

# Combined TAPP and TEP: A New Modified Technique for Laparoscopic Inguinal Hernia Repair

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## ABSTRACT

**Background:** No other laparoscopic procedure has been the source of controversy as much as the laparoscopic approach to inguinal hernias. The two common laparoscopic techniques include the transabdominal preperitoneal repair (TAPP) and the total extraperitoneal repair (TEP). We present our experience with a novel technique by combining the two ideas of TAPP and TEP to get benefit of both techniques. We compared the operative time and the need for mesh fixation of the new technique with that of the standard TAPP technique.

**Methods:** From May 2009 to July 2011, a total of 335 patients complaining of indirect inguinal hernia were included in this study. We have operated on 137 patients with new technique of combined TAPP and TEP (first group). The other 198 patients were operated with the standard TAPP technique (second group). All patients who had the new modified technique were operated by a single surgeon in a university-affiliated hospital.

**Results:** All procedures have been finished laparoscopically with no conversion. The average operative time was 39.8 minutes for the first group and 44.3 minutes for the second group. Mesh was fixed in 30 patients (21.9%) of the first group and 81 patients (40.9%) of the second group. Postoperative port site infection in the first group occurred in 3 patients (2.19%). No perioperative morbidity or mortality occurred.

**Conclusion:** Combined TAPP and TEP is safe and feasible. It simplifies the procedure; makes operative time significantly less with lower rate of recurrence as well as decreases the need for mesh fixation.

**Keywords:** TAPP, TEP, Laparoscopic hernia repair.

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## INTRODUCTION

A variety of laparoscopic techniques for hernia repair were described. The two common laparoscopic techniques include the transabdominal preperitoneal repair (TAPP) and the total extraperitoneal repair (TEP) which mimics the open preperitoneal repair of Stoppa. Both the TAPP and TEP use the basic principle of placing a piece of mesh in the preperitoneal space as described by Stoppa.<sup>1</sup> The TAPP repair is performed from within the abdomen with an incision that is made in the peritoneum to access the preperitoneal space. It is the most common laparoscopic technique used because it allows the surgeon to have the entire abdominal cavity as visual referral points. In the TEP

repair, dissection is initiated totally in the extraperitoneal space. However, there is a crucial difference between the two techniques because TEP does not include the use of pneumoperitoneum as opposed to TAPP approach. The TEP technique of laparoscopic inguinal hernia repair avoids entry into the abdominal cavity, and thereby eliminates the risks and complications inherent to the TAPP repair. Major blood vessel, bowel and bladder injury are extremely rare and mostly associated with TAPP technique. Recently, the TEP technique has become more popular laparoscopic approach to groin hernias.

In our practice, we developed a novel technique by combining the two ideas of TAPP and TEP so as to get benefit of both techniques. We noticed that creating a 'pneumoperitoneum-like' state in TEP technique facilitates the dissection of the peritoneum and fascia transversalis off anterior abdominal wall. We do this in TAPP by insufflation of CO<sub>2</sub> under vision in extraperitoneal space using Veress needle then withdraw the needle and continue the operation as usual classical TAPP.

## METHODS

From May 2009 to July 2011, a total of 235 patients were scheduled for elective laparoscopic inguinal hernia repair and included in this study. All patients have signed an informed consent to be enrolled in this study and protocol of the research has been approved by Alexandria Faculty Medical Ethics Committee. All patients were operated under general anesthesia in a university-affiliated hospital. The patients were randomly divided into two groups: The first group included 137 patients who underwent the new technique of combined TAPP and TEP while the second group included 198 patients who underwent the standard TAPP technique. All the patients had routine preoperative evaluation. The patients were put in supine position which had been changed to Trendelenburg position after introduction of first umbilical trochar.

In the first group, who underwent combined TAPP and TEP, a Veress needle was inserted through a small supra-umbilical incision and a pneumoperitoneum at a pressure of 15 mm Hg was performed. Removal of Veress needle and then a 10 mm camera trochar was inserted instead and the groins were assessed. The preperitoneal space was then entered through a small 2 mm infraumbilical incision,

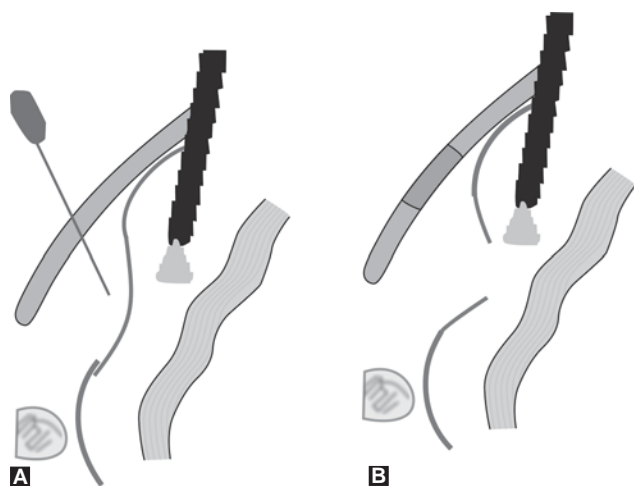
through which another Veress needle or 5 mm trochar was introduced to the preperitoneal space under transperitoneal scope direct vision. The preperitoneal space was insufflated by CO<sub>2</sub> to a pressure of 10 mm Hg so that the peritoneum and fascia transversalis were dissected off anterior abdominal wall under visual control by the intraperitoneal scope (Fig. 1A).

After that, the second Veress needle was withdrawn, insertion of two 5 mm midclavicular routine working trochar to intraperitoneal space and complete the operation as classical TAPP by transverse incision of the peritoneum, dissection of the preperitoneal space and put 15 × 10 cm mesh to cover all three groin hernia orifices (Fig. 1B). Our protocol was routinely not to fix the mesh regarding that the laying space is roomy enough for it to be spread satisfactorily. In some cases where the surgeon was not satisfied, the mesh was sutured to the pubic bone, Cooper's ligament and the muscle layers anteriorly but not into the ileopubic tract or posterior to this. None of our cases had bilateral hernia. Closure of transverse peritoneal incision was done in all cases using continuous 3-0 Vycril intracorporeal sutures. At the end of procedure, routine inspection of the abdomen, deflation of the pneumoperitoneum and closure of the skin incision by subcuticular absorbable fine sutures were done.

All our patients were followed up for 6 to 18 months with an average of 10 months by 3 months OPC visits. All intraoperative and postoperative complications, operative time, hernia recurrence, the need for mesh fixation and patients' satisfaction were recorded and statistically analyzed.

## RESULTS

Two hundred and thirty-five male patients were included in this study. Of them, 184 patients (78.3%) suffered from



**Figs 1A and B:** (A) Inflation of preperitoneal space by Veress needle under vision of transperitoneal scope, (B) complete operation as classical TAPP

right indirect inguinal hernia, 51 patients (21.7%) suffered from left indirect inguinal hernia. One hundred and sixty-one cases (68.5%) were bubonocoele and 74 cases (31.5%) were funicular type of inguinoscrotal hernia, complete scrotal cases were not included. Patients' average age was 34 years (Table 1).

All procedures were completed laparoscopically. The operative time, defined as the time from skin incision to skin closure, ranged from 30.2 minutes up to 44.6 minutes with average operative time of 39.8 minutes in the first group while in the second group; it ranged from 40.6 minutes up to 49.2 minutes with average of 44.3 minutes. In the first group, we used Veress needle in preperitoneal inflation in 88 cases and 5 mm trochar in 49 cases, we found it easier by trochar but there was no significant difference in operative time recorded which was 39.4 in needle group versus 36.2 minutes in trochar one ( $p = 0.79$ ). In the first group, mesh was fixed in 30 patients (21.9%) while in the second group, it was fixed in 81 patients (40.9%; Table 2).

There were no intraoperative or postoperative complications except for postoperative port site infection which occurred in three patients (2.19%). No perioperative deaths occurred. All patients were discharged within two days of surgery. Their activity was not restricted postoperatively in all patients. No recurrence was observed in regular follow-up visits for 6 to 18 months with average 10 months, and patient satisfaction was subjectively excellent, as determined by office interview.

## DISCUSSION

Hernia repair is currently the most commonly performed general surgical operation; it occurs with a greater frequency in men than women (12:1 ratio) and accounts for nearly 800,000 cases per year in the United States.<sup>2</sup> The goals of successful hernia repair must include achievement of an effective repair with the lowest possible recurrence, minimal operative and postoperative discomfort with a rapid return to normal activity, and also cost-effective. Success of groin hernia repair depends largely on the surgeon's understanding of the functional anatomy and pathophysiology of the abdominal wall and groin, as well as knowledge of how to use the currently available techniques and materials most effectively.

**Table 1:** Patients' demographic data

Patients	
• Age (yrs)	27-51 (average, 34)
• Hernia	
– Right	184 (78.3%)
– Left	51 (21.7%)

**Table 2:** Relation between method of preperitoneal insufflations and operative time in the first group

Instrument used		Mean operative time	p
Veress needle	88 (65%)	39.4	0.79
Trochar 5 mm	49 (35%)	36.2	
Total	137 (100%)	30.2	

The repair of inguinal hernias no longer involves just the sewing together of a defect in the musculature. Several approaches, which hernia surgeons must be familiar with, have been used for repair of groin hernias and have included tissue repairs (later termed 'tension' repairs), as well as mesh or tension-free repairs and laparoscopy. Although each of these repairs boasts its successes, there are advantages and disadvantages to each approach.

Tension-free repairs are considered as a milestone in the evolution of the hernia repair surgeries. The use of mesh in hernia repairs, however, was not widely accepted for use until Lichtenstein<sup>3</sup> coined the term 'tension-free' repair. This repair uses nonabsorbable sutures and a prosthetic flat mesh screen to reinforce the canal floor. Since its introduction, this repair has been the most widely performed groin hernia repair and is used as the standard to which newer techniques are compared. In an attempt to improve on the Lichtenstein repair, Gilbert<sup>4</sup> used the internal ring as direct access to the preperitoneal space through an open anterior approach. This innovation of accessing the preperitoneal space from an anterior approach led to the development of the Prolene Hernia System mesh. Finally, advancements in laparoscopy led to the development of laparoscopic inguinal hernia repair. Currently, there are multiple tension-free techniques, which include the open anterior approach (on-lay Lichtenstein patch, plug and patch), open posterior approach (Stoppa-Rives, Kugel), and the closed posterior approach (laparoscopic) either TAPP or TEP.<sup>5</sup>

The laparoscopic approach for inguinal hernia repair was introduced in the 1990s and has since been modified and refined. The early descriptions of laparoscopic inguinal herniorrhaphy were by Ger,<sup>6</sup> Shultz et al.,<sup>7</sup> Corbitt,<sup>8</sup> and Filipi et al.<sup>9</sup> Laparoscopic techniques are being used increasingly in the repair of ventral hernias and offer the potential benefits of a shorter hospital stay, decreased wound complications and possibly a lower recurrence rate. However, no other laparoscopic procedure has been the source of as much controversy as the laparoscopic approach to inguinal hernias. The basis for this debate is the already excellent results of conventional open hernia repair. The uptake into practice of this procedure by general surgeons has been less than expected. The main disadvantages are the long learning curve required, relatively high cost, long

operative duration, controversial benefits and the need for general anesthesia due to the perceived risk of adverse effects of pneumoperitoneum, which is thought not to be well-tolerated by a patient who is awake during the procedure. While the traditional open mesh repair requires average surgical skills and the delivery of local or regional anesthetics in most of the cases.

It is now accepted widely that bilateral inguinal hernia repair and recurrences are indications for TAPP repair, with clear benefits for the patient in terms of less postoperative pain and shorter work absence.<sup>10</sup>

Laparoscopic techniques for the repair of inguinal hernias have become an increasingly popular alternative to open techniques.<sup>11</sup> There is good evidence that laparoscopic repair of a groin hernia is associated with excellent results when performed by expert surgeons. No clear consensus has emerged as to the best laparoscopic technique.<sup>11</sup>

When faced with an unforeseen anomaly during TEP in which improved abdominal visualization is necessary, a surgeon may convert from a TEP to a TAPP approach.<sup>11</sup> With better equipment and techniques for creation of pneumoperitoneum serious complications are now infrequent.<sup>12</sup>

In our novel techniques, the formation of 'pneumo-peritoneum-like' state facilitates the dissection of the peritoneum and fascia transversalis off anterior abdominal wall under vision so as to reduce complications from unpredictable anomalies and in the same time reducing the operative time. Intraoperative and postoperative complications are minimal as well as recurrence rate. Patients' satisfaction is good. The ability of repair recurrent hernia and bilateral hernias in less time is another advantage. The new technique requires more prospective studies to assess the postoperative complications, training curve of the surgeons and its statistical significance.

## CONCLUSION

Our novel use of a laparoscopic combined TEP approach and TAPP approach to repair inguinal hernia is feasible, save and seems to be easier and time saving than original methods separately.

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