

Transabdominal pre-peritoneal repair procedure (TAPP) versus open hernia repair (OHR) in the treatment of inguinal hernia

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ABSTRACT



Inguinal hernia is a common condition, with about 30% of men and 6% of women developing this condition throughout their lifetime. Laparoscopic hernia repair procedures have become more and more important lately, due to the advantages of a fast recovery and reduced postoperative pain. The paper presents our clinical experience involving the TAPP repair procedure, compared to open hernia repair (OHR). We retrospectively compared our first 50 cases comprising patients who underwent the TAPP hernia repair procedure between January 2018 and June 2020, with 50 cases who underwent the OHR procedure in the same period. The total operation duration was 102.5 minutes in the TAPP group and 78.4 minutes in the OHR group. The average hospital stay in the TAPP group was 1.5 days with six patients requiring reinterventions for postoperative bleeding and who were discharged seven to nine days later. There is still no consensus regarding the use of tacks and/or the surgical glue, the surgeon's experience and the intraoperative findings representing a cornerstone in choosing the best repair method for each case. Laparoscopic hernia repair has some advantages over the open technique, but it can be followed by complications that can further raise parameters.

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Introduction

During a normal lifespan, about 30% of males and up to 6% of females can develop groin hernias [1,2]. Open hernia repair (OHR) has been the standard in the treatment of this type of pathology for more than a century. With different techniques that have various degrees of recurrence, today's gold standard in OHR is represented by the Lichtenstein technique [3,4]. In recent years, due to its many advantages (reduced hospitalization, less chronic pain, and a lower degree of recurrence), laparoscopic inguinal hernia repair has emerged as one of the most attractive and sought-after techniques of hernia repair [5]. Although there are many techniques to choose from, all with advantages and disadvantages, depending on factors such as age, associated comorbidities, and recurrence, laparoscopic hernia repair has a faster post-operative recovery rate and, overall, it is more cost-effective than the open approach [6,7]. The laparoscopic transabdominal pre-peritoneal repair procedure (TAPP) underwent many

modifications since its introduction and the possibility of choosing different fixation methods and types of meshes represents a versatile approach in many cases that can be challenging especially to surgeons-in-training and beginners [3]. Having in mind that there is still no standard consensus regarding the surgical technique (mesh tack fixation, the use of surgical glue, or even simple mesh placement), our paper aims at highlighting our clinic's experience involving the TAPP repair procedure from the beginning of our learning curve and our first 50 cases.

Materials and Methods

We retrospectively compared our first 50 cases comprising patients who underwent the TAPP hernia repair procedure between January 2018 and June 2020 to the 50 cases who underwent the OHR procedure in the same period. All the patients were admitted to the 4th General Surgery Clinic of the University Emergency Hospital in Bucharest. The informed consent was obtained before

surgery and our hospital's standard consent forms were used. The diagnosis was made after the clinical exam, and in some cases, ultrasound and CT scans were also performed. The European Hernia Society (EHS) groin hernia classification was used for each patient.

The patients in the TAPP group were operated on under general anesthesia and some patients in the OHR group benefited from spinal anesthesia. All patients benefited from a preoperative single-dose second-generation cephalosporin antibiotic treatment and thromboprophylaxis with low molecular weight heparin. Open surgery followed the standard Lichtenstein tension-free mesh repair with a microporous polypropylene mesh and the laparoscopic TAPP repair utilized pre-shaped microporous mesh.

Initially, pneumoperitoneum was established by using the open Hasson technique and after the first five cases, the Veress technique was preferred. Both 30° and 45° angle cameras were used. Additional 5 mm trocars were placed using standard trocar placement guidelines and adhesiolysis with hernia sac reduction was performed with laparoscopic scissors and, occasionally, with bipolar forceps. All the mesh types came from the same provider. The mesh fixation in the TAPP group was made using helicoidal clips (Pro Tack) with an adsorbable suture for the peritoneum and, in the more recent cases, we used surgical glue for both mesh and peritoneum closure. Post-operative pain management was only on demand and consisted of non-steroidal anti-inflammatory drugs. No opioids or opioid derivatives were given. Early postoperative complications were obtained from the patient's chart files and long-term complications were registered during our follow-up program.

All the data gathered was centralized in a spreadsheet and the statistical analysis was performed using dedicated statistical software (NCSS 2021 edition). All *p* values lower than 0.05 were considered statistically significant.

Results

We managed to retrospectively review a total of 100 patients who were assigned to the TAPP (*n*=50) and the OHR group (*n*=50), respectively. Due to the non-linear distribution of the data collected and the small study, many of the non-statistical parameters analyzed had a *p*-value lower than 0.05. All the data analyzed were summarized in Table 1.

All the patients were diagnosed with uncomplicated inguinal hernias and the EHS classification was utilized for each patient. The mean age in the TAPP group was 53.77 years and 69.9 years in the OHR group. The male to female ratio was in favor of the former (TAPP group male to female ratio 10:1 same as the OHR group). All OHR patients (*n*=50) benefited from a sutured microporous polypropylene mesh, whereas in the TAPP group, the

mesh was fixed using surgical glue (*n*=18) and helicoidal clips (*n*=32).

The total operative duration was 102.5 minutes in the TAPP group and 78.4 minutes in the OHR group. The average hospital stay in the TAPP group was 1.5 days, with six patients requiring reinterventions for postoperative bleeding and being discharged seven to nine days later. The OHR group had a longer hospital stay in comparison to the latter (4.1 days) and, except for 4 cases that developed seromas on the seventh-day follow-up visit and 5 cases that had scrotal edema, no other complications were noted in the OHR group. No late postoperative septic or hemorrhagic complications were observed in the TAPP group.

No patient from either study group exhibited preoperative pain. Post-operative pain was observed in 3 TAPP patients, in whose cases reversible lateral femoral cutaneous nerve lesion was identified and 5 OHR patients that presented with scrotal edema.

Table 1. Bivariate analysis

	TAPP (N=50)	OHR (N=50)
Age (mean + SD)	57 ± 16.862	69.918 ± 8.265
Gender		
Female	5	6
Male	45	44
Operative duration	102.5 ± 45.738	78.4 ± 16.954
Fixation method		
Non-resorbable helicoidal clips	32	
Surgical glue	18	
Hospital stay (mean + SD)	1.51 ± 1.34	4.10 ± 1.04
Post-operative complications	6	6

Discussion

Inguinal hernia repair represents one of the most common and the oldest surgical procedures done around the world, with a large variety of different operative techniques that focus on the hernia sac and wall defect [8]. Although the gold standard in hernia repair has been represented by the open technique with all of its procedures for more than a century, the first potential laparoscopic inguinal hernia repair was described by Ralph Ger in 1982 and the first TAPP repair was performed by Leroy in 1990 [9]. On the other hand, the first tension-free hernia repair evolved between 1984 and 1988 and it has established itself as a cornerstone in hernia surgery well before the wide implementation of laparoscopic surgery [9]. According to a population-based study, patients who undergo inguinal hernia repair have a cumulative incidence

as their number increases with age (18.9% by age 70, 27.7% by age 80, 35.1% by age 90) to a total of 42.5% for a normal male lifespan [10]. By comparison, a recent review that followed the results of 80 publications has found that the same incidence is only between 3-6% in women [11].

Primary inguinal hernia should be surgically treated in order to prevent its two major complications, i.e. incarceration and strangulation, regardless of the patients' age or associated comorbidities, but there are some studies that may offer a non-surgical alternative for elderly patients such as "watchful waiting" as long as the hernia is asymptomatic or minimally symptomatic [10,12,13].

Few randomized studies compare the TAPP hernia repair to the Lichtenstein repair for primary inguinal hernias [14]. Although our study presented its limitations, our results showed a shorter operative time for the Lichtenstein repair compared to the TAPP repair procedures, results that were described in other studies of the kind, although the majority of reviews find little or no differences between these types of procedures [15,16]. In part, this is because of our limited experience and superposition on the normal learning curve for the TAPP procedure and in contrast with mirroring our lengthy expertise for the Lichtenstein repair technique. Recently, laparoscopic hernia repair is increasingly performed in daycare surgery [17]. However, a careful preoperative evaluation for associated pathology and a selection of cases should be performed based on the surgical and anesthetic risk evaluation [18,19]. Laparoscopic techniques, in particular, may induce specific cardiovascular complications in the elderly, that require special perioperative care [20]. This can be seen in the mean age of the study groups, where due to cardiovascular and neurological associated comorbidities that were recently diagnosed or chronic conditions in elderly patients, OHR was preferred in these situations.

In general, postoperative pain represents one of the factors that many studies lack or have a hard time assessing due to several subjective factors. General anesthesia was given to all patients in the TAPP group and no postoperative pain was reported. Patients in the OHR group received a combination of general or spinal anesthesia depending on each case and, like in the first group, no postoperative pain was signaled. Due to the type of anesthesia used in the case of the TAPP repair, almost all studies have demonstrated the advantage of pain management of this procedure in comparison with the Lichtenstein repair [15,21,22]. Inflammation and by default pain is reported to be lower secondary to the laparoscopic approach by several studies, having as a consequence, a lower metabolic impact and easier recovery, but there are studies that find that there is no

difference in inflammation and postoperative pain between these types of procedures [23-25].

All groups had few postoperative complications. The majority of the studies present in the literature depict a very low postoperative complication rate of the TAPP procedure versus the Lichtenstein repair [26-28]. In our study, there were fewer complications seen in patients who benefited from the TAPP repair, but those who experienced complications, had a prolonged hospitalization. The complications found in the OHR group had only a slight impact on the overall hospitalization time, but the average time a patient spent in the hospital was almost three times higher than in the TAPP group.

A study conducted by Loos MJ et al. revealed that the incidence of postoperative pain was significantly lower compared to the open Lichtenstein procedure (8.1% compared to 18%, $p=0.006$) [23]. In our study, we identified 3 patients in the TAPP group (reversible lateral femoral cutaneous nerve lesion) and 5 in the OHR group (presented with scrotal edema) that exhibited postoperative surgical site pain.

Regarding the local recurrence, some meta-analyses that compared laparoscopic approaches with open approaches revealed a higher incidence of hernia recurrence rates in patients who underwent the TAPP procedure, but to some extent attributed to the high number of TAPP patients analyzed [29-31]. Regarding this aspect, our study is still in the prospective phase, all TAPP patients being included in a follow-up program that is still undergoing.

We have found that fewer complications were present in patients that benefited from the use of surgical glue both for mesh and peritoneum fixation. The majority of intra and postoperative complications were seen in patients who benefited from the tack mesh fixation.

In the last decade, there has been a large number of studies that compare staple fixation using tacks and different types of glue for mesh and peritoneum fixation [32-34]. In his study, Hindmarsh et al. observed that the placement of a tack on the pubic tubercle may invariably lead to a higher rate of post-operative pain [35]. In our cases, we found no difference in post-operative pain either by using tacks or surgical glue. However, there are studies that demonstrate the superiority of surgical glue and there are studies that demonstrate the benefits of tack use [36,37].

In our study, we have seen that the use of tacks appears to be equally effective to the use of surgical glue, the albeit volume of patients was one of our study's limitations. We also noticed that it was more cost effective to use surgical glue than stapling methods such as tacks; however, the latter was more time effective from a procedural point of view.

The present study has some limitations. Since the timeline of this study was superposed on the learning curve of the TAPP hernia repair procedure in our clinical setting, our experience is limited to a short period, thus the number of cases included is not very high, and the results may have a better statistical significance in a larger randomized study.

Highlights

- ✓ There is no consensus on the most adequate surgical technique for hernia repair.
- ✓ The transabdominal pre-peritoneal repair procedure (TAPP) may have some advantages over the open technique, with a short postoperative stay and less pain, but it can be followed by specific postoperative complications.

Conclusions

Having in mind that there is still no consensus regarding the use of tacks and/or surgical glue, the surgeon's experience and the intraoperative findings represent a cornerstone in choosing the best repair method for each case. Laparoscopic hernia repair may have some advantages over the open technique, but it can be followed by complications that can further raise parameters. Further research and studies on a greater number of subjects are necessary to better understand the best course of action in TAPP repair. Large randomized prospective trials are required to demonstrate the advantages of each of these methods.

Conflict of interest disclosure

There are no known conflicts of interest in the publication of this article. The manuscript was read and approved by all authors.

Compliance with ethical standards

Any aspect of the work covered in this manuscript has been conducted with the ethical approval of all relevant bodies and that such approvals are acknowledged within the manuscript.

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