

Lecture

The use of eTEP hernioplasty in the treatment of ventral hernias

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Abstract: This article is devoted to one of the methods of treatment of ventral hernias, namely eTEP hernioplasty (Enhanced-view Totally Extraperitoneal Technique). The purpose of the work is a comprehensive review of the surgical technology, comparison of technologies proposed by various authors and highlighting the features of the endoscopic anatomy of the anterior abdominal wall and of the surgical techniques. After that we collected data on the long-term results from these authors, and based on them concluded that all the presented techniques were acceptable and safety. However, to date, in our opinion, insufficient attention has been paid to two aspects of this operation, namely fixation of the prosthesis and drainage of the retromuscular space. It is also worth noting that the issue of specific endoscopic anatomy of the anterior abdominal wall in the aspect of surgical treatment of ventral hernias is discussed by a small number of authors, while the same anatomical landmarks may have different names. In this work, we have combined all the best practices and suggestions from the authors of publications on this topic. This work was presented at 1st Congress of International Society for Clinical Physiology and Pathology (ISCPP 2023).

Keywords: ventral hernia, surgery, extended totally extraperitoneal, hernioplasty, laparoscopy, long-term outcomes

1. Introduction

Surgery of the anterolateral abdominal wall hernias has undergone revolutionary changes from plastic surgery with local tissue to minimally invasive laparoscopic and extraperitoneal treatment methods using mesh implants.

We consider eTEP hernioplasty (Enhanced-view Totally Extraperitoneal Technique) to be one of the promising methods for treating ventral hernia. The eTEP hernioplasty method was proposed less than 15 years ago and during this time has already been introduced in medical institutions in many countries around the world. The essence of the operation is dissection of the retromuscular space and augmentation of the anterior abdominal wall by suturing the hernia defect and installing a mesh implant retromuscularly.

2. Patients and Methods

We aimed to conduct an analysis that could help improve the results of eTEP hernioplasty in the treatment of ventral hernias by identifying the most effective surgical techniques for performing the operation.

The first work with a detailed description of eTEP-hernioplasty technique of a ventral hernia was written by I. Belyansky, who published impressive results of performing eTEP-hernioplasty of a ventral hernia according to Rives-Stoppa with posterior separation according to Y. Novitsky in 2016 on the example of three patients with complex ventral hernias with numerous large fascial defects and deformations of the abdominal wall, which necessitated access through the abdominal cavity. In 2018, he was also the first to publish a paper describing the technique for performing the eTEP Rives-Stoppa procedure with direct access to the retromuscular space.

3. Results

The author's publications highlight several technical points that must be observed for the best result [3, 4]:

1. To facilitate dissection in the retrorectal space laterally towards the linea semilunaris, the free edge of the posterior layer of the rectus sheath is retracted medially using atraumatic clamps.



2. During dissection of the retromuscular space, it is necessary to visualize the deep inferior epigastric artery, which runs along the posterior caudal aspect of the rectus abdominis muscle.

3. The neurovascular bundles that pass between the internal oblique and transverse muscles, and then perforate the rectus abdominis muscle (usually 5-6 pieces on each side), are an anatomical landmark, because are located at the lateral edge of the rectus muscle, and therefore are the lateral border of dissection. They must be preserved to prevent dysfunction and atrophy of the rectus abdominis muscle. During insufflation, previously horizontally oriented vessels are pulled upward, which is why this landmark was called the “lamp post sign” in the study by Ramana [16].

4. When suturing the anterior layer of the rectus abdominis sheath - if there is a large so-called “dead” space in the subcutaneous tissue - after reduction of the hernial sac, incisions are made in the dermis to create skin folds, and this prevents postoperative deformation and the formation of seroma.

The authors describing their experience in treating a ventral hernia using this technology are unanimous in the issue of the patient’s position on the operating table, as well as in the adoption of anatomical landmarks for installing ports and lateral boundaries of dissection, with the exception of Kumar [6], who presented a modification of the operation in 2021 using 3 ports instead of 4, but subsequently the technology for performing the operation remains without fundamental changes relative to the one proposed by Belyansky.

Ramana [16] in his work described the above-mentioned “lamppost sign” and a number of other important anatomical landmarks:

1. “Volcano sign” - after performing a crossover during treatment of the hernial sac, the latter, due to insufflation into the retromuscular space, takes on the appearance described in the work as “edges of a volcano”; we propose the translation “slopes of a volcano”. During preperitoneal dissection between the posterior layers of the rectus abdominis muscle sheaths, the hernial contents are compared to magma, and the overall picture looks like a volcanic eruption.

2. “Mercedes-Benz sign” - a diagram of the relationship between the vas deferens, lower epigastric and gonadal vessels in the preperitoneal tissue of the groin area; the same as the “inverted Y” in the work of Furtado [5] in relation to the surgical treatment of inguinal hernias;

3. “Frenulum sign” - this is how the connection of the upper edges of the posterior layer of the rectus sheath with the xiphoid process is described; these “frenulum” must be crossed to completely unite the two retromuscular spaces when the hernia is localized M1 and M2 in order to avoid recurrence of the hernia in this area.

Table 1. Summary data on the results of eTEP hernioplasty by various authors.

Author	Number of patients	Observation period, month	Average area of hernia defect, cm2	S of mesh, cm2	Length of operation, minutes	Length of stay, days	Complications
Andreuccetti J, 2021	19	24	21	380	171	3,9	1 seroma 1 early adhesive intestinal obstruction
Baig SJ, 2019	21	2	45,33	25x20 eTEP RS 30x30 eTAR	176	-	1 seroma 1 divergence of the anterior sheath 1 hernia recurrence 1 chronic pain syndrome
Belyansky I, 2018	37	1	-	-	198	1	2 seromas 1 adhesive intestinal obstruction (1 month)
Burdakov VA, 2019	150	12	-	502,8	109,2	4,6	1 aneurysm of MCA uptake 2 retromuscular haematoma 3 seromas with symptoms 4 chronic pain syndromes 1 conversion (peritoneal injury)
Köhler G, 2019	31	8	34,5 (3.6-64)	420 (144-600)	128 (81-221)	3	1 surgical site infection 1 eventration with strangulation of the small intestine



Kopteev NR, 2022	58	24	51,0+63,5	468+212	156+63,6	4,03	in the preperitoneal tissue (reoperation, 5 days after operation) 4 seromas 1 retromuscular haematoma 4 seromas (3 subcutaneous, 1 retromuscular), 1 incompetence of the suture of the posterior sheath of the rectus abdominis muscle (IPOM, 10 day after operation)
Lu R, 2019 (lap-eRS)	120	6	5,5	526.3+294.7	120,4	1	1 intestinal obstruction (resection of bowel, 26 day after operation) 2 hernia recurrence 4 retromuscular seromas 3 haematoma 1 hernia recurrence 2 seromas 1 haematoma
Lu R, 2019 (robo-eRS)	86	6	7,1	507.5 ± 178.6	174,7	1	1 early adhesive intestinal obstruction 10 seromas 4 haemaoma 1 surgical site infection 4 seromas with symptoms 1 hernia recurrence
Mitura K, 2023	11	7	38.5 (16.5–96.0)	486 (280–590)	204 (158–295)	3.4	1 retromuscular haematoma 1 small bowel perforation
Morrell A, 2020	74	8	5,6 cm (width!)	456.5 (150–630)	174.4 (66–301)	1,5	1 retromuscular haematoma 1 small bowel perforation
Orlov BB, 2022	202	1	-	-	180	5	1 subcutaneous haematoma 1 small bowel perforation
Penchev D, 2019	27	1	71.4+47.1	428.4+220.6	186+62	2,9	none
Prakhar G, 2020	171	6	51.35	397.56+208.83	176.75+62.42	2.18	7 paralytic ileus 5 surgical site infection 3 hernia recurrence 4 conversion 1 seroma 2 chronic pain syndrome
Radu VG, 2020	60	15	99.5 (6-375)	28x17	140-290	-	1 seroma 2 chronic pain syndrome
Rajkiran K, 2019	24	6	to 7 cm (width!)	15x15 or 30x30	169,8	2,16	none
Salido Fernandez S, 2020	40	10	100	400+199	126+36	1	1 early adhesive intestinal obstruction 1 small bowel perforation 1 hernia recurrence 2 incompetence of the suture of the posterior sheath of the rectus abdominis muscle
Sanna A, 2019	18	1	43.31	267.47+84.94	125.64+27.21	2.7	1 subcutaneous haematoma 2 seromas with symptoms



4. Discussion

Most authors [1, 8, 11, 12, 15, 17] agree that initial insufflation is carried out to a pressure of 12 mmHg, with the exception of Belyansky [3, 4] and Morrell [10], who recommend 15 mmHg.

Also, most authors note the convenience of reducing pressure in the cavity when tightening the suture at the stage of suturing the anterior leaf of the rectus sheath, although specific values may differ: Radu [13, 14] recommends reducing it to 5-6 mm Hg, while Morrell [10] advises stopping at 8-10 mmHg.

Opinions differ most regarding the issue of fixation of the mesh prosthesis. We, like a number of specialists - Lu [7], Mitura [8], Penchev [11] - prefer not to use any fixing devices. However, a number of authors use both the placement of the mesh without fixation and with its fixation. Axial sutures can be used, as in Kumar [6], or suturing the implant at the corners, as recommended by Prakhar [12]; the use of tackers at specific points is also mentioned - for example, by Rajkiran [15]; and fixation of the mesh with fibrin glue by Baig [2]. In the work of Sanna [17], a lightweight large-pored polypropylene mesh was secured with 8 ml of fibrin glue and additionally in the area of the pubic bone with tackers. Andreuccetti et al. [1] used in different cases both fixation with glue or staples, and placement of mesh without fixation.

Most authors drain the intervention area situationally, leaving this issue to the discretion of the operating surgeon. Possible criteria for the advisability of leaving drainage are described - for example, Prakhar [12] recommends draining the intervention area if a relatively large space has been separated or diffuse bleeding is noted. Mitura [9], Mitevski [8] and Lu [7], on the contrary, in all cases left suction drains, the drain was removed after 1-2 days. However, some authors systematically refuse to install drains - for example, Baig [2], Kumar [6] adhere to this tactic. In all cases, an abdominal bandage is fastened on the operating table, and this is considered sufficient to prevent the formation of seroma and hematoma.

5. Conclusions

Evaluating the information obtained from the analyzed sources, we came to the following conclusions:

1. eTEP hernioplasty is being performed for ventral hernias more and more often and has results comparable in effectiveness and safety to other popular methods of minimally invasive hernioplasty.
2. The issue of specific endoscopic anatomy of the anterior abdominal wall in the aspect of surgical treatment of ventral hernias is discussed by a small number of authors, while the same anatomical landmarks may have different names.
3. There is no clear opinion on the issue of fixation of the prosthesis and drainage of the retro-muscular space; more statistical data is required to form a consensus.

Application of artificial intelligence:

The article is written without the use of artificial intelligence technologies.

Author Contributions: Conceptualization, formal analysis, investigation, writing—original draft preparation, I.K.; writing—review and editing, supervision, project administration, D.T.

All authors have read and agreed to the published version of the manuscript.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

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