

# Key points for safe transabdominal peritoneal laparoscopic inguinal hernioplasty (TAPP)

## *Puntos clave para realizar una hernioplastía inguinal laparoscópica transabdominal peritoneal (TAPP) segura*

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### Keywords:

transabdominal  
preperitoneal, safety,  
inguinal hernia, key  
points.

### Palabras clave:

transabdominal  
preperitoneal,  
seguridad, hernia  
inguinal, puntos  
clave.

### ABSTRACT

Progress in the surgical treatment of inguinal hernia is due to the introduction of new techniques and materials and better knowledge of the region's anatomy. This study aims to review the experience obtained in a private hospital center to determine the points of the surgical technique that increase safety. An observational, retrospective, cross-sectional, and analytical study was carried out, and a protocol of 11 points was established, followed in all procedures using the transabdominal and preperitoneal techniques. The records of patients with inguinal hernia treated from January 02, 2000, to December 31, 2021, were reviewed. There were 750 patients with an average age of 52 years and 623 patients with unilateral hernia. Polypropylene mesh was used in 98% of the patients. The most frequent complication was seroma; in 15 patients, recurrence, adhesions, infection, and death represent less than 1%. The causes of complications were analyzed. It is concluded that the eleven points established in the surgical protocol are essential for safe transabdominal preperitoneal surgery.

### RESUMEN

Los progresos en el tratamiento quirúrgico de la hernia inguinal se deben a la introducción de nuevas técnicas y materiales, así como al conocimiento de la anatomía de la región. El objetivo de este estudio es revisar la experiencia obtenida en un centro hospitalario privado, para determinar los puntos de la técnica quirúrgica que aumentan la seguridad. Se realizó un estudio observacional, retrospectivo, transversal y analítico y se estableció un protocolo de 11 puntos, los cuales se siguieron en todos los procedimientos, usando la técnica transabdominal y preperitoneal. Fueron revisados los expedientes de pacientes con hernia inguinal atendidos del 02 enero de 2000 a 31 de diciembre de 2021. Se contabilizaron 750 pacientes, con promedio de 52 años; 623 pacientes con hernia unilateral. En 98% se usó malla de polipropileno. La complicación más frecuente fue el seroma, en 15 pacientes, la recidiva, adherencias, infección y muerte representan menos de 1%. Fueron analizadas las causas de las complicaciones. Se concluye que los once puntos establecidos en el protocolo quirúrgico son esenciales para la realización de una cirugía transabdominal preperitoneal segura.

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### INTRODUCTION

Progress in the surgical treatment of inguinal hernia is due to the introduction of new techniques and materials, as well as to the better knowledge of the anatomy of the region. In 1982, Ger reported the repair using only clips for the closure of the deep inguinal orifice; in 1989, Bagjavalenski proposed the

occlusion of the indirect sac using a mesh, and in 1992 Schoultz and Arregui described the longitudinal opening of the peritoneum, how to free the sac and place a large mesh covering the internal, direct and femoral orifices, thus establishing the transabdominal and transperitoneal technique later known as TAPP.<sup>1,2</sup> Today, laparoscopic inguinal hernia repair is performed in Latin America in only



**How to cite:** Chalita-Manzur A, López-Gavito E, Vázquez-Rosales MA, Chalita-Joanny JA, Rodríguez-Paz CA. Key points for safe transabdominal peritoneal laparoscopic inguinal hernioplasty (TAPP). Cir Gen. 2024; 46 (2): 105-109. <https://dx.doi.org/10.35366/118278>

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Received: 10/24/2023  
Accepted: 08/21/2024

6% of inguinal plasty cases, while in Australia, it is performed in up to 80%.<sup>2</sup> In addition to the transabdominal peritoneal technique (TAPP), there are other approaches, such as extraperitoneal (TEP) and extraperitoneal extended vision (eTEP).<sup>3</sup> Knowledge of anatomy is important since now the structures are visualized posteriorly, different from what the surgeon was used to in previous approaches as in the techniques proposed by Bassini and McVay; in addition, precise knowledge and mastery of the technique favor patient safety regarding results.<sup>4</sup> The present study aimed to review the experience obtained in a hospital center to determine the points of the surgical technique that increase patient safety.

MATERIAL AND METHODS

An observational, retrospective, cross-sectional, and analytical study was carried out, reviewing the records of patients who underwent inguinal hernia repair by TAPP technique from January 2, 2000, to December 31, 2021. They were followed up for five years until 2018, and the corresponding time was for those who underwent surgery afterward. All were treated at the Hospital de las Américas in San Luis Potosí, S.L.P. Mexico.

Surgical technique: a surgical protocol based on 11 strategic key points was established: 1) Placement of three ports, one of 10 mm in the umbilical scar for the optic and two of 5 mm, one in each flank, 3 or 4 cm above the level of the horizontal transumbilical line.<sup>5</sup> 2) Localization of the symphysis pubis and the iliac crest. 3) Opening of the peritoneum, starting at the level of the imaginary line between the iliac crest and the midline. 4) Dissection of the retroinguinal and retropubic spaces with a lower limit of about 2 or 3 cm distal to the pectineal ligament and femoral vessels. 5) Identification of the ilioinguinal, iliohypogastric, and genitofemoral nerves.<sup>6</sup> 6) Dissection of the external limit until the psoas muscle is identified and dissection up to the pubic tubercle, which is the internal limit. 7) Identify and dissect the hernial sac, pre-herniation lipoma, and the cord or round ligament elements. 8) When dissecting the pectineal ligament and femoral vessels, look for femoral defects and avoid vessels known as “corona mortis”.<sup>7,8</sup> 9) Placement of a “custom-made” mesh, according to the size of the pelvis, having weighed the area with metric tape on the outside of the patient and guided by the size of the instruments on the inside. 10) Heavy polypropylene mesh was used, fixing it with metallic tackers or 0 polypropylene suture, 3 cm from the hernial defect above to the pectineal

Table 1: Recommended safety measures.

TAPP-type inguinal plasty safety points
Placement of ports
Location of the symphysis pubis and iliac crest
Opening of the parietal inguinal peritoneum
Dissection of the retroinguinal and retropubic space
Identification of the inguinal nerves
Identification and dissection of the external limit up to the psoas
Identification and dissection of the internal limit up to the midline and pubis
Dissection of the hernial sac and lipomas of the cord
Identification of the pectineus ligament and the femoral vessels
Placement of adequately sized netting
Hermetic closure of the peritoneum

TAPP = transabdominal peritoneal.

**Table 2: Results. N = 750.**

Total population	
Female	258
Male	492
General anesthesia patients	746
Average length of hospitalization (hours)	20
Hernias	
Bilateral	127
Femoral	7

ligament and the pubic tubercle. 11) Closure of the peritoneum as tight as possible. Three-chip cameras and occasionally HD cameras were used. The optics used were 0 degrees most of the time. During 2021, self-adherent meshes were placed ([Table 1](#)).<sup>9</sup>

Statistical analysis: statistical analysis was used to describe measures of centralization and dispersion; the results are given in proportions.<sup>10,11</sup>

Ethical considerations: The patient's informed consent was obtained for the surgeries, and their data was anonymously handled for research. The study was not risky for the patient and followed the Helsinki Declaration and the General Health Law for human studies.

## RESULTS

During the study period, there were 750 patients, 492 (65.6%) male and 258 (34.4%) female. The average age was 52, ranging between 16 and 94 ([Table 2](#)). Six hundred and twenty-three patients had unilateral hernia (83%) and 127 bilateral (17%). Heavy polypropylene mesh was used in 738 (98.4%) and self-adherent mesh in 12 (1.6%). The average operative time was 42 minutes, ranging from 27 to 82 minutes. General anesthesia was used in 746 patients (99%) and regional anesthesia in the rest (1%). The average number of hours of hospitalization was 20 hours, with a range of 12 to 48 hours. The number of complications is shown in [Table 3](#). There were

15 seromas, corresponding to 2%. All others were 0%.

Given the work's objective, the complications' causes were analyzed, and the following was found: a) recurrence: a 65-year-old male patient (0.13%), operated on in 2003. After two months, he presented a conical pelvis with recurrence; a midline hernia was found in the reintervention, and a short mesh was appreciated. A wide dissection of the retro inguinal space was performed, and the mesh was placed above the previous one and fixed to the pubic tubercle with polypropylene sutures. Since then, the surgical protocol included this fixation. b) Infection: three patients (0.4%), all male, presented infectious conditions. Two were deep surgical site infections (abscesses in left iliac fossa) and one was superficial (subcutaneous). Cultures were *Escherichia coli* Blee+, sensitive to amikacin, so they were managed with this antibiotic at a dose of 1 g intramuscular for 14 days, as well as puncture (4 and 3) for the abscesses and drainage with Penrose tube for the superficial one. The cases occurred in 2005, and since then, it has been decided to be impregnated with a solution of amikacin 500 mg directly without dilution. It was not necessary to remove the mesh. c) Bladder perforation: in a 53-year-old male patient (0.13%), with previous surgery eight years earlier, bilateral anterior inguinal plasty with mesh, in another institution. During dissection of the retroinguinal space, when separating the bladder, firm adhesions were seen with the mesh placed years before, which led to perforation when trying to separate the bladder. It was resolved by closing the bladder in planes and placing a Foley catheter

**Table 3: Complications.**

	n (%)
Relapse	1 (0.13)
Infection	3 (0.4)
Adherence	1 (0.13)
Bladder perforation	1 (0.13)
Seroma	15 (2.0)
Death	1 (0.13)

for 10 days. The hernia was repaired with mesh occupying both sides of the iliac crests, fixed to the pubis and pectineal ligaments. d) Seroma: in 15 patients (2%) treated by in-office punctures. In two patients operated on in 2002, a residual hernial sac had been left, requiring its removal because it formed a seroma "capsule". e) Mortality: in one patient (0.13%) due to corona mortis lesion not noticed in the first surgery and hypovolemic shock in reintervention the following day. There were no cases of inguinodynia in the medium- or long-term.

In 127 patients with bilateral inguinal hernias, both sides were dissected, according to protocol, from iliac crest to iliac crest. A mesh covering both inguinal regions, about 30 cm in longitudinal diameter, was placed.

In the total number of patients (750), seven (0.9%) femoral hernias were not diagnosed during the preoperative period, but they were detected when the femoral orifice was intentionally checked; they occurred in six female and one male patient. Self-adherent mesh was used in 12 patients only when the mesh size was adequate for the patient's size (Table 3).

## DISCUSSION

Surgical treatment of inguinal hernia using the laparoscopic TAPP technique was established as the treatment of choice in a private hospital. Since the beginning of the interventions 20 years ago, a protocol has remained practically unchanged and consists of the following 11 key points during surgery. This protocol has maintained the advantages of minimally invasive surgery, such as less pain, short hospital stay, and cosmetic aspects. The data analysis reported a recurrence rate of 0.13%; according to the experience of other Latin American authors, the recurrence rate is up to 2.6% at 5 years of follow-up.<sup>9</sup>

It is important to highlight that there were no cases of inguinodynia, and we consider the nerve identification step fundamental. We consider that the placement of tackers or sutures in the pubic tubercle in the pectineal ligament was not a cause of inguinodynia in this

cohort of patients, so we should look for the causes of nerve injury and not the placement of metallic or plastic material or sutures in the ligaments. The use of amikacin solution and prophylactic intravenous amikacin was added to the protocol, which has resulted in no infections. Remnants of the hernia sac are no longer left behind, as recommended in the medical literature in the early years,<sup>10</sup> since this led to the appearance of seromas that required excisional surgical management.

Wide dissection in bilateral inguinal hernias is important. A large mesh should be placed longitudinally, covering both orifices and well fixed. The procedure is not risk-free, and care must be taken in the dissection of the retropubic space due to the risk of injury to the vasculature known as "corona mortis".

## CONCLUSIONS

Based on the analysis of this cohort of patients who underwent laparoscopic TAPP-type inguinal plasty, it is recommended to follow the 11 key points to perform this surgery safely.

Dissection and care of the inguinal nerves considerably reduce the risk of inguinodynia as a postoperative complication. The placement of tackers or sutures in the pectineal ligament or pubic tubercle does not seem to cause inguinodynia. Careful dissection of the hernia sac, leaving no remnant in the canal, eliminates the possibility of a seroma refractory to simple drainage. Strict adherence to the key points for safe TAPP inguinal hernioplasty allows diagnosis of inadvertent femoral hernia in up to 1 in 100 procedures.

## ACKNOWLEDGMENTS

Dr. Héctor Faustino Noyola Villalobos  
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