Robot-assisted treatment of epigastric hernias with a suprapubic approach

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Abstract

Background

Robotic ventral hernia repair has shown itself to be feasible and safe in abdominal wall surgery. Presently, the ports are commonly placed laterally to meet the distance from the fascial defect. The aim of our study is to reort our experience of epigastric hernias treatment with the trocars' insertion in the suprapubic region.

Methods

A retrospective search on a prospectively collected dataset was performed to identify patients treated for primary or incisional hernias of the epigastric region with a robotic-assisted approach. In all cases, three 8-mm trocars were inserted in the suprapubic area and the preperitoneal or the posterior rectus sheath spaces dissected to ensure a proper mesh overlap. After hernia reduction, the fascia was closed with a running suture, the mesh placed and the peritoneum sutured.

Results

Twelve patients were selected. Median age was 58.5 years (interquartile range (IQR) 47.8–67.3) and four patients were male (33.3%). All patients were referred to surgery because of pain. The median measure of the hernia defect was 30 mm (IQR 13.75-31), median larger mesh diameter was 13.5 cm (IQR 9.5–15.0) and median operative time was 136.5 minutes (IQR 120-186.5). No intraoperative complication or conversion to open surgery occurred. Postoperatively, two patients presented a seroma and the median length of hospital stay was 2.0 days (IQR 1.75-3).

Conclusions

In the robot-assisted treatment of hernias of the epigastric region, a suprapubic port placement can be considered instead of a lateral one. Further studies are needed to assess the benefits and limitations of such technique.

Trial registration

Retrospectively registered (Comitato Etico Cantonale Ticino n. 2019-01132 CE3495)

1.0 Background

Robotic ventral hernia repair has shown itself to be feasible and safe in abdominal wall surgery [1].

Presently, the port placement depends on the location of the defect and on the surgeon's experience. In most described techniques, the trocars are placed in the lateral abdomen to meet the distance from the fascial defect [2–8]. In this work, we describe our experience with the trocars' insertion in the suprapubic region when treating hernias of the epigastric region.

2.0 Methods

2.1 Patients' inclusion

A *retrospective search on a prospectively collected dataset was performed to identify patients treated for primary or incisional hernias of the epigastric region with a robotic-assisted approach over a 2-years period, from April 2018 to March 2020. Epigastric hernias were defined as bulges situated above the transverse umbilical line within the rectus abdominis space.*

The dataset included demographic and clinical records such as age and sex, past medical history, hernia etiology, symptoms, dimension of the hernia and the mesh, operative times, conversion rate, length of hospital stay and complications (Table 1).

Descriptive statistics were presented as absolute frequencies and percentage for categorical variables and median with interquartile ranges (IQR) for continuous variables.

2.2 Surgical technique

The patient is in supine position, the adjustable lower section of the table is bent to some degrees in order to avoid conflicts between the thighs and the robotic camera and instruments. The pneumoperitoneum is established inserting a Veress needle into the left upper abdomen under the costal margin.

Afterwards, three 8 mm trocars are inserted in the suprapubic area, ideally 8 cm distant from each other on a straight line, whereas, in patients with a narrow pelvis the distance can be reduced to 6 cm and the two lateral trocars can be placed somewhat cranially (Figure 1).

It is recommendable to first insert one of the lateral trocars to avoid struggle due to the median umbilical fold and a thick preperitoneal fat tissue. Once the first trocar has been placed, the other two can be inserted under camera view. The robot Da Vinci Xi is docked from the right side, the camera is used 30° up, bipolar forceps and hot shears are introduced.

The hernia defect can now be evaluated. The transverse peritoneal incision, respectively peritoneum and posterior rectus sheath in case of sublay mesh placement, should be made at least 5 cm caudally the inferior hernia border in order to ensure a proper mesh overlap.

When choosing a preperitoneal mesh repair, it is useful to dissect leaving the preperitoneal fat adherent to the peritoneum, that would otherwise tear. The hernia sack is reduced and, once dissected the preperitoneal plan at least 5 cm in all directions around the hernia defect, the fascia is closed with a continuous suture using a V-Loc 0 (Covidien).

After being cut to the required size and shape to cover the hernia defect as above described, the mesh is rolled and a knot is placed in its middle. After insertion, the rolled mesh is placed along the cranial line of dissection, fixed with one stitch (Vicryl 3-0) and then enrolled from the distance to the camera. The mesh is finally fixed to the anterior wall with further 3 Vicryl 3-0 stiches and the peritoneum is closed with a continuous suture using V-Loc 3-0.

When choosing a sublay mesh repair, the transverse incision is so made, that the peritoneum and posterior rectus sheath are prepared “en bloc” from the rectus muscle on both sides. In the midline, the preperitoneal fat is left adherent to the peritoneum. After the reduction of the hernia sack, the sublay space is dissected at least 5 cm in all directions around the hernia defect. Fascia closure, mesh shaping, introduction and fixation resemble those of the preperitoneal technique. To close the transverse incision, the continuous suture with V-Loc 0 incorporates the peritoneum and the posterior rectus sheath together. Video 1.

3.0 Results

Twelve patients were selected from the prospectively collected database. Median age was 58.5 years (IQR 47.8–67.3) and four patients were male (33.3%). Two patients had hypertension (16.6%), one cardiac history (8.3%), one chronic renal failure (8.3%) and two malignancy (16.7%). All patients were referred to surgery because of pain and none of them described recurrent episodes of bowel obstruction.

The median measure of the hernia defect was 30 mm (IQR 13.7–31.0), the median larger diameter mesh was 13.5 cm (IQR 9.5–15.0), the median mesh area was 135 cm^2 (IQR 72–199) and the median operative time was 136.5 minutes (IQR 120.0-186.5). No intraoperative complication occurred and no conversion to open surgery was required.

Postoperatively, two patients presented a seroma. One of them was treated with a one-step needle aspiration and the other one resolved spontaneously. Only a patient had a prolonged postoperative pain, which required analgesics and resolved within a month after the operation. The median length of hospital stay was 2.0 days (IQR 1.7-3.0). Details are reported in Table 1.

4.0 Discussion

Since the first report on laparoscopic ventral hernia repair in 1993 [9], the video-assisted approach in the treatment of ventral hernias has gained attention in order to achieve an ideal abdominal wall reconstruction with the advantages of minimally invasive surgery.

The arguments speaking for the laparoscopic approach are mainly lower postoperative pain, shorter hospitalization and faster recovery after surgery [10–13]. Consequently, laparoscopic intraperitoneal onlay mesh (IPOM) repair has become a popular surgical technique for the treatment of ventral hernias. With the increasing popularity of robotic surgery, many techniques have been described to combine the benefits of open hernia surgery and minimally-invasive approach [14]. In fact, thanks to the robotic 3D visualisation and instrumentation, maneuvers as component separation, fascial closure, mesh suturing and, if needed, transversus abdominis release are technically feasible and safe, so that a preperitoneal or retromuscular hernia repair with mesh placement is achievable also in minimally-invasive surgery.

Since the first report of robot-assisted modified Rives/Stoppa for the treatment of midline hernias in 2012 [15], several further series have been published [2–8, 16–22]. When the port placement sites are described, the trocars are inserted quite lateral through the abdominal wall, in order to enable the necessary working space and, in large hernias, perform a double-docking. Only Sharbaugh et al. [7] describe an “inferior port placement” for the treatment of epigastric hernias. However, in robot-assisted colon surgery, the suprapubic approach has already been extensively described for complete mesocolic excision in right colectomy [23–26]. Finally, worth to mention is the work by

Costa et al. about the laparoscopic treatment of midline hernias with defect closure and retromuscular mesh placement through a suprapubic port placement. [27].

In our work, we report on 12 patients affected by hernias of the epigastric region who were successfully treated with robot-assisted abdominal wall surgery inserting the ports in the suprapubic region. As we switched from the lateral to the suprapubic approach, we observed some advantages. First, the orientation of the surgical field is modified and, in our opinion, enhanced having the linea alba over the midline of the camera (Fig. 2). In case of subxiphoid hernias, the dissection of the preperitoneal space under the diaphragm is pretty facilitated, so that a proper mesh overlap can be cranially achieved (Fig. 3). The main topic is of course the lateral overlapping in large hernias, which leads to a double-docking. Through the suprapubic approach, the side view of the operative field is so enlarged, that a broad mesh can be placed with a single-docking. Finally, we find that the aesthetic side of the suprapubic port placement can be interesting in young patients affected from a primary hernia.

Unfortunately, the suprapubic approach has a major limitation. Hernias of the lower abdomen cannot be treated. In our series, we operated on three patients with combined epigastric and umbilical hernias. However, when the defect reaches a few cm. below the umbilicus, the distance between the ports and the transverse incision starts to get limited and the technique becomes less feasible.

This study has many limitations. In fact, we present a retrospective case series with a small number of patients and inherent bias. Nevertheless, we thought it would be interesting to share our experience and remarks about this technique, whose benefits and limitations should be further investigated in large trials.

5.0 Conclusions

In the robot-assisted treatment of hernias of the epigastric region, a suprapubic port placement can be considered instead of a lateral one. Further studies are needed to assess the benefits and limitations of such technique.

Abbreviations

IQR: interquartile ranges.

Declarations

Ethics approval and consent to participate: Written non-opposition consents were administered to patients and the local ethical committee approved the study (Comitato Etico Cantonale Ticino n. 2019-01132 CE 3495).

Consent for publication: Written non-opposition consents were obtained from all patients for publication.

Availability of data and materials: The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests: The authors declare that they have no competing interests.

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Authors' contributions: protocol/project development: RP, MDG, DLR. Data acquisition and interpretation: JMAT, FM, MM. Statistical analysis: FM, SS. Manuscript drafting: RP, MDG, DLR, JMAT. Manuscript revision and accountable for all aspects of the work: FM, SS, MM. All authors approved the final version of the manuscript.

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Tables

Table 1: Patients' characteristics

Age (years)	*Gender*	*Side*	Type of surgery	*Comorbidities*	*Etiology*	*Hernia diameter (mm)*	*Mesh dimension (cm)*	*Operative time (min)*	*Postoperative complications*
64	*Male*	*Epigastric*	*rTAPP*	*Immunosuppression*	*Incisional*	*40*	*15x14 cm (210 cm^2)*	*249*	*None*
57	*Female*	*Epigastric*	*rTAPP*	*None*	*Incisional*	*30*	*8x6 cm (48 cm^2)*	*140*	*None*
38	*Female*	*Epigastric*	*rTAPP*	*None*	Primary	*10*	*6x6 cm (36 cm^2)*	*175*	*None*
51	*Female*	*Epigastric*	*rTAPP*	*Breast Cancer*	*Incisional*	*10*	*6x6 cm (36 cm^2)*	*122*	*None*
31	*Female*	*Epigastric*	*rTAPP*	*None*	Primary	*30*	*10x8 cm (80 cm^2)*	*110*	*None*
54	*Female*	*Umbilical and Epigastric*	*rTAPP*	*Hypertension, chronic renal failure,* active smoking, dyslipidemia	Primary	*15*	*15x10 cm (150 cm^2)*	*120*	*None*
67	*Male*	*Epigastric*	*rTARM*	*Hypertension*	*Incisional*	*55*	*28x20 cm (560 cm^2)*	*275*	*None*
60	*Male*	*Umbilical and Epigastric*	*rTAPP*	Lymphoma	*Incisional*	*30*	*15x13 cm (195 cm^2)*	*221*	*None*
72	*Female*	*Epigastric*	*rTAPP*	*None*	*Incisional*	*20*	*12x10 cm (120 cm^2)*	*174*	*None*
68	*Female*	*Epigastric*	*rTAPP*	*None*	Primary	*8*	*10x10 cm (100 cm^2)*	*87*	*Seroma*
30	*Female*	*Umbilical and Epigastric*	rTARM	*None*	Primary	*30*	*25x15 cm (275 cm^2)*	*133*	*None*
82	*Male*	*Epigastric*	*rTAPP*	Ischemic cardiomyopathy	*Incisional*	*35*	*15x10 cm (150 cm^2)*	*120*	*Seroma*

rTAPP: Robotic Transabdominal Preperitoneal. rTARM: Robotic TransAbdominal RetroMuscolar.

Figures

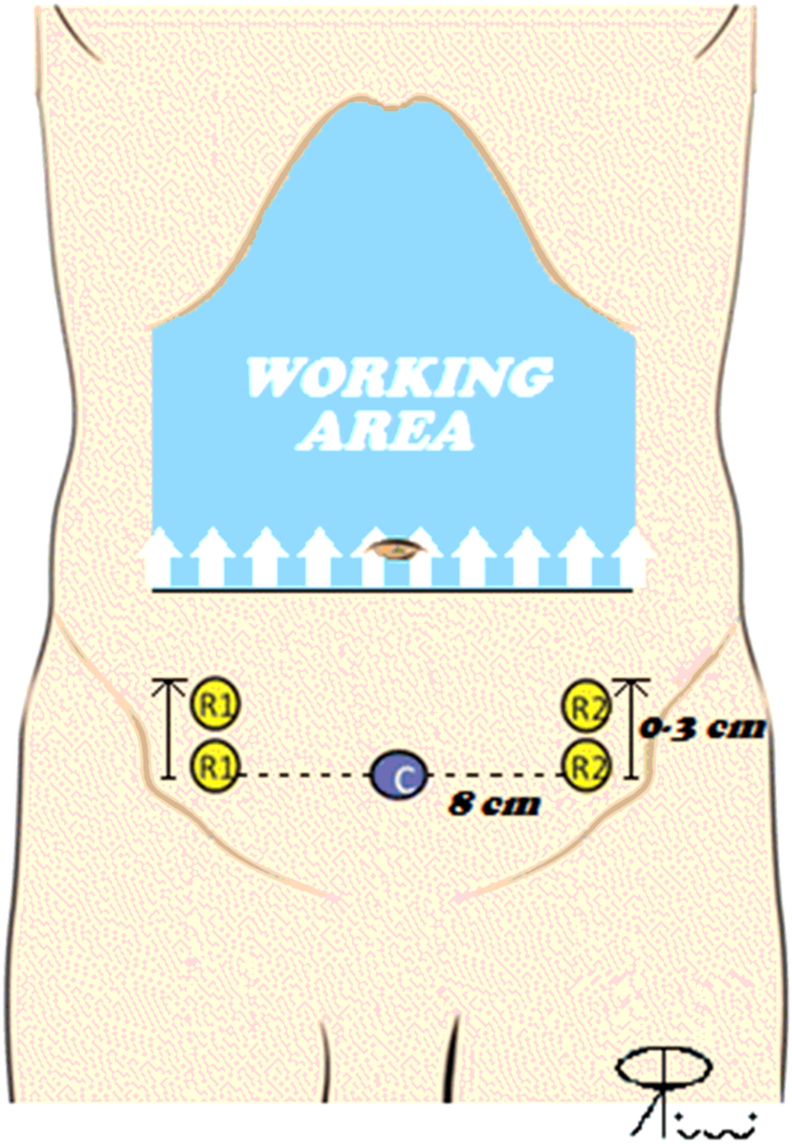

Figure 1

Placement of the three 8 mm trocars in the suprapubic area.

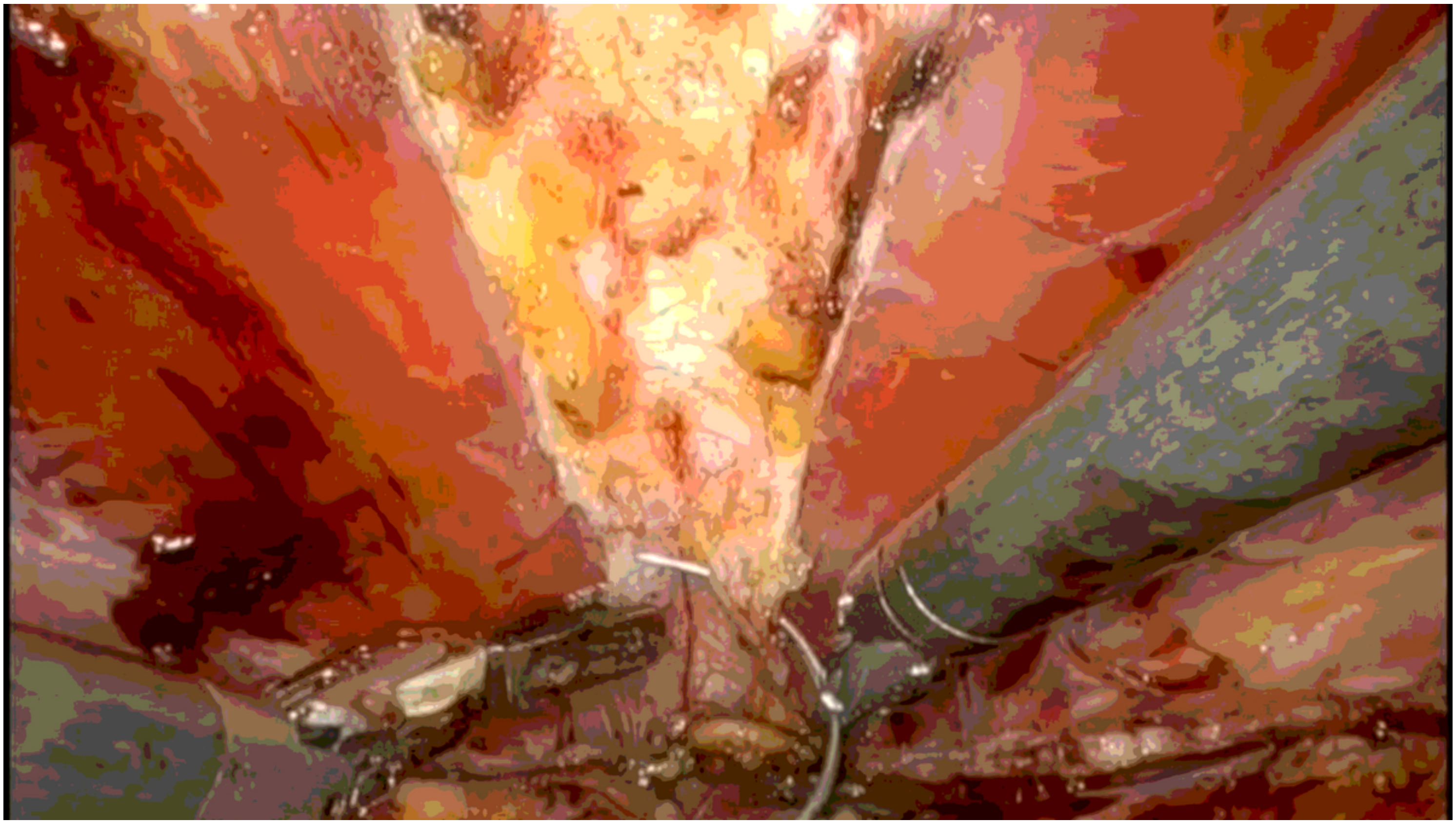

Figure 2

Intraoperative view showing the suturing of the linea alba.

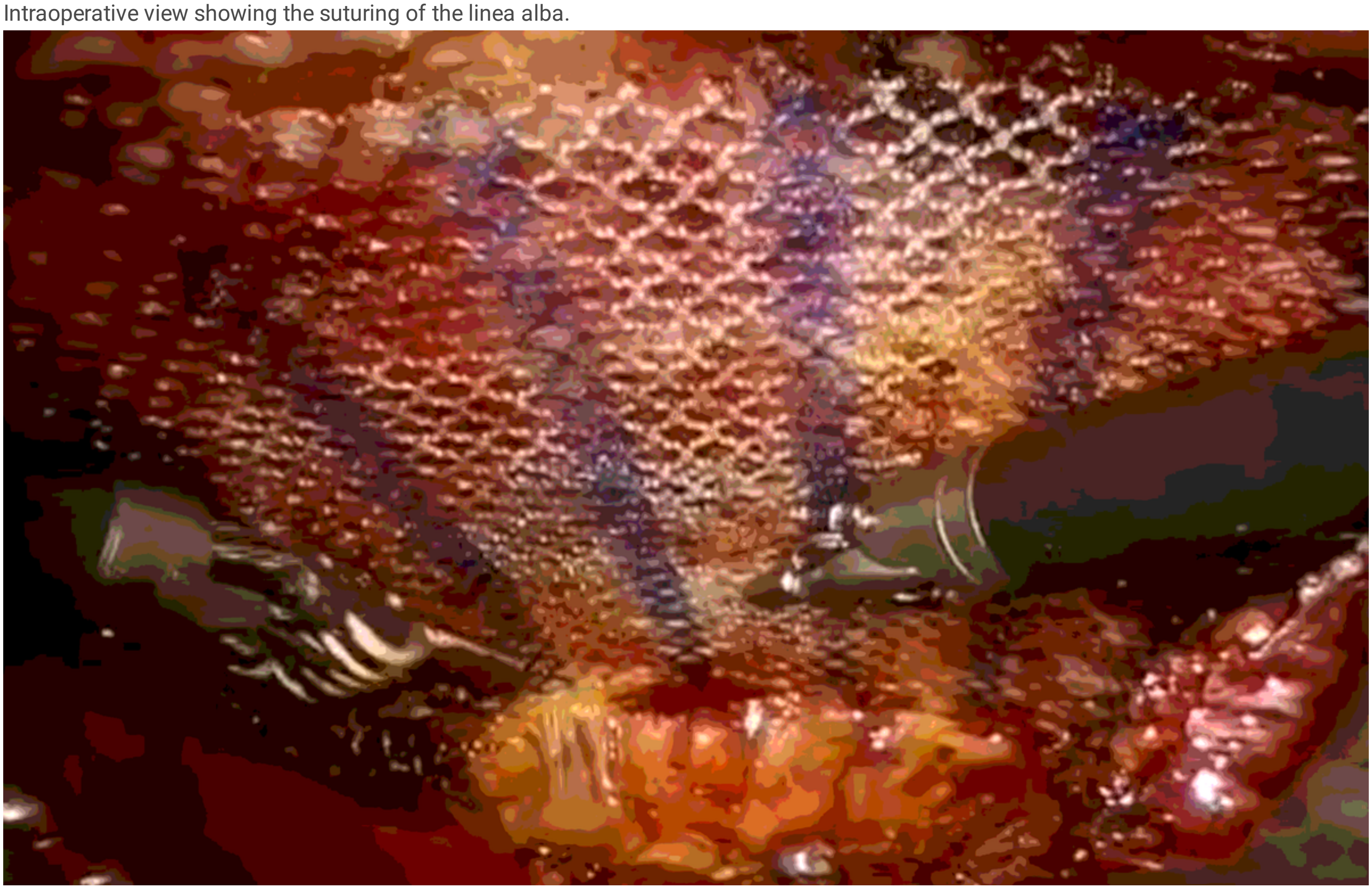

Figure 3

Intraoperative view showing the preperitoneal mesh placement.

Supplementary Files

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- Video1.mp4