Endoscopic preaponeurotic mesh placement in cases of divarication of recti associated or not with midline hernia

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Background
Divarication of rectus abdominis muscle is common especially after childbirth. Usually it is asymptomatic but may be associated with backache. Its problem is mainly esthetic and managed by plastic surgeons. General surgeons are called for management of divarication if associated with hernia defects. Till now, there is no unique procedure for the optimal management of divarication of recti associated with midline hernia defects. Open surgical repair, subcutaneous endoscopic repair, and transabdominal laparoscopic repair all with or without mesh fixation could be an accepted solution.
Aim of the study
The aim of this study is to evaluate the subcutaneous endoscopic plication of the divarication of rectus abdominis muscle, repair of the hernia defect if present, and placement of preaponeurotic nonabsorbable mesh.
Patients and methods
The study is a prospective clinical trial carried out in Zagazig university hospitals in the period between March 2018 and October 2018, where endoscopic placement of nonabsorbable prolene mesh on the anterior rectus sheath after plication and repair of the defect in cases of divarication of rectus abdominis muscles associated or not with midline hernia was done.
Results
A total of 19 patients underwent endoscopic plication of rectus abdominis muscle; 12 of them had midline hernia, in whom repair of the defect was done, and the nonabsorbable mesh was placed over the anterior rectus sheath, with good outcome comparable to most studies on that topic, apart from seroma, which occurred in five cases, and prolonged operative time.
Conclusion
Preaponeurotic endoscopic technique for plication of divarication of rectus abdominis muscle and onlay mesh placement is better than open surgical management. It is a safe, reproducible, and effective alternative for patients with ventral hernias associated with divarication of rectus abdominis muscle.

Keywords:
divarication, laparoscope, repair, ventral hernia

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Introduction

The abdominal wall is an anatomical structure responsible for protection of the abdominal viscera, maintaining its position during changes in gravitational forces and increased intraabdominal pressure [1].

The anterior-lateral abdominal wall is formed by muscles that may be found symmetrically on either side of the linea alba. These are rectus abdominis muscles situated in the anterior median line and lateral flat muscles: external oblique, internal oblique and transverses abdominis muscles. It is essential for maintaining proper posture, including stabilization of the pelvis and lumbar spine [2,3].

Divarication of the rectus abdominis muscles is defined as distancing from the muscular borders in the midline greater than 2.2 cm. It is not a rare condition [4,5].

Divarication of the rectus abdominis muscles is characterized by bulging in the anterior wall of the abdomen when the patient exerts contraction of the abdominal musculature and/or increase of the intraabdominal pressure [6]. Divarication of the rectus abdominis muscles is responsible for the protrusion of abdominal wall, hernia formation, and triggering functional problems such as back pain [7].

The main complaint is esthetic, making its treatment, nowadays, performed by plastic surgeons [8]. However, if associated with hernia of the anterior abdominal wall, which is not uncommon, general surgeons are usually called upon to perform the repair, and they do not always take into consideration the abdominal wall weakness owing to divarication of the rectus abdominis muscles. The concomitant presence of divarication and the nonuse of meshes appear to be the most important factors associated with failure to repair midline hernial defects and consequent recurrence of the hernia [9].

Treatment of divarication of the rectus abdominis muscles, associated or not with abdominal wall hernias, in patients with excess skin is usually performed by a large transverse incision in the lower abdomen associated with dermolipectomy [10–12]. Plication techniques are the most commonly used and may or may not be associated with mesh placement. However, there is a group of patients in whom there is no need for dermolipectomy, in which conventional operation with midline longitudinal incision was performed. Results were unfavorable from the esthetic point of view [13,14].

Another great debate concerns the durability of the plication associated or not with midline hernias. Probably small/single defects and a short distance between both rectus aponeurosis will not require reinforcement with prosthesis and are unlikely to relapse. In contrast, multiple fascia defects, severe musculoaponeurotic laxity, and divarication more than 5 cm will certainly need the use of reinforced prosthesis [15].

Al-Qattan [15] reported 100% recurrence after longitudinal rectus muscle plication without mesh in severe musculoaponeurotic laxity after 1 year of follow-up [16].

The conventional laparoscopic technique of intraperitoneal mesh placement does not seem to solve the problem of divarication unless it is also repaired by intracorporeal or transfascial sutures. Nevertheless, the results have been questionable, and extraperitoneal alternatives have been described [17,18].

Schwarz *et al*. [19] described a hybrid technique that, through a periumbilical incision with the aid of endoscopic vision, has the retromuscular space dissected for placement of the mesh, known as MILOS.

Daes [20] have described and have used totally extraperitoneal techniques for the correction of anterior wall hernias associated with divarication of the rectus abdominis muscles. Despite very encouraging results, these procedures are more complex and require greater anatomical knowledge and laparoscopic skills than onlay techniques.

In this study, patients who experienced midline hernial defect and divarication of recti and were not in need for abdominoplasty or not willing to do were offered a subcutaneous preaponeurotic technique for plication of divarication of recti and repair of midline hernial defects with application of nonabsorbable prolene mesh.

Patients and methods

This study is a prospective clinical trial that was carried out in Zagazig University Hospital in the period between March 2018 and October 2018, where 19 patients with divarication of recti with or without midline hernia were subjected to laparoscopic plication of recti muscles, fixation of onlay mesh, and repair of hernia defect if present. Approved by the ethical committee of the faculty, all patients were informed and consented.

Patients included were those who experienced divarication of recti, with or without midline hernia, and not willing to do abdominoplasty.

Patients excluded were those who were not fit for general anesthesia, had impaired coagulation profile, had liver cell failure, had renal failure, had heart failure, had previous surgery for ventral hernia, had large hernia defects, had incisional hernia, and those who were asking for abdominoplasty.

Technique

After proper diagnosis of the condition and proper preoperative investigations and patient consenting, patients underwent the procedure under general anesthesia. They were placed in supine position with legs separated apart. Skin preparation was done, and the patient was draped. The surgeons stood in between the patient's legs, and an assistant stood on the left or right sides according to preference.

A suprapubic transverse incision 2 cm length was done with dissection of the subcutaneous tissue down to the rectus sheath aponeurosis. Creation of preaponeurotic space was carried out by combined blunt and sharp dissection using finger and monopolar diathermy with the aid of Langenbeck retractors, and then a purse-string suture was taken in the subcutaneous tissue to hold the optic port and prevent CO_2 leak.

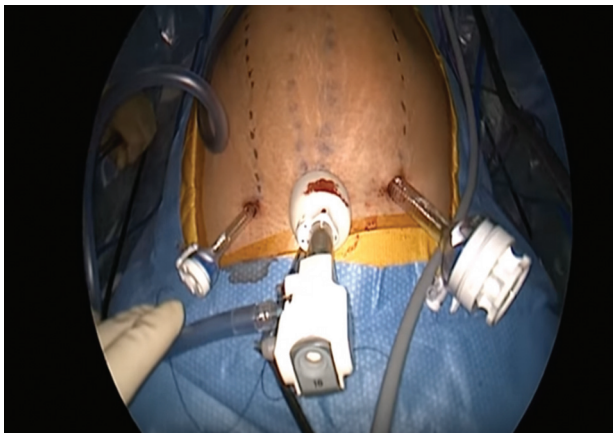
An 11-mm port was inserted and fixed in position with the purse-string suture. Insufflation of the prepared space was done with CO_2, at pressure 10–12 mmHg. A 10-mm, zero angle telescope was inserted. Two working 5-mm ports were inserted under vision at 5–6 cm apart from the suprapubic port (Fig. 1).

Separation of the subcutaneous tissue from the aponeurosis was carried out by monopolar cautery, using hook, scissors, and Maryland graspers for control of bleeding vessels. The limit of dissection was the midclavicular lines on both sides and just below xiphoid process. The umbilical cicatrix was released, and hernia sac if present was dissected around.

A defect, if present, was closed by nonabsorbable suture (Fig. 2). Plication of the recti was carried out using prolene zero (Fig. 3), from just below the xiphoid process to 2–3 cm below the umbilicus. The cavity was washed out by sterile saline. A nonabsorbable mesh was applied and fixed to the aponeurosis from just below the xiphoid process to 3 cm below the umbilicus and 4 cm on each side by prolene sutures (Fig. 3).

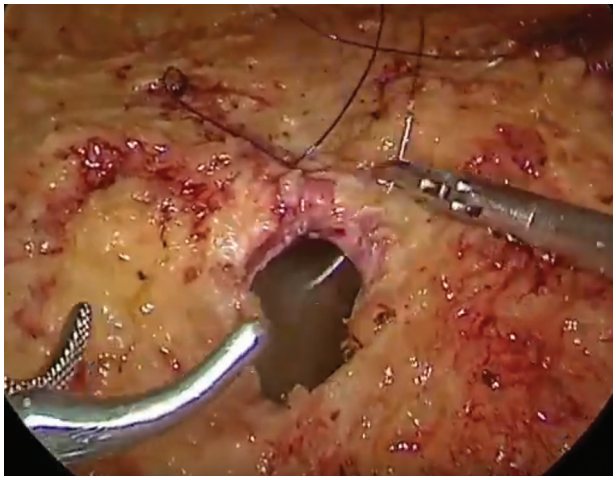
The prolene mesh was applied and fixed with prolene zero sutures (Fig. 4). The umbilical cicatrix was fixed at

Figure 1



Port position.

Figure 2

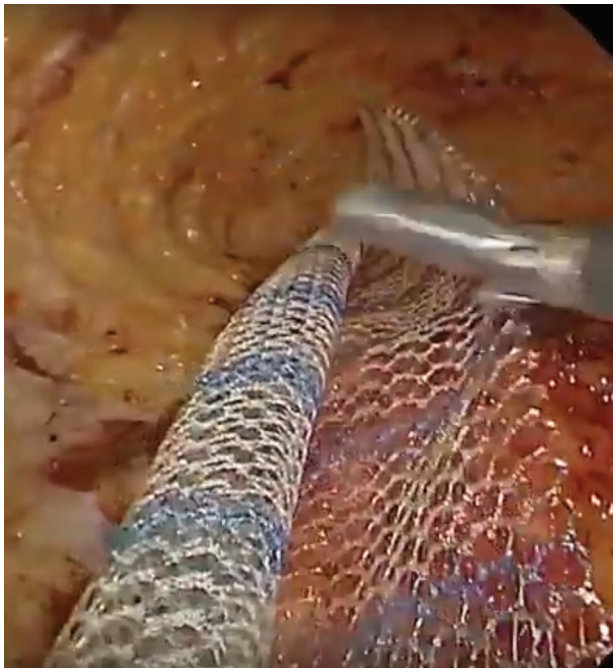


Closure of the hernia defect.

Figure 3

Plication of recti muscles.

Figure 4



Mesh application.

the midline by absorbable suture, and the cavity was drained by closed suction drain system.

Follow up

The patients were followed up for a period of 12 months, and all data regarding patient characteristics, operative findings, and postoperative follow-up were collected for analysis.

Results

A total of 19 patients underwent endoscopic plication of abdominal recti muscles, and repair of hernia defect, if present, for treatment of divarication of abdominal recti muscles associated or not with hernia defect. Of those patients, four were male and 15 female. The mean±SD age was 35.94±7.23 years, and range was 26–49 years. Mean±SD BMI was 28.78±1.93, and range was 25 to 32 years. One case was diabetic, and hernia presented in 12 (63.1%) cases, all being primary. The mean±SD hernia size was 2.1±0.44, and the range was 1.5–3. The mean±SD divarication distance was 5.42±1.3 and ranged from 3 to 8 cm, as shown in Table 1.

All cases were completed by a laparoscope, without conversion. The mean±SD operative time was 131.57 ±13.23 min., ranging from 110 and 160 min. Midline hernia repair was done in 12 (63.1%) cases. Prolene mesh was fixed on the anterior rectus sheath with prolene suture in all cases. The space was drained with suction drain.

Mean±SD hospital stay was 31.47±7.21 hours, and the range was 24 and 48 h.

The mean±SD follow-up time was 8.94±2.14 months, ranging between 5 and 12 months. The drainage time ranged between 11and 17 days, with mean±SD of 14.31±1.91.

Seroma occurred in five (26.3%) cases: one resolved after one-time aspiration, other three of them resolved after three aspirations, and the last one needed five times aspiration to resolve. In the follow-up period, no recurrence was recorded, but one case of wound infection was resolved after systemic antibiotic administration. These are presented in Table 2.

Discussion

The increase in the intraabdominal pressure is the main cause of divarication of rectus abdominis muscle [21]. Pregnancy is the most common cause, and divarication persists in ~30% of patients [5].

The main complaint of patients with divarication of rectus abdominis muscle is the changed shape of the abdomen. So surgical repair is generally considered an esthetic issue and is mainly done by plastic surgeons. Divarication of rectus abdominis muscle is associated with midline abdominal hernia in many cases. If this condition is encountered, management is carried out by general surgeons. There are many options for management of divarication of rectus abdominis muscle, including physiotherapy [5], the results of which are not encouraging and may be implicated as adjuvant therapy of the surgical management [22].

Different and wide varieties of surgical intervention for divarication of recti exist; the plastic surgeons prefer to do plication with dermolipectomy with or without mesh fixation [5].

Open technique for plication and repair of midline hernia defects, although effective in the repair and has a low recurrence but are associated with prolonged hospital stay, increased postoperative pain and increased rate of infection and seroma formation. Köhler stated that patients with midline hernia with or without divarication of recti will definitely benefit from mesh hernioplasty and rate of recurrence in nonmesh repair is associated with 10-fold recurrence rate over mesh repair [1,23].

Preperitoneal prolene mesh offered by Bezama Murray *et al*. [24] in 2009, under epidural anesthesia, had good cosmetic results and low cost. This technique would be recommended for patients with a less than 3-cm divarication of recti [25] but needs an expert surgeon [5].

Table 1 Demographic and clinical data

Male	4
Female	15
Age [mean±SD (range)] (years)	35.94±7.23, range 26–49
BMI [mean±SD (range)] (years)	28.78±1.93, range 25–32
Divarication with hernia	12
Divarication without hernia	7

Table 2 Operative and follow-up data

Male	4
Female	15
Age [mean±SD (range)] (years)	35.94±7.23, range 26–49
BMI	28.78±1.93, range 25 to 32
Divarication with hernia	12
Divarication without hernia	7

Laparoscopic plication with transfascial sutures and intraperitoneal meshes is also an option of minimally invasive techniques with low rate of seroma formation. Reinforcement with an intraperitoneal mesh carries risks such as laparoscopic access and use of intracavitary prosthesis and its fixation media (like intestinal lesions, adherences and intestinal obstruction), postoperative neuralgias, and in many cases the patient feels unsatisfied because of the cosmetic results at the immediate postoperative period [26–28].

Juárez Muas [29] presented endoscopic component separation for a nontension midline closure in large linea alba defects where edges apposition is difficult.

In our study, we avoided the drawbacks of laparoscopy by doing preaponeurotic dissection. Endoscopic surgery allows us to perform a dissection with good hemostasis, control of perforating vessels, washing, and aspiration of devitalized fat tissue before placing the prosthesis.

We applied nonabsorbable mesh in the 19 patients of the study. All had divarication of recti and 12 of them had a primary midline hernia. The mean±SD operative time was 131.57±13.23 min., ranging between 110 and 160 min, which started longer than average, but improved with the progress of the study. The work portals placed on the plication axis and mesh fixation, which are performed on the 'floor' of the operative field, allow the sutures to be performed easily by laparoscopy. In the impression that the authors of this study had longer operative time, we can say 'the use of barbed sutures is very beneficial in mesh fixation than prolene sutures.'The hospital stay time was 31.47 ±7.21 h, which is near to the results of Juárez Muas [29].

Rate of seroma formation was 26.3%, which is slightly less than some studies such as that of Claus CMP [5]. This is attributed to the systematic use of drainages, and the use of corset from the time of the surgery. Seroma was also noticed to be related to the duration of drainage, as it was high in short-time drainage. Schwarz *et al.* [19] described a hybrid technique, through a periumbilical incision with the aid of endoscopic vision. They placed the mesh in the retromuscular space with lower seroma rate.

Through avoiding mesh contact with skin and using antibiotics before and after surgery, we reduced the infection risks. We have only one case superficial wound infection.

Low back pain disappeared in 100% of patients between 7 and 30 days postoperatively. Hypoesthesia is a manifestation that occurs in 100% of patients in the immediate postoperative period. The total recovery of skin sensitivity occurs from the periphery to the umbilical region between 2 and 6 months after surgery.

Despite short follow-up time, we reported zero recurrence, no skin contractions, or reflections. The main goal of this surgical procedure is the permanent repair of hernias, restoring the anatomical midline, and prioritizing the functional aspect over the esthetic one. A new series and long-term results are needed. However, it seems good option for patients without indication of dermolipectomy.

Conclusion

Preaponeurotic endoscopic technique for plication of divarication of rectus abdominis muscle and onlay mesh placement is superior to open conventional surgery regarding cosmesis, postoperative pain, rate of complications, and overall cost, so it is a reproducible and effective alternative for patients with ventral hernias associated with divarication of rectus abdominis muscle.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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