

## Laparoscopic Repair of Inguinal Hernia TEP versus TAPP

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### Rezumat

#### *Cura chirurgicală a herniilor inghinale pe cale laparoscopică TEP comparat cu TAPP*

**Introducere:** Obiectivul acestui studiu a fost să comparăm rezultatele tratamentului laparoscopic al herniilor inghinale prin două metode: repararea transabdominală preperitoneală (TAPP), respectiv preperitoneală total extraperitoneală (TEP). **Metode:** În acest studiu retrospectiv au fost incluse toate cazurile de hernie inghinală primară operate laparoscopic prin TAPP sau TEP în Clinica Chirurgie 2 a Spitalului Județean de Urgență Timișoara între 2012 și 2013. Au fost operați 90 de pacienți: 44 cu TEP și 46 cu TAPP. Principalul obiectiv urmărit a fost recidiva herniară la doi ani. Obiective secundare urmărite au fost complicațiile pe termen scurt și lung: hematome și seroame post-operatorii, inflamații testiculare, durere inghinală cronică, reoperații, mortalitatea la 30 de zile.

**Rezultate:** Dintre cei 90 de pacienți operați, 70 au completat urmărirea la doi ani, 36 (81,81%) cu TEP, respectiv 34 (73,91%) cu TAPP. Nu s-au înregistrat recidive. Au fost două cazuri de sângerare intra-operatorie la TAPP, ambele au fost oprite cu ajutorul dispozitivelor de sigilare vasculară; 8 cazuri de edem testicular post-operator la TAPP și 3 la TEP. Emfizemul subcutanat a apărut la 16 cazuri de TAPP și 3 de TEP.

**Concluzii:** Diferențele dintre TEP și TAPP au fost doar între complicații minore, nicio complicație majoră nu a apărut în studiul nostru însă. Nicio recidivă nu s-a înregistrat la urmărirea de doi ani după urmărirea a 70 de pacienți din 90.

**Cuvinte cheie:** TEP, TAPP, hernie laparoscopică, preperitoneal

### Abstract

**Aim:** The purpose of the study was to compare the results of laparoscopic inguinal hernia repair using two different methods: transabdominal preperitoneal (TAPP) repair and the technique of totally extraperitoneal repair (TEP).

**Methods:** In this retrospective study were included 90 cases of inguinal hernia that underwent for laparoscopic approach of inguinal hernia repair at the Emergency County Hospital Timisoara at the 2<sup>nd</sup> Surgical Clinic between 2012 and 2013. The primary outcome was recurrence of the hernia at two years follow-up. Secondary outcomes were short and long-term complications: hematoma and seroma formation, inflammation of the testis, chronic inguinal pain, reoperation, 30 days mortality.

**Results:** Of the 90 patients who underwent unilateral hernia repair, 70 were completely followed-up for 24 months, 36 (81.81%) patients with TEP and 34 (73.91%) with TAPP. Regarding the main outcome there was no recurrence of the hernia at two years follow-up. There were two cases of bleeding in the TAPP group; both were managed by laparoscopic sealing of the damaged vessels, 8 cases of post-operative edema of testis in TAPP and 3 cases in TEP. Regarding the subcutaneous emphysema there were 16 cases in TAPP and 3 cases in TEP. **Conclusions:** Differences between TEP and TAPP in our study were related to minor complications, no major complications occurred. After the two years follow-up of 70 of a total of 90 patients, there was no recurrence of the hernia.

**Key words:** TEP, TAPP, laparoscopic hernia, preperitoneal

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## Introduction

Inguinal hernia repair is the most frequently performed operation in general surgery. The standard methods for inguinal hernia repair had few changes over a hundred years until the introduction of synthetic mesh. The next big change in hernia repair might be the introduction of laparoscopic repair. In the literature there is a controversy about the approach for routine repair of inguinal hernia (1,2,3).

Since the early 1990s, laparoscopic techniques have entered the field of general surgery; the first cases of minimally invasive inguinal hernia repair were reported in 1992(4). Trans-abdominal preperitoneal (TAPP) inguinal hernia repair includes laparoscopic exploration of both inguinal areas and the whole peritoneal cavity, a further incision to the overlying peritoneal sheet in order to reduce the hernia sac and to place a prosthetic mesh against the inguinal wall at the level of properitoneal space (4). The technique of totally extraperitoneal repair (TEP) allows exploration of the myopectineal orifices, the dissection and reduction of the hernia sac and its content and placement of the mesh without entering the abdominal cavity (5).

## Methods

This is a retrospective study comparing the laparoscopic approach for inguinal hernias through the totally extraperitoneal or the transabdominal techniques. Patients operated for primary inguinal hernia using one of the two procedures TEP or TAPP at the Emergency County Hospital Timisoara at the 2<sup>nd</sup> Surgical Clinic between 2012 and 2013 were included in the present study. Inclusion criteria were: patients with primary inguinal hernia operated by a laparoscopic procedure using TEP or TAPP; exclusion criteria were: recurrent inguinal hernia operated laparoscopic. The primary aim of the study was to assess the recurrence rate of hernias during a two year follow-up period; the secondary aims included assessment of short and long-term complications: hematoma and seroma formation, inflammation of the testis, chronic inguinal pain, reoperation, 30 days mortality and other variables such as: operating time, fixation method, conversion to other procedure, bilateral hernia treatment. Laparoscopic TAPP and TEP repair was done as per standard procedural guidelines using three trocars and a mesh of 14/10 cm. Three trocars were used for all the procedures. The mesh size was standard for all the procedures: 14/10 cm. All the meshes were anchored with tackers at the level of Cooper's ligament and anterior abdominal wall muscles. Depending on the surgeon's preference absorbable or permanent tackers were used for fixation in all the cases and peritoneal opening when TAPP was performed was closed with tackers. The follow-up was done in the ambulatory setting of the 2<sup>nd</sup> Surgical Clinic and consisted in an anamnesis of the patient complaints and a physical exam. Four surgeons performed all the procedures, all trained in laparoscopic surgery, two of them were attendants since 2011. Statistical analysis was done using Microsoft Excell.

## Results

Were included 44 cases of TEP and 46 cases of TAPP. There was only one case of femoral hernia in a woman operated with TAPP technique; the other patients were all male and the hernias were inguinal. There were three cases of bilateral hernia operated with TAPP, one was discovered intra-operatively. All patients operated laparoscopic for inguinal hernia were ASA (American Society of Anesthesiology risk class) I and II. Comorbidities were represented by blood high pressure, obesity, diabetes mellitus type 2, benign prostate hypertrophy and different articular disease (Table 1, Table 2).

There were two cases of bleeding in the TAPP group, one at the level of corona mortis and another at the level of inferior epigastric artery, both related to tackers application. Both were managed by laparoscopic sealing of the damaged vessels. There was a single damage to the bowel at the level of the sigmoid colon by colo-parietal dissection of the adhesion between the colon and the abdominal wall; the sigmoid wall was not perforated, but there was a burning spot on the serosa. There was a conversion from TEP to open Lichtenstein procedure due to the lack of muscle relaxation and the inability to create a proper working space. One patient had an adverse reaction to anesthetic drugs and the procedure was aborted after only the unilateral repair of a bilateral inguinal hernia was performed. One patient from TEP group was discharge on the 2<sup>nd</sup> postoperative day and readmitted in the hospital on the 5<sup>th</sup> postoperative day with signs of abdominal massive ascites. Ultrasound revealed fluid in the peritoneal cavity, clinical exam showed diffuse mild pain, distended abdomen. Puncture-aspiration was performed and 4 liters of fluid were aspirated, a sample was sent to the lab: it was urine. A urinary bladder catheter was placed and maintained for 14 days, with no recurrence of the fluid intra-abdominal accumulation or any other adverse event. The patient was discharged with the catheter in place on the 5<sup>th</sup> day after admission (Table 3).

**Table 1.** Pre-operative data of the patients

	TEP (n=44)	TAPP (n=46)
Age (years)	47 (21-77)	43 (22-64)
BMI (kg/m <sup>2</sup> )	28.7	27.8
Sex (Males:Females)	44:0	45:1
ASA I:II	20:24	26:20
Comorbidities	36.36%	32.60%

**Table 2.** Intra-operative data of the patients

	TEP (n=44)	TAPP (n=46)
OR time (minutes)	74 (62-98)	69 (40-135)
Bleeding	0	2(4.34%)
Bowel damage	0	1
Conversions	1 ( TEP to open)	0
Others	0	1 Related to general anesthesia

**Table 3.** Post-operative data of the patients

	TEP (n=44)	TAPP (n=46)
Edema of testis	3 (6.8%)	8(17.39%)
Re-operation	0	1 (2.17%)
Bladder damage	1(2.27%)	0
Hospital stay	2 (1-3)	2 (1-5)
Orchitis	0	3(6.52%)
Seroma of inguinal area	1(2.27%)	0
Subcutaneous emphysema	3(6.8%)	16(34.76%)
Postoperative pain	1 (2.27%)	1(2.17%)

There was no recurrence at two years follow-up of the 36 (81.81%)patients with TEP and 34 (73.91%) with TAPP. No 30 days mortality was registered. One patient with TAPP was reoperated for adhesions between the mesh and the large omentum, caused by incomplete coverage of the upper border of the mesh with the peritoneum. One patient from the TEP group had his seroma treated by one puncture-aspiration under ultrasound guidance (Fig. 1 and 2). One 54 years old patient presented crural pain in the femuro-cutaneous territory after TEP. The patient was successfully treated by Carbamazepine and the symptoms resolved after 3 weeks of treatment.

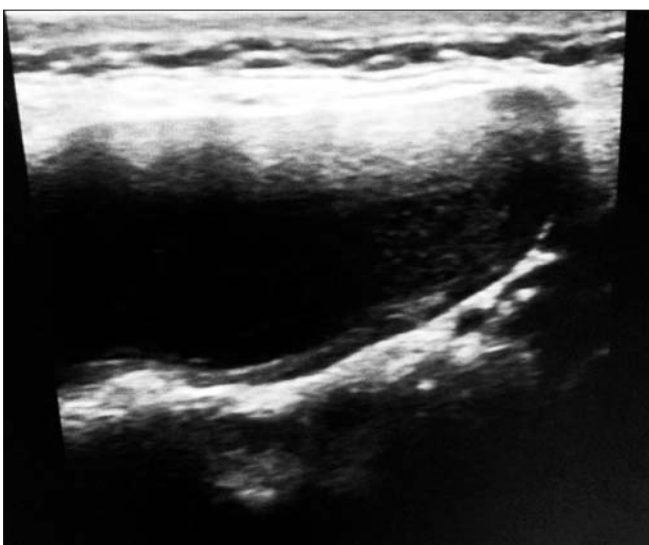
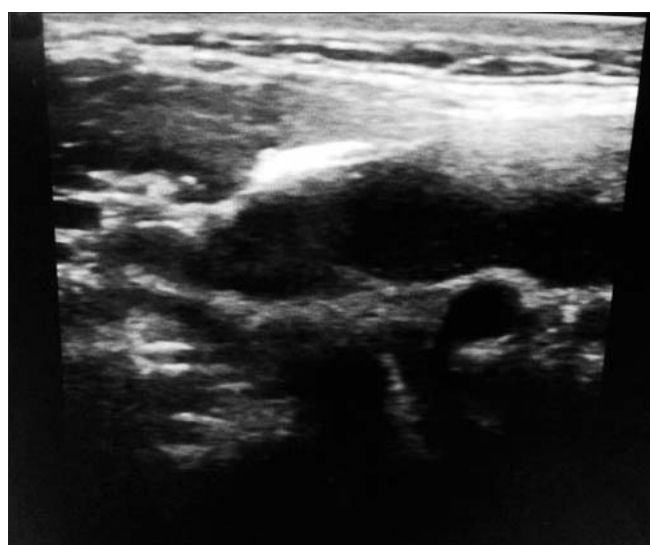
## Discussions

Most of the patients were males, there was a female operated with TAPP who had a femoral hernia. According to European Hernia Society in females with hernia, the laparoscopic approach is the preferred one due to better finding of a femoral hernia and a better solution for repairing this defect with the preperitoneal mesh placement (6).

In our clinic patients with ASA risk score greater than two

were operated with spinal or local anesthesia, the need for general anesthesia is one of the main drawbacks of the laparoscopic hernia repair, but this disadvantage has been surpassed in some selected cases(who wanted laparoscopic repair, but refused general anesthesia) by doing TEP and using epidural anesthesia (7). There was a case in the TAPP group in which the procedure had to be aborted before finishing the contralateral asymptomatic hernia, which was an intra-operative finding, due to adverse reaction to anesthetic drugs.

The incidence of bilateral inguinal hernia has been variably reported in literature. Reports from cross-sectional studies and cohort of adult patients report an incidence of bilateral hernia up to 6% when clinical examination alone was used for diagnosis (8). The incidence of bilateral hernia had been proven higher in the pediatric population with routine contralateral exploration (9). Before the advent of laparoscopic surgery routine contralateral exploration for bilateral hernias was not practiced in adults and no further discussion was needed. Laparoscopic approaches (TAPP) lead to an increase in the detection of incipient contra lateral hernias (10). A 20% increase in detection rates has been reported with use of laparoscopy over and above routine clinical examination (11), making laparoscopy a diagnostic tool for bilateral inguinal hernias; even when TEP is employed it may be used in cases where there are some clinical symptoms, but no clear clinical signs of herniation. Besides detecting contra lateral inguinal hernias, laparoscopic hernia repair was reported to aid in the detection of other hernias like incisional, Spigelian, obturator and femoral hernias, especially in cases of TAPP (12). The discovery of contralateral hernias is a certain advantage; another additional benefit is the exclusion of hernias in those patients with an equivocal clinical examination, particularly with the use of TAPP procedure (10).

**Figure 1.** Inguinal seroma after TEP**Figure 2.** Inguinal seroma drainage under ultrasound guidance with the 23 gauze needle (the white area) – with the consecutive shrinkage of the seroma cavity

The median time for both procedures was relatively the same, but greater than one hour, although the experience of the operating surgeons ranged widely. However, the definition of an experienced laparoscopic surgeon is still controversial. There are papers reporting (13) that an experience of 80-100 procedures are required for a general surgeon to complete the herniorrhaphy in less than one hour, however when others investigated the learning curve for TEP repair, it showed that operating time drops below 60 min only after 100 procedures were performed (14). The long learning curve was one of the main reasons why some of the surgeons avoid using the TEP procedure and prefer TAPP (15).

There was one sigmoid burn due to use of the cautery in order to release the adhesion between the colon and the abdominal wall in the TAPP group; this dissection should be avoided according to EHS guidelines as there are no benefits and bowel damage can occur (6). The lesion was solved by laparoscopic placement of few sutures; the bowel lumen was not opened. The evolution was uneventful in this case.

Bleeding occurred intra-operatively twice; every time the bleeding was related to tackers' firings. Once the corona mortis was damaged and required application of clips and lavage, in the other case the inferior epigastric artery was damaged when the peritoneal sheet was attached to the abdominal wall and dissection and placement of clips stopped the bleeding. Both cases occurred in the TAPP group. Even if closing the peritoneum with tackers improved operating time, the accidentally damage of the arteries and nerves of the abdominal wall should drive the surgeons to the more time consuming, but less damaging use of sutures. Some advocate the use of fibrin glue in order to fix the mesh in place, but also to close the peritoneum, leading to less chronic pain and less bleeding (16).

Seroma in the inguinal area with consecutive requirement of drainage appeared in one young male patient after TEP, the patient had a large congenital hernia and the removal of the entire hernia sac was impossible. Four days after the procedure the patient presented to the ambulatory clinic with a seroma at the level of the inguinal area and a puncture-evacuation under ultrasound guidance was performed. Another puncture was not needed. Many other patients had some degree of seroma, but no other procedure was required for drainage. Lau et al found that significant clinical factors associated with seroma formation included old age, large hernia defects, an extension of the hernia into the scrotum, and the presence of a residual distal indirect sac (17).

Orchitis developed in three patients after TAPP. These patients had large hernias and after the procedure all of them had inflammation at the level of the chord, which resolved after 3 to 5 weeks with anti-inflammatory drugs. The inflammation was consecutive to dissection maneuvers most likely, as the large hernia sac was adherent to the chord structures.

Conversion from laparoscopic TEP to open Lichtenstein procedure was decided in a 62 years old male patient due to a very large hernia defect and an incomplete muscle relaxation; there was an inability to create a proper working space. A good communication between the surgical and the

anesthesiology team is crucial to perform a TEP, especially under epidural anesthesia.

Several patients had in their medical history contralateral hernia repair, usually a tislular repair. All these patients after laparoscopic TEP or TAPP were surprised to see the difference in the pain level and they stated that if they have to choose again between these two methods they will choose the laparoscopic approach.

The difference between the rates of the complications between TEP and TAPP were due most likely to different observation teams and to the retrospective study nature, but no major complications occurred.

This study is the first study in our hospital and region regarding laparoscopic hernia repair, and included an interesting late bladder perforation treated by conservative measures. The relative small numbers of the cases of the study is one of the limitations of our study.

## Conclusion

Laparoscopic cure of the hernia is a strong option for repairing inguinal hernias, despite the long learning curve needed; it is feasible, safe, and provides good satisfaction to the patients. Differences between TEP and TAPP in our study were related to minor complications, no major complications occurred. After the two years follow-up of 70 of a total of 90 patients, there was no recurrence of the hernia.

## Conflicts of interest

The authors have nothing to disclose.

## Ethical policies

The County Emergency Hospital of Timisoara ethical committee approved this study.

## Authors' contribution

Varcus Flore - Associate Professor, MD, PhD, Surgical Clinic 2, Victor Babes University of Medicine and Pharmacy, Timișoara, Romania – contributed to the design, acquisition of data, writing and reviewing the manuscript, approved the final form of the manuscript

Duta Ciprian - Professor, MD, PhD, Surgical Clinic 2, Victor Babes University of Medicine and Pharmacy, Timișoara, Romania – contributed to the design, acquisition of data, review the manuscript for important data, approved the final form of the manuscript

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Tarta Cristi - Associate Professor, MD, PhD, Surgical Clinic 2, Victor Babes University of Medicine and Pharmacy, Timișoara, Romania – contributed to the design, acquisition of data, writing and reviewing the manuscript, approved the final form of the manuscript

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