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# Minilaparoscopy For Inguinal Hernia Repair

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## ABSTRACT

**Background and Objectives:** Inguinal hernia repair is among the most common procedures performed worldwide and the laparoscopic totally extraperitoneal (TEP) approach is a recognized and effective surgical technique. Although technically advantageous because of the option of no mesh fixation and no need for creation of a peritoneal flap resulting, in less postoperative pain and faster recovery, TEP has not achieved the popularity it deserves, mainly because of its complexity and steep learning curve. Minilaparoscopy was first described in the 1990s and has recently gained significantly from better instrumentation that may increase TEP's effectiveness and acceptance. We performed a prospective study, to analyze the outcomes of minilaparoscopy in pain and operative time when compared to the conventional laparoscopic technique in hernia repair.

**Methods:** Fifty-eight laparoscopic inguinal hernia repairs were performed: 36 by traditional laparoscopic technique and 22 by minilaparoscopic instruments (mini). A study protocol was applied prospectively for data collection. Variables analyzed were early postoperative pain (at hour 6 after procedure), pain at discharge, use of on-demand analgesics, and operative time.

**Results:** The mini group presented reduced early postoperative pain and operative time. The present study also suggests less postoperative pain at discharge with mini procedures, although this difference was not statistically significant. No difference between the groups regarding on-demand use of analgesics was found.

**Conclusions:** This study corroborates findings in previously published papers that have shown the feasibility of minilaparoscopy in laparoscopic TEP hernia repair and its benefits regarding postoperative pain, operative time, and aesthetic outcomes.

**Key Words:** Endoscopic hernia repair, Microlaparoscopy, Minilaparoscopy, Minimal access hernia surgery, Needlescopic surgery.

## INTRODUCTION

Inguinal hernia repair is one of the most common surgical procedures performed worldwide, with [sim[20 million surgeries performed every year.[1–3] Although controversies remain in the literature regarding the different techniques and surgical indications, there is a need to improve outcomes vis-à-vis chronic pain, operative time, costs, and aesthetic benefits. In the field of minimally invasive techniques, the endoscopic approach has reached great acceptance. Several studies suggest advantages regarding less chronic postoperative pain and numbness, faster recovery, less complications (such as infection and hematoma), and even costs, when compared to open access for hernia repair.[3,4]

In laparoscopic surgery there are 2 main techniques for hernia repair: transabdominal preperitoneal (TAPP) and totally extra peritoneal (TEP) approaches, and both use a mesh in the preperitoneal space. The search for better outcomes has led surgeons to look for alternatives for laparoscopic inguinal hernia repair. Minilaparoscopy (mini), by the reduced diameter of the traditional laparoscopic instruments, is the natural advancement of endoscopic hernia repair, and may lead inguinal hernia surgery in a new direction. With the advent of low-friction trocars, longer and precisely engineered for low-friction forces between the trocar and the mini instruments, improvement has been found in surgical precision during dynamic tasks (e.g., dissection of hernia sac), causing less stress and higher efficiency resulting in ease of tasks. Trocar dislocation and skin reinsertions were

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significantly diminished, consequently reducing skin trauma, resulting in improved aesthetics.[5–7,8]

Although advantageous in several ways, mainly because of doing away with mesh fixation, resulting in less postoperative pain and faster recovery, TEP has not been widely adopted because of its complexity, especially in creating the preperitoneal space and understanding inguinal anatomy in a narrow space.[9,10]

The hypothesis was that combining the established advantages of TEP with the delicacy, precision, and increased visualization of the mini in narrow spaces, it would be possible to develop an operative technique that would be simultaneously attractive for the surgeon, because it is simpler and faster to execute and for the patient, it can also promote less abdominal wall trauma and improve the aesthetic outcome.[9,10]

This hypothesis was studied in a nonconsecutive convenience sample of cases of inguinal hernia. TEP technique was compared for both conventional and mini approaches for inguinal hernia repairs.

## METHOD

From May 2012 through September 2015, 58 laparoscopic inguinal hernia repairs were performed by the TEP technique in the surgery department of the Hospital Universitário Gaffree Guinle (HUGG), Federal University of the State of Rio de Janeiro (UNIRIO). Inclusion criteria for this study were patients with nonrecurrent unilateral inguinal hernias. Exclusion criteria were patients under 18 years of age, use of systemic corticosteroids, and complex cases, including recurrent hernia, inguinal bilateral hernia, active infection, inguinoscrotal hernia, and history of extraperitoneal procedures. Patients who agreed to participate were required to read and sign an informed written consent.

In this study, 58 patients were included and were divided into the control group (CG) and minilaparoscopic group (MLG). The surgical team, equipment, and patient positioning for both groups are summarized in **Figure 1**.

Thirty-six surgeries were performed by the traditional TEP technique in the CG. In both groups, patients were under general anesthesia, in a supine Trendelenburg position, without bladder catheterization. A single dose of cefazolin (1 g), was administered as a prophylactic antibiotic at anesthesia induction. The preperitoneal access was begun by a periumbilical incision, ipsilateral to the hernia. After exposing the anterior rectus sheath, ~1.5 cm of the sheath was opened. After dissection of the muscular fibers and visualization of the posterior sheath, an 11-mm reusable

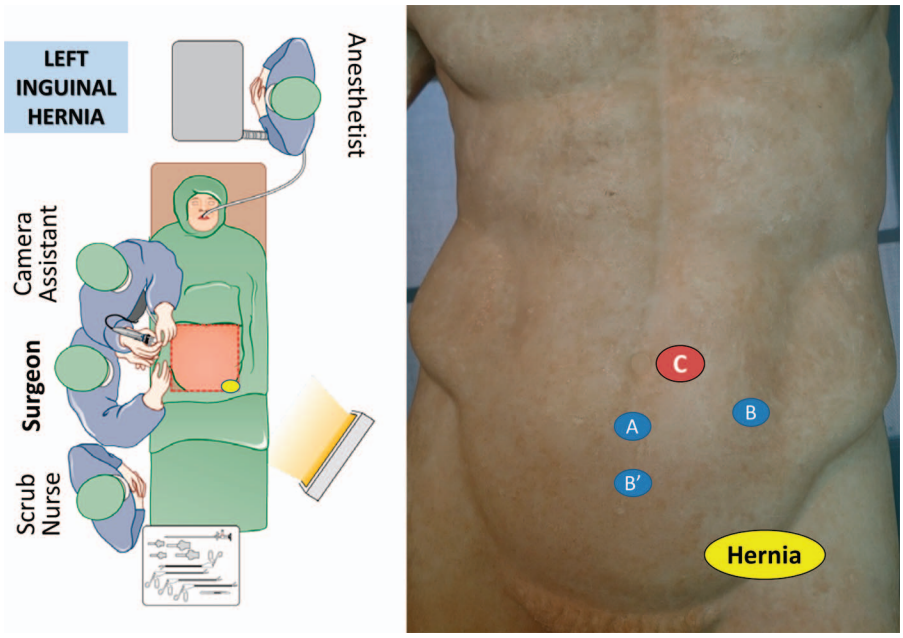


**Figure 1.** Operating room setup and trocar positions for a left inguinal hernioplasty. After inserting the camera (C), trocar A is inserted. If a good operative space is obtained, the best choice is to place the next trocar at the B position; otherwise, the second trocar is inserted at B′ position. A, B, and B′ can be either 6 mm (CG) or 3.5 mm (MLG).

trocar was positioned with a U suture with a polypropylene 0 thread. Through the 11-mm trocar a 30° 10-mm optic was used to access the preperitoneal space. That space was progressively created by blunt telescopic dissection and $CO_2$ insufflation at a continuous pressure of 12 mm Hg. No disposable trocar or dissecting balloon was used in this step.

Once enough space was created, two 6-mm reusable trocars were placed (**Figure 1**): one in an infraumbilical position and the other in the iliac fossae, ipsilateral to the hernia. After the instruments were positioned, we started the dissection of Frouchaud's myopectineal orifice, along with the identification of all the following anatomical structures: pubic bone, inferior epigastric vessels, gonadal vessels, deferens duct (male patients), round ligament (female patients), Cooper's ligament, and the urinary bladder, followed by identification, dissection, and reduction, when present, of the indirect sacs, cord lipomas, and hernial contents. After properly finishing dissection, we inserted a trimmed portion of polypropylene mesh (measuring 16 × 11 cm) with no folds into the cavity with the paraumbilical 11-mm trocar (**Figure 2**). Small peritoneal openings were routinely closed with Vicryl 3-0 sutures. The preperitoneal space was desufflated under direct vision. No mesh fixation was performed.

When residual pneumoperitoneum was present, a Veress needle puncture was used to evacuate the gas and the aponeurosis was sutured with polypropylene 0. Finally, the skin was sutured with Mononylon 4-0 sutures. The type of hernia (indirect, direct, or mixed) and operative timing were recorded in all cases.

Another 22 procedures were performed by minilaparoscopic approach (MLG), with Karl Storz new generation of minilaparoscopic instruments (3 mm low–friction trocars). Surgery was performed with exactly the same steps as in the conventional technique (CG) except for simple substitution of the 2 working trocars of 6 mm for those of 3.5 mm and, consequently, the use of 3-mm low-friction instruments.

Patients in both groups were medicated in the postoperative period in a standard manner: with nonsteroidal antiinflammatory drug and on-demand use of analgesics (dipyrone 1 g IV). The number of doses of dipyrone needed was also recorded, along with the value obtained on the visual analog pain scale at 6 hours after surgery and at hospital discharge (24 h after surgery).

In this prospective series, all procedures were performed by the same surgeon; there was no patient selection for one or the other technique, and the type of surgery was chosen by instrument availability. A minilaparoscopic set of instruments was received as a loan for a limited time. Before and after this period, the standard 5-mm TEPs were performed and during the loan period, only the mini-TEP was performed. No selection criteria other than the availability of the mini instruments were used. The operative time was also recorded in all cases.

For statistical analysis, the data were stored in SPSS Statistical Software (IBM, Chicago, Illinois, USA), and standard statistical tests were performed. To evaluate pain and operative time, we performed the Mann-Whitney nonparametric test, whereas for the use of on-demand analgesia (dipyrone), a $\chi^2$ test was performed. The results are presented by median and range. $P < .05$ denoted statistically significant differences.

## RESULTS

The median age for CG was 55 (±17) years, whereas for MLG was 53 (±14) years. For the CG the number of indirect, direct, and mixed hernias was 19, 15, and 2, respectively. On the other hand, for MLG, there were 13

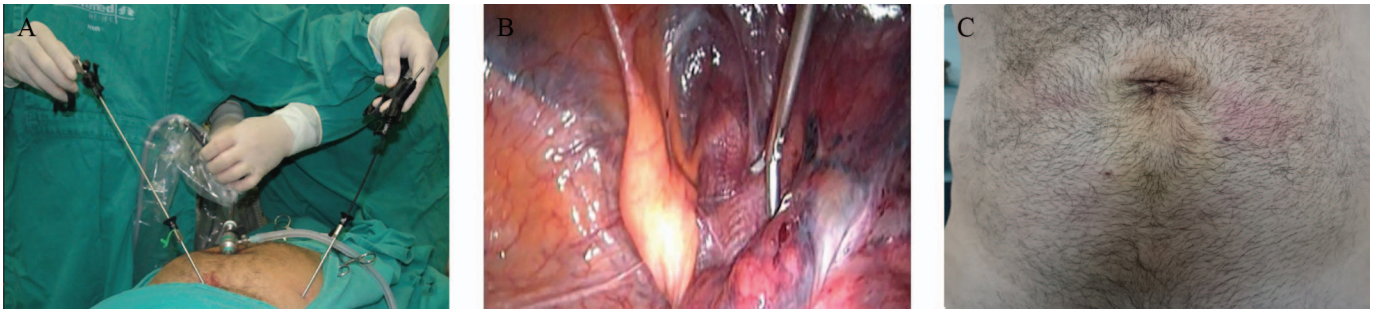


**Figure 2.** (A) Great ergonomics and good triangulation can be obtained. (B) Intra abdominal view of the hernia site, showing final adjustments of the mesh. (C) Early good aesthetic results on the 2nd POD.

cases of indirect and 9 cases of direct hernias. No statistical differences were found between these groups.

The results are summarized in **Table 1**. The 2 parameters pain at 6 h after surgery and operative time were higher in the CG ($P = .035$ and 0.007) than in the MLG. There were no differences between groups regarding pain at discharge and the use of rescue analgesia.

## DISCUSSION

In laparoscopic surgery, there are 2 main techniques for hernia repair, TAPP and TEP, with standard use of mesh. Comparing both approaches, in TAPP there is the advantage of obtaining an intraperitoneal view of abdominal structures, whereas in TEP, there is only the view of the space created extraperitoneally. However, studies have suggested that TEP may be a better option, because it eliminates the need of creating a peritoneal flap that subsequently must be closed. Mesh fixation is also not necessary for TEP, resulting in less chronic pain and faster recovery.[10–15] In this study, we noticed low pain scores in both groups of TEP repairs and lower in the MLG group.

The main reason not to operate in more complex cases—recurrent, scrotal, and bilateral hernias—in the present investigation was to avoid confounding factors, facilitating statistical analysis. The authors have routinely used minis in operations for bilateral and recurrent hernias, but usually have not used them in repair of large scrotal hernias. In those cases, a hybrid procedure with 5-mm instruments has been the surgery of choice.

Described in the early 1990s by Dulucq et al,[13,14] TEP involves the use of a large mesh that covers the myopectineal orifice at the preperitoneal layer of the fascia transversalis. Endoscopic hernia repair has been considered to be slightly superior to open approaches, mainly because it is associated with an earlier recovery, less chronic pain, and a lower risk of infection.[11–15]

**Table 1.**
Pain Scores and Operative Time

| Outcome | CG | MLG | *P* |
|---|---|---|---|
| Pain at 6 hours* | 3.5 (2–5) | 2 (1.75–3) | 0.035 |
| Pain at discharge* | 1 (1–2) | 0.5 (0–2) | 0.083 |
| Operative time (min) | 37.5 (32–45) | 33 (30.3–37) | 0.007 |

Data are expressed as the mean (range).
*Pain scale score (10 maximum).

Although mostly attractive and advantageous, endoscopic repair of inguinal hernias is still an unpopular procedure among surgeons. Several problems prevent its widespread usage, including the higher cost of the procedure. TEP is a complex procedure with a steep learning curve, being considered the most difficult among the laparoscopic procedures, and some have suggested that the learning curve may entail as many as 250 cases.[3] It also carries the risk of severe complications, not commonly seen in open procedures. To simplify the procedure and reduce costs, avoidance of dissecting balloons and mesh fixation has been advocated, being the core technique of both groups in this study.[10–15]

With the advent of the reduced-port surgery era, minilaparoscopy regained attention as an attractive option for improving the cosmetic appearance, while preserving the most valuable laparoscopic principle of instrument triangulation. In addition to its known advantages to surgeons who have been performing minilaparoscopy for years, minilaparoscopic instruments have been improved for better performance at lower cost, thus allowing mini procedures to be an even more attractive option. These advantages now greatly surpass aesthetics, the only proven advantage of single-port and NOTES.[7,9,19,20]

The search for better outcomes has led surgeons to keep looking for new alternatives for hernia repair, and the minilaparoscopic technique is one that may guide hernia repair into a new direction. Minilaparoscopy was originally used for TEP in the late 1990s,[8,16,17] but previous use of minilaparoscopic instruments did not achieve the expected results, mostly because the older instruments were flimsy, fragile, and costly. Today, the instruments are more resistant and cost effective, and the new low-friction instruments are a real game changer. These significant advances have changed the scenario of minilaparoscopic surgery.[1,2,18–22]

The advent of the new low-friction trocars, engineered for low-friction forces between the trocar and the mini instruments, improves surgical precision during dynamic tasks (e.g., dissection of the hernia sac), resulting in less stress and higher effectiveness, especially in hernia surgery. Trocar dislocation and skin reinsertions were significantly diminished, consequently reducing abdominal trauma, resulting in less pain and improved aesthetics.[1,7, 9,10,18–21.] (**Figure 3**) This technique of mini-TEP without mesh fixation also entails a considerable reduction in cost, because it does not use expensive meshes, disposable instruments, the fragile 3-mm laparoscope, sutures, glue, or tackers, and hence it is possi-

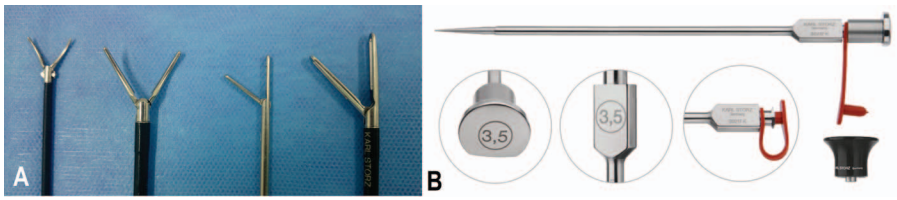


**Figure 3.** (A) Comparison between tips of mini and regular 5-mm laparoscopic instruments. (B) Details of the new low-friction 3.5-mm trocar, precisely engineered for low-friction forces between the trocar and the mini-instruments, having no valve and no seal.

ble to perform this type of repair on a larger number of patients to their advantage.[1,7,8,10]

Previous studies have evaluated operative time, pain, the aesthetic aspect of scars, and the results have brought optimism for the minilaparoscopic approach. The evident aesthetic benefits are based on patient satisfaction regarding the scars of the procedure. The difference in operative time favoring minilaparoscopy was apparently small (4.5 min), but it was not only statistically significant ($P < .05$), representing 14% shorter time, but also a possible unexpected result as many would expect the mini instruments to perform worse than the 5-mm ones. The most possible reasons for the better performance in time for minis are easier manipulation of mini-instruments with low-friction trocars increasing dexterity and precision and better visualization of the structures in the restricted visual field.[8,9–17]

An important feature of minilaparoscopic surgery, the decreased surgical trauma is achieved by the reduction in diameter of the laparoscopic instruments and trocars.[18–20] This improvement is obtained with the maintenance of range of motion in triangulation throughout surgery. Along with the benefit of low-friction trocars, minilaparoscopy has the potential of improving ergonomics and, therefore, provides the surgeon the precision that is needed.[5–7,9,10,18–22]

Clear visualization is mandatory in laparoscopic procedures, and especially in the ones performed in restricted surgical spaces like the preperitoneum. One of mini's unique features is the reduced optical shadow produced by the minilaparoscopic instrument. Enhanced visualization achieved with the mini is remarkable, allowing easier identification of the structures facilitating procedures such as TEP inguinal hernia repair.[9,10,18–22]

This gain in precision provided by better visibility and lower friction, becomes particularly important when it is necessary to work in a previously nonexistent space, such as the preperitoneal space. The reduced size of mini-instruments can enhance the view to a range of up to 2.7 times in magnification.[1,5–7,9,1018–22]

## CONCLUSIONS

Our results support the benefits suggested in previous noncomparative studies regarding early postoperative pain and a small but significant reduction in operative time.[9–11]

The mini-TEP, combining features and advantages of the extraperitoneal approach with the delicacy and precision of the mini-instruments, appears simple, safe, and versatile. Reduced costs can be anticipated because this technique obviates the need for using balloon dissection and mesh fixation. A reduced learning curve can also be anticipated, because minilaparoscopic preperitoneal dissection allows faster and easier creation of the preperitoneal space.[9–11]

The results found in the present study suggest that patients and surgeons may benefit from gains in operative time and reduction in early postoperative pain with the use of minilaparoscopy for the TEP technique. The findings are in accordance with previous studies that have suggested the same findings along with the evident aesthetic gains that the use of such small instruments afford the patient. Although this study did not evaluate short-term complications and recurrences, none was registered.

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