of the posterior inguinal wall is a safe, reliable, and effective method as one step surgical procedure, for infected mesh removal and avoiding recurrence of a hernia.

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the authors.

ETHICAL APPROVAL

As per international standard or university standard, written approval of Ethics committee has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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