

THE SURGICAL TREATMENT OF INGUINAL HERNIA USING THE LAPAROSCOPIC TOTALLY EXTRA-PERITONEAL (TEP) TECHNIQUE

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Abstract

The surgical repair of inguinal hernia represents one of the most frequent procedures used in general surgery. The new surgical techniques are simpler, with a lower morbidity and recurrence of less than 2%. The laparoscopic totally extra-peritoneal (TEP) technique is contraindicated in complicated hernias (occlusion, incarceration) and in voluminous inguino-scrotal hernias.

Purpose. *the evaluation of the TEP technique, of the risk factors and of the postoperative results on the group of patients who have undergone surgery in the Surgical Clinic 2 Cluj Napoca.*

Material and method. *The study is prospective, on a group of 40 patients operated with the TEP technique in the Surgical Clinic 2 during the period May 2013 – July 2014. The following have been assessed: the demographic data, the risk factors, the immediate complications, the recurrence of the hernias.*

Results. *The average duration of hospitalization was 6.79 days. The intraoperative incidents were: 7 minimal peritoneal lesions with pneumoperitoneum and a hemorrhagic lesion of the epigastric vessels repaired endoscopically by the clipping of the lesion. There were 2 recurrences, 24 hours and 1 year after surgery, solved by the Lichtenstein technique. After 30 interventions, the average duration of the surgery was of 64 minutes, being longer in the case of bilateral hernias and being influenced by the team's learning curve.*

Conclusions. *The TEP technique is a safe option followed by a low rate of complications, a low recurrence rate and low intensity postoperative pain.*

Keywords: inguinal hernia, postoperative morbidity, surgical treatment, TEP.

Introduction

The surgical repair of inguinal hernia represents one of the most frequent procedures used in general surgery, with a number of at least 700 000 cases/year in the USA [1,2] and with approximately 30 000 cases operated on in 2010 in Korea [3]. For the surgical repair of hernia defects several techniques have been proposed which had in view

whether to use synthetic prostheses as a routine, the way the grafts are placed, as well as the anterior or posterior approach of the inguinal channel. European surgical guides consider that the Lichtenstein technique represents the golden standard in the repair of parietal inguinal defects [4,5], being known that the technique reduced the number of postoperative recurrences [6]. Recent articles opt for the use of endoscopic techniques in the repair of inguinal hernias. These are associated with a low recurrence rate and a much faster postoperative recovery. TEP (totally

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extraperitoneal) is similar in principle with the properitoneal Stoppa technique, but it offers much more benefits. It is associated with much less severe postoperative pain than the open technique, a low rate of chronic pain and much superior esthetic results. As opposed to other endoscopic techniques, TEP avoids the penetration in the peritoneal cavity and thus it is not associated with intra-abdominal complications (intestinal lesions, postoperative occlusions). The recurrence rate for this technique is described as being of 1-4% [1]. The main disadvantage remains the difficulty of the technique, associated with an increased learning curve. The surgical results depend on the experience of the surgical team especially concerning the endoscopic techniques.

Material and method

The study included patients hospitalized at the Surgical Clinic No. 2 of Cluj-Napoca with the diagnosis of inguinal hernia, for which the TEP cure of the hernia was carried out during the period May 2013 – July 2014. The study is prospective, having in view the surgical management of these patients. The data of 40 patients operated on by the TEP technique have been analyzed.

The evaluation of the patients was made on the basis of the anamnesis, the objective examination, the biological samples and the data observed during the surgical interventions. The data obtained by the clinical observations on the postoperative evolution were added to these.

In our study, the diagnosis of hernia was established clinically, at the objective examination of the patients, the other possibilities of paraclinical diagnosis (MRI, abdominal CT) not being routinely accessible. The bilateral inguinal hernias diagnosed were solved by the TEP technique bilaterally, in the same surgical session.

The statistical processing was carried out with the SPSS 17 software, with the use of the statistical Chi-Square Test; the statistical estimation was made for a minimum threshold of statistical significance $p=0.05$, corresponding to a statistical precision of 95%.

The choice of the TEP technique was influenced by the experience of the surgical team, the same surgeons carrying out all the interventions.

The surgical technique

The preoperative preparation of the patients corresponds with that in the laparoscopic interventions. Besides the usual blood samples, an ECG and a pulmonary radiograph are carried out for each patient, and for the known chronic pathologies a specialized consultation is requested.

It is mandatory that every patient be informed about the surgical technique and the possible risks, signing an informed consent form.

In our technique we use three ports: two 10 mm ones

and a 5 mm working port. The patient, in general anesthesia is positioned in supine position, in 30 ° Trendelenburg position and rotated on the side opposite to the hernia.

For the first port (optical) we adopt the “open method” and make a 12 mm incision at the inferior edge of the umbilicus, on the side of the hernia. We dissect the subcutaneous cellular tissue with the scissors and we identify the anterior rectus sheath, making a transversal incision at this level. Subsequently we penetrate in a retromuscular way and introduce a 10 mm trocar with a balloon, which allows the extension of the dissection, avascularly towards the pubic symphysis (Fig.1, Fig. 2). To avoid the loss of CO₂, the margins of the wound are anchored with two Backhaus forceps.

We place the second 10 mm port at the middle of the

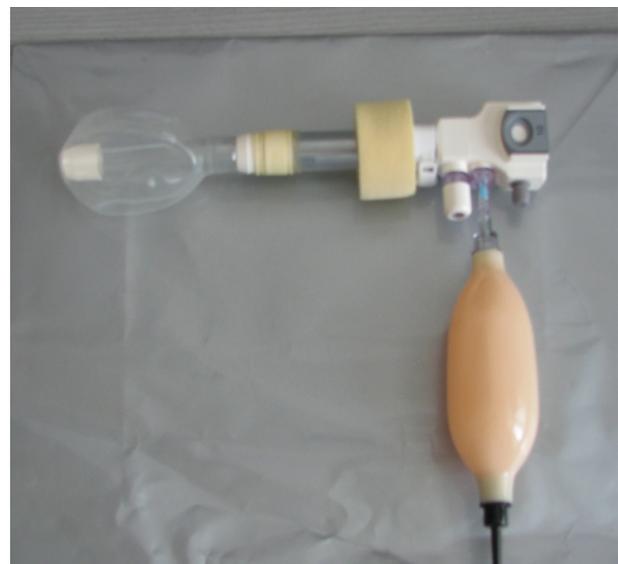


Figure 1. 10 mm trocar with dissection balloon.

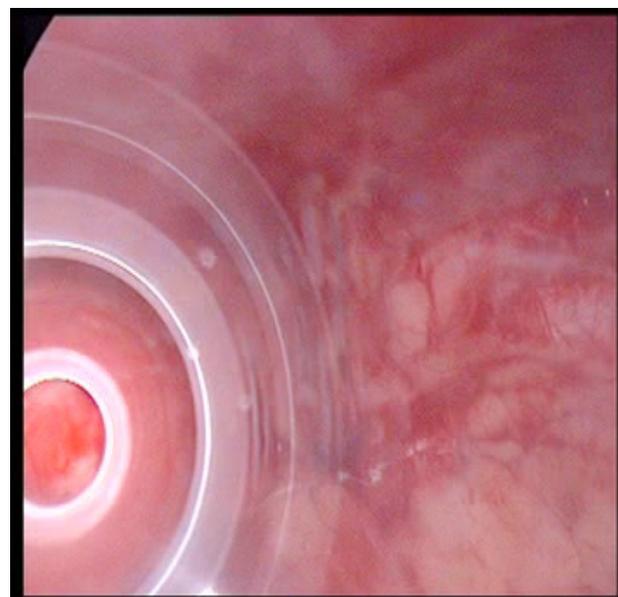


Figure 2. Image from the balloon trocar.

distance between the pubis and the umbilicus, and the last 5 mm port, 3 cm above the anterior superior iliac spine on the hernia side.

The anatomic reference points are represented by the inferior epigastric vessels found in the inferior portion of the rectus muscle, these being previously retracted, to avoid vascular lesions. The second anatomic reference point is represented by Cooper's ligament, which is freed from the pubic symphysis up towards the external iliac vein. The last reference point is given by the pubis, the lateral dissection of the properitoneal space starting from this level. We continue the dissection up to the level of the psoas muscle and the anterior superior iliac spine avoiding lesions to the nerve bundles at this level (Fig. 3, Fig. 4).

After we identify and reduce the hernial sac, we parietalize the gonadal vessels and the deferent duct. Through the 10 mm port on the median line, we introduce a 10x15 cm polypropylene mesh that we place in the properitoneal space created, covering the entire area of the Hesselbach triangle, the deep inguinal orifice and the medial portion of the external iliac vein (Fig. 5).

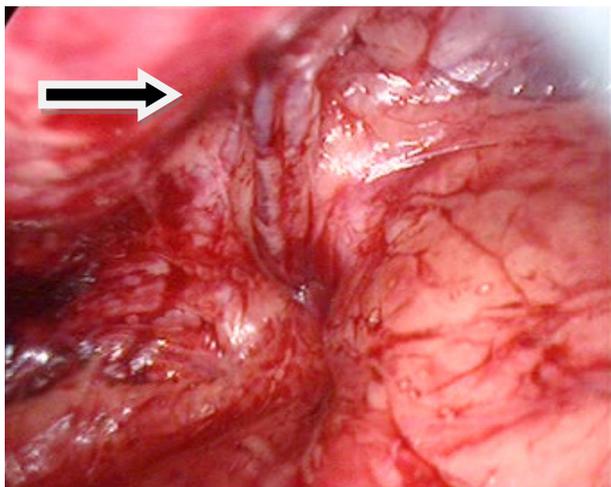


Figure 3. Epigastric vascular bundle.

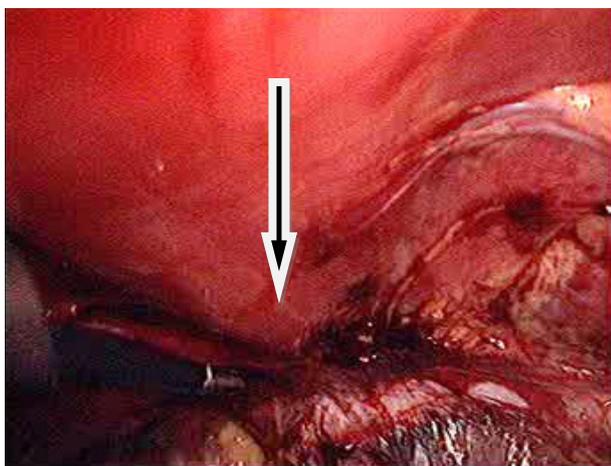


Figure 4. The pubic symphysis. Cooper ligament.

To avoid nerve lesions, in most cases we have not chosen to anchor the mesh with clips, these being used only in one case, presenting a large parietal defect, to hinder the migration of the prosthesis. We routinely used the drainage of the properitoneal space (Fig. 6), the exsufflation of the CO₂ being carried out under visual control, to certify the correct placement of the polypropylene prosthesis, the hernial bag being always maintained posterior to the mesh. The drainage was suppressed in a variable interval of 24-48 hours, and the mobilization of the patients was initiated on the same day of the surgery. All the patients followed antibiotic prophylaxis with cephalosporins until the suppression of the drainage.

The duration of the surgery was represented in this study by the interval of time from the incision until the suture of the tegument, and the hospitalization was recorded in relation to the nights spent in hospital.

Results

The surgical indication of TEP was established

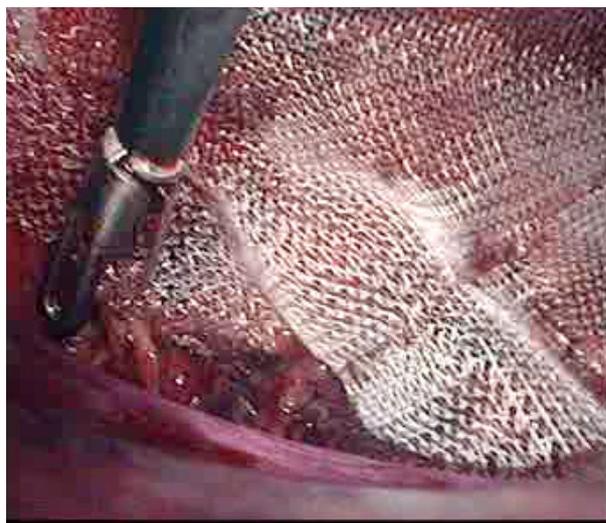


Figure 5. The placing of the mesh.

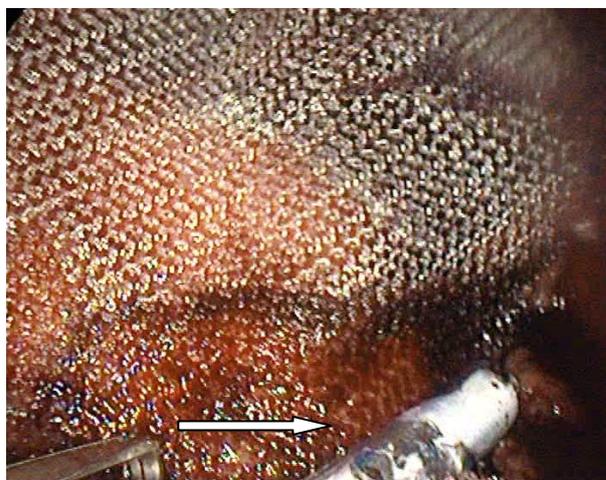


Figure 6. Properitoneal drainage.

both for primary and for recurrent or bilateral hernias. The following parameters were monitored: age, sex, BMI, the operating surgeon, the localization of the hernia, the surgery time, peri and postoperative complications, the duration of the hospitalization (Tab. I).

The gender distribution of the patients shows a preponderance of the male gender, proving the higher risk of emergence of this pathology in men (Fig. 7).

The risk factors identified in the development of inguinal hernias were represented in our study by physical effort, chronic cough associated to pulmonary pathologies, smoking and chronic constipation. These were frequently associated with the male gender. The large majority of patients were not obese, the average BMI being 24.9.

The ages of the patients varied between 19 and 74 years, the maximum incidence of inguinal hernias being recorded in the 5th and 6th decade of life.

The clinical manifestations were dominated by pain in the inguinal area corresponding to the hernia, symptoms accentuated by physical effort and by prolonged orthostatism, the objective examination confirming the presence of pseudotumoral formations located at the inguinal level.

The surgical interventions were carried out in programmed conditions in 82% of patients (Fig. 8), the TEP technique being in principle contraindicated for incarcerated hernias.

The average duration of the hospitalization after the carrying out of the TEP technique was of 4.71 days, with a global average of hospitalization of 6.79 days. The duration of the hospitalization was shorter than that of patients operated on by other surgical techniques, the major advantage being offered by the markedly less pain complaints in patients with TEP. The mobilization of the patients was carried out in the same evening of the surgical

intervention, pain stability and the quality of the prosthesis of the abdominal wall being monitored. In 1 case we found hernia recurrence the first day after surgery, which required reintervention and the solving of the defect by the “tension free” Lichtenstein technique using a 7.5/10 cm polypropylene mesh.

Postoperative monitoring of the cases was carried out clinically and with imaging methods 6 months and 1 year after surgery. We had 1 patient with hernia recurrence 1 year after the intervention, in whom the Lichtenstein technique was used for solving the defect. One case presented at the 1 month ultrasound control a postoperative seroma which imposed an inguinal incision and drainage, subsequently with favorable evolution (case with large hernia defect and where the mesh was anchored with clips). Both cases with recurrences belonged to the first 10 TEP interventions in the clinic. After the increase of the surgical experience and the reaching of the learning curve there were no more hernia recurrences.

In 7 cases the accidental lesion of the peritoneum with pneumoperitoneum occurred. One case needed conversion to the Lichtenstein technique due to the loss of the work camera. Upon the accidental opening of the

Table I. The demographic data of patients with inguinal hernias.

Demographic data	Number	Percentages %
Age		
Range	19-74	
Average	49,76	
The gender of the patients		
Female	2	5%
Male	38	95%
Environment of origin		
Urban	20	50%
Rural	20	50%
Distribution in years		
Year 2013	15	37.5%
Year 2014	20	62.5%
Type of surgery		
Unilateral TEP cure	34	85%
Bilateral TEP cure	6	15%
Type of hernia		
Right inguinal hernia	20	50%
Left inguinal hernia	14	35%
Bilateral inguinal hernia	6	15%

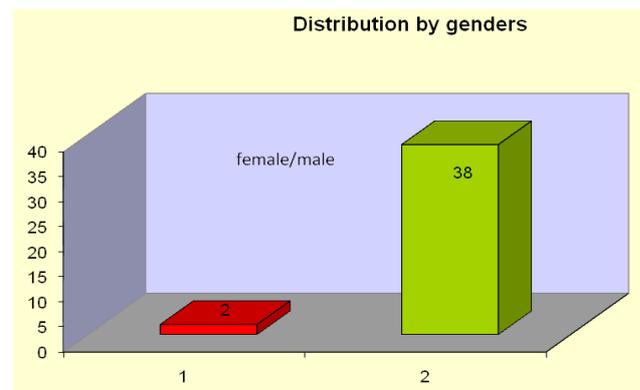


Figure 7. The distribution by genders of patients with inguinal hernias.

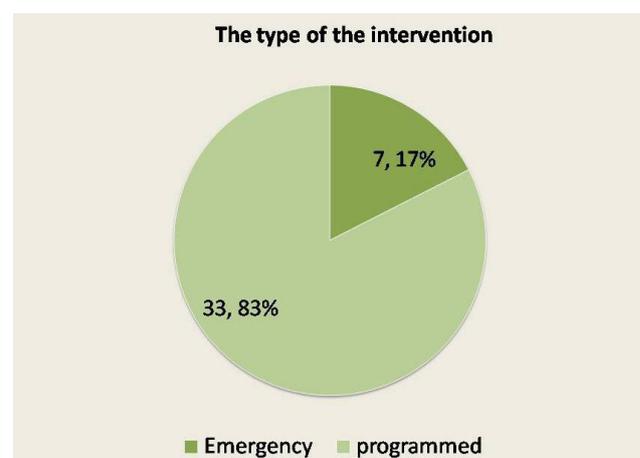


Figure 8. The type of surgical intervention.

peritoneum, to combat pneumoperitoneum we used the Veress needle introduced transperitoneally in the left hypochondriac region, its use allowing the maintaining of the work camera. We also closed the peritoneal defects by the application of titanium clips on the effraction areas.

In 1 case we had a hemorrhage from the level of the epigastric vessels, which was managed by the clipping of the wounded vessel.

The processing of the data shows a statistical correlation between the emergence of complications and the learning curve, these diminishing significantly after the first 30 cases ($p < 0.05$). No death was recorded during or after surgery, the only major complication being the hernia recurrence in the 2 cases.

The TEP technique by the approach of the properitoneal space is associated with low postoperative pain, very rare wound complications and as a whole a fast postoperative recovery as compared to other surgical techniques.

Discussion

The repair of inguinal hernias still represents a major health issue. The multitude of techniques described confirms the instability of the inguinal area and the complexity of the repair of this anatomic area. The objective of these techniques is to offer the most secure possible repair of these parietal defects.

Endoscopic techniques are the only ones that offer these solutions without affecting the integrity of the abdominal wall. In the TEP technique the placing of the mesh is done in the properitoneal space covering the entire inguinal area, including the area of indirect, femoral or obstructing hernias.

This technique is characterized by low postoperative pain level, precocious mobilization, rare wound complications and quick recovery. To this we can also add the advantages of not entering the peritoneal cavity, thus avoiding the risk of lesions of the intra-abdominal organs.

The question which persists is if TEP is as safe for the patient as the classical method, or “the standard” refers only to the short duration of hospitalization, low costs and quick reintegration of the patient into daily activity.

The learning curve for TEP is longer because surgeons are not familiar with the anatomy of the pelvic space, with the visualization “from the inside” of the abdominal wall and with the much limited operative field in these situations.

The studies talk about a learning curve of around 80 cases [7], and others of 20-50 cases [8]. Choi [9] claims that 60 interventions are necessary for the TEP technique to reach the learning curve. Aeberhard pleads for a learning curve of 80 cases, and the surgery time decreases under 60 minutes after 100 interventions [10]. In our study we have noticed after the first 30 cases a reduction of the average surgery time to 64 minutes and the reduction of incidents

during surgery, the learning curve being influenced by the experience of the surgical team in laparoscopy techniques.

For the dissection of the retromuscular space we use the electrodissection scissors or the prehention clamp for a “blunt dissection”, because it is absolutely necessary to avoid hemorrhage at this level. Hemorrhage, even a small one, is very difficult to control due to the small dissection space and to the technical difficulties. In this study we had 1 case with vascular lesion solved by the application of titanium clips.

The Trendelenburg position is mandatory because it allows the retraction of the content of the hernial bag towards the peritoneum, avoiding the accidental injury of the intestinal loop.

General anesthesia allows a good relaxation of the muscles, contributing to the maintaining of the work “chamber”. Urinary catheterization was used in all cases to maintain the bladder in repletion thus avoiding the narrowing of the operative field.

The introduction of the ports under optical control avoids lesions, in our cases there being no complication due to these maneuvers.

“The learning curve”, defined as each surgeon’s degree of adaptation for the surgery to happen with a minimum of complications and in a minimum time is influenced first of all by the operating surgeon’s experience. To this the presence of specialized staff and good quality anesthesia are added, all offering an optimal surgical space to reduce the incidence of complications during surgery.

This is explained by the familiarity of the surgical team with laparoscopic interventions, the difficulty in the realization of the technique being given especially by the narrow surgical space and the anatomy of the inguinal channel looked at from the posterior.

For the solving of the incidents during surgery we chose different technical artifices according to each complication.

We had 7 cases in which we accidentally perforated the peritoneum upon the isolation of the hernial bag. It is important in the surgical strategy to close these defects which may be the source of future bowel obstructions by the migration of the loops of small bowel at this level. In all the cases studied, and where we had an effraction, we were able to solve it by the application of titanium clips on the perforation area.

In the case of hemorrhages during surgery we opted for electrocauterization or tamponade, and for the lesion of epigastric vessels, the hemorrhage was solved by the clipping of the vessel involved (1 case in our statistics), the surgery being finished endoscopically.

We had 2 recurrences, which imposed the repair of the hernia in time II by the Lichtenstein technique, with “tension free” mesh. In one case the recurrence occurred 24 hours postoperatively and was due to the poor placing of the mesh. In the other case the hernia occurred 1 year after

surgery, the initial indication for TEP being a voluminous inguino-scrotal hernia and where we did not opt for the anchoring of the mesh during surgery. The recurrence rate described in literature is according to Brandt Kerkhof of 8.9%, and according to Neumayer of 4% [11,12,13,14,15] comparable with the results of our study of 5%.

In the cases studied we had no postoperative seromas or hematomas, with the exception of one case which imposed an inguinal incision for the evacuation of the seroma (case with large parietal defect and where we anchored the mesh with titanium clips). The lack of seromas is explained by the routine use of properitoneal drainage for 24-48 hours.

We consider that voluminous hernias, obesity, a history of surgical interventions on the lower abdomen are contraindications for the TEP technique. To these we can add the contraindications of general anesthesia and the chronic treatment with anticoagulants.

The advantages of the technique represented by the esthetic ones, the pain related ones and the quick resuming of the activity compensate for the costs given by the technical endowments, especially since they are already in the standard of laparoscopic surgeries. Even in the conditions of multiple abdominal scars, represented by the insertion of the trocars, the sum of these incisions is smaller than the incision in the open technique, postoperative pain complaints being much smaller for TEP.

In our study the polypropylene mesh was only anchored in 1 case with large parietal defect, the anchoring being made with spiraled titanium clips. The recurrence rate in the study was of 5%, the lack of anchoring of the mesh not influencing the results. The studies show that there is no statistically significant difference for the recurrence rate according to the anchoring/non-anchoring of the polypropylene mesh [16,17]. In our study recurrences were mostly due to technique errors associated with a forced surgical indication and with the learning curve of the technique. The non-anchoring of the mesh is associated though with a smaller rate of postoperative pain and the decrease of the consumption of analgesics [18,19].

Conclusions

The rate of intra and postoperative complications in the case of the TEP technique was low in our study, and after the first 30 cases operated we did not encounter any more complications, which leads us to state that it is a reproducible technique, easy to carry out in the conditions of trained surgical teams, with a surgical duration similar or even shorter than the Lichtenstein technique.

We consider that performing 30 surgical interventions is enough to reach the learning curve and the maximum limitation of surgical complications, for a team which also approaches other laparoscopic interventions.

The TEP technique remains one of the most frequent surgical techniques used in the repair of hernia defects

being a safe technique, with excellent medium and long term results.

For large hernia defects it is necessary to anchor the mesh to prevent its migration and recurrence.

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