

# Laparoscopic Totally Extraperitoneal Inguinal Hernia Repair: Nonfixation of Three-Dimensional Mesh

## Reparo da hérnia inguinal por laparoscopia totalmente extraperitoneal

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### ABSTRACT

**Background:** Laparoscopic totally extraperitoneal (TEP) repair is preferred over transabdominal preperitoneal hernia repair (TAPP) as the peritoneum is not violated and there are fewer intra-abdominal complications. This is undoubtedly the most elegant technique, but more difficult to perform. The purposes of this study were to describe and discuss our techniques and the modifications of using 3-D mesh in TEP inguinal hernia repair. **Methods:** Patients who underwent an elective inguinal hernia repair at the Department of Abdominal Surgery at the CHICAS (Centre Hospitalier Intercommunal des Alpes du Sud), Gap, France and Department of Surgery, Professor Edmundo Vasconcelos Hospital, São Paulo, Brazil between May and December 2009 were enrolled retrospectively in this study. Operative and postoperative course were studied. **Results:** A total of 39 hernia repairs were included in the study. The hernias were repaired by TEP technique. Mean operative time was 45 min in unilateral hernia and 62 min in bilateral hernia. There were no serious complications. **Conclusion:** According to our experience, in the hands of experienced laparoscopic surgeons, TEP has an acceptably low complication rate. Laparoscopic hernia repair seems to be the favoured approach for most types of inguinal hernias. However, the patient must be told about the possible complications.

**Key words:** Laparoscopic surgery. Inguinal hernia. Surgical mesh.

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## INTRODUCTION

The inguinal hernia repair has been a controversial area in surgical practice ever since it was conceived.<sup>1</sup> The fact that numerous different procedures are in use reflects the complexity of inguinal instability and its repair. The aim of hernia repair is to repair the weakness of the abdominal wall. The laparoscopic procedure is the only technique that allows us not to injure the abdominal wall. In the laparoscopic procedure, the repair is achieved by placement of a prosthetic mesh to cover the entire groin area, including the sites of direct, indirect, femoral and obturator hernias. The totally extraperitoneal procedure (TEP) combines the advantages of tension-free mesh reinforcement of the groin with those of laparoscopic surgery, reduces postoperative pain and shortens recovery time while

avoiding the need for a transabdominal approach.<sup>2</sup> The establishment of this technique by Dulucq in Europe may be considered a logical further development of transabdominal preperitoneal hernia repair (TAPP).<sup>3,4</sup> The surgeon can use the endoscopic inguinal hernia technique for the repair of a primary hernia, providing the surgeon is sufficiently experienced in the specific procedure.<sup>5</sup>

In this paper we will evaluate the technique for laparoscopic hernia repair. This retrospective review will evaluate the safety and effectiveness of this repair. We discuss the changes to the operative technique that helped reduce complication rates and present reasons for continuing to utilize the laparoscopic approach. We describe and discuss our techniques and the modifications when using 3-D mesh in laparoscopic totally extraperitoneal (TEP) inguinal hernia repair.

## MATERIALS AND METHODS

Patients who underwent an elective inguinal hernia repair at the Department of Abdominal Surgery, CHICAS, Gap, France and at the Department of Surgery, Professor Edmundo Vasconcelos Hospital, São Paulo, Brazil between May and December 2009 were enrolled retrospectively in this study. We evaluated subjects for inclusion in a consecutive series of 39 laparoscopic hernia repairs who had undergone the TEP procedure. The protocol of this study was approved by the Medical Ethics Committees of Professor Edmundo Vasconcelos Hospital and CHICAS.

### SURGICAL TECHNIQUE

#### - Preoperative preparation

The TEP is performed under general anesthesia and with the administration of a single dose of antibiotic prophylaxis (cephalosporin: 2g cefazolin). The patient urinates just before the surgery. The patient is placed in the supine position; the arm is set along the body on the side opposite the hernia. The surgeon stands on the side opposite the hernia. The patient is placed in a slight Trendelenburg position.

#### - The operation step 1: extraperitoneal access

A Veress needle is first inserted in the midline just above the pubis in the suprapubic space of Retzius. We use three trocars in the midline. A infraumbilical transverse incision is made. A 10-mm trocar is inserted in the subcutaneous plane in a horizontal direction, then slowly lifted up and introduced at an angle of 60° towards the sacrum.

#### - The operation step 2: dissection of the preperitoneal space

The laparoscope is introduced through the infraumbilical port and the preperitoneal space is visualized. We use the 0° laparoscope for the preperitoneal dissection. The insufflation continues with a pressure set at no higher than 12 mmHg. One hand holds the optic, the other leans on the abdominal wall. It is a question of balance between left and right.

#### - Medial dissection

With the laparoscope the surgeon creates a medial tunnel. There are three essential anatomic landmarks: 1 the pubic bone, 2 the arcuate line, 3 the

inferior epigastric vessels. The first step is to identify the pubic bone which appears as a white glistening structure in the midline. The second anatomical key is the arcuate line on the side. The third anatomical key is the inferior epigastric vessels. Under direct visualization two 5 mm trocars are placed in the midline: one just above the pubis and the other between the first two trocars. In the case of direct hernia, the hernial sac is visualized before the inferior epigastric vessels. In the indirect hernia, the inferior epigastric vessels are seen before the hernial sac is encountered.

#### - Lateral dissection

This is the time to dissect the lateral space. The passage to do the lateral dissection is in the angle between the arcuate line and the inferior epigastric vessels. If the arcuate line extends lower, a short incision (scissors without coagulation) must be made in it to ensure safe and adequate dissection.

The lateral dissection is done all the way up to the psoas muscle inferolaterally, thereby exposing the nerves in the « lateral triangle of pain ». <sup>6</sup> The lateral space contains loose aerolar tissue, which is completely divided using blunt dissection.

#### - The operation step 3: hernia dissection

The hernia is completely dissected from the cord structures and reduced. Next, the peritoneal sac with reflection is completely reduced. The vas deferens is seen lying separately on the medial side and gonadal vessels are seen on the lateral side forming a triangle. This triangle, known as « triangle of doom » is bounded medially by the vas deferens, laterally by gonadal vessels with its apex at the internal inguinal ring, and the base is formed by the peritoneum. <sup>6</sup>

#### - The operation step 4: placement of the mesh

The 3-D anatomically contoured polypropylene mesh (Microval; Malmont, France) is introduced through the 10-mm infraumbilical port. The mesh is placed over the space created for it to cover the sites of direct, indirect, femoral and obturator hernias (Figure 1). The mesh must be large enough - measuring at least 10 x 14 cm - for the hernial ring to be nearly in the middle of the mesh. <sup>5</sup> A good mesh must be supple and easy to place. In the bilateral hernia, it's easier to place two meshes instead of placing one large piece of mesh. Thanks to the anatomical mesh, stapling is no longer necessary. <sup>7</sup> To avoid possible

damage to nerves, staple fixation of the meshes is used only in exceptional cases involving a highly enlarged internal ring. In this case the mesh is only stapled medially and to the Cooper's ligament to avoid neuralgia.<sup>8</sup>

#### - The operation step 5: the deflation process

The deflation process happens under direct visualization, the hernial sac and lipoma are placed behind the mesh. The extraperitoneal space is then inspected for haemostasis, the abdomen desufflated, and the skin incisions are then closed. During the deflation process, repositioning of the peritoneal sac on the mesh, in particular the dorsal edge of the latter, is carefully performed to avoid displacement or folding of the mesh. We don't use any drainage.

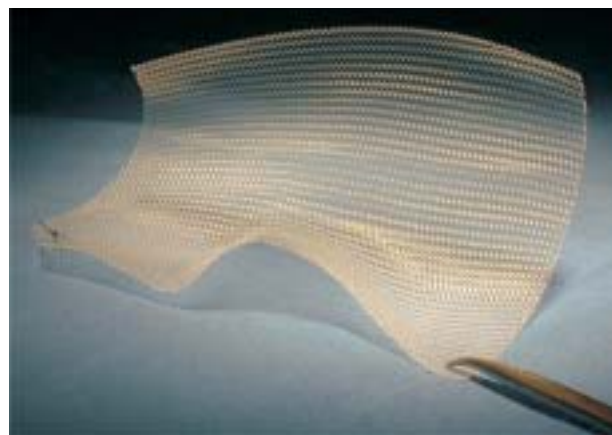
#### - Postoperative course

The operation can be performed in a day surgery unit.<sup>9</sup> Ambulatory surgery appears to have benefits in terms of organization and economics. The hospital charges are lower for ambulatory surgery, and the ambulatory surgery keeps inpatient resources available for complex cases and emergencies. A technique without balloon dissection, without stapling and in ambulatory surgery is less expensive.<sup>10</sup>

## RESULTS

We performed 39 laparoscopic TEP repairs with 3-D mesh under general anaesthesia between May and December 2009. All of these patients were male, with a mean age of 52.3 years. Eighteen percent of the hernias were recurrences after conventional repair. The median ASA grade was 2, with 46% of them having one or more comorbidities. Hernia characteristics are shown in table 1.

Mean operative time was 45 min in unilateral hernia and 62 min in bilateral hernia. The mean hospital stay was 1.3 days. A total of three complications occurred (8%), including two patients with seroma formation and one scrotal haematoma. All these complications were managed conservatively. There were no serious complications, conversion to open procedure or perioperative mortality. The median follow-up period was 6 months (2-9 months). There was no recurrence of hernia within this early postoperative period.



**Figure 1** – The configuration of a right-sided 3-D mesh (Microval; Malmont, France).

## DISCUSSION

Laparoscopic hernia repair has several advantages over conventional open methods as shown by prospective randomized trials comparing laparoscopic to tension-free open herniorrhaphy.<sup>11</sup> The major advantages include less postoperative pain, earlier return to normal activities and work, better cosmetic results and cost effectiveness.<sup>12,13</sup>

Laparoscopic inguinal hernia repair require the acquisition of technical skills. A learning curve of at least 40 cases is necessary to reduce the rate of complications and recurrences.<sup>14</sup> It is currently thought that all recurrences appear within the first 2 years of follow-up. One of the ways to shorten the learning curve and minimize the recurrence rate is to refine the techniques in a major center.

Historically, cost analysis favored open hernia repair over laparoscopy. However, with more than a decade of experience in laparoscopic hernia repair

**Table 1** - Hernia characteristics.

Variable	No. (%)
Site of hernias	
Right	19 (49%)
Left	15 (38%)
Bilateral	5 (13%)
Types of hernias	
Direct	10 (26%)
Indirect	21 (54%)
Femoral	1 (2%)
Recurrent	7 (18%)

and the dissemination of knowledge to all regions, costs have fallen and are now comparable to open repair.<sup>15,16</sup>

Intraoperative major complications are rarely seen in hernia surgery. A more common intraoperative complication encountered with TEP and TAPP is injury to the bladder (0%-0,2%), mainly in patients with previous suprapubic surgery. Studies on TEP and TAPP report intraoperative bowel injury in 0% to 0,3% of cases, with rates of 0% to 0,06% in large investigations involving considerably more than 1000 patients, and damage to major vessels at rates of 0% to 0,11%.<sup>17</sup>

Problems may arise if the patient is not in the Trendelenburg position. In this case, the bowel may stay in the hernia and the risk of bowel diathermy injury increases. The laparoscopic extraperitoneal repair is performed under general anesthesia with a good curarization, otherwise the workspace is too small. The dissection must always be done with the same steps, for the technique to be reproducible. During the dissection, the surgeon must see the spider's web aspect to indicate that he is in the right direction.

Injury to these vessels can be fatal and usually requires an urgent laparotomy and vascular repair. Patients with unrecognized bowel injuries generally present 3-7 days after injury with complaints of fever and abdominal pain. However, reported intervals from time of occurrence of injury to onset of symptoms vary from 18h to 14 days.<sup>18,19</sup> There were no postoperative complications in our patients. Since our follow-up was relatively short, our results may apply mainly to the operative and early postoperative courses.

One of the debates about the TEP techniques is whether stapling is necessary. Staples could induce damage to sensory nerves leading to disabling neuropathies.<sup>20</sup> In a case-control study comparing

selective non-stapling against stapling for TEP hernioplasty, there was no hernia recurrence over a medium follow-up period of 1.4 years.<sup>21</sup> In a randomized clinical trial comparing fixation vs nonfixation of mesh there were no clinical advantages and fixation increases the cost.<sup>22</sup> We think that not stapling can shorten both the learning curve and operating time.

We used three-dimensional (3-D) anatomically contoured polypropylene mesh (Microval ; Malmont, France) for the reinforcement of the inguinal region. As the 3-D mesh conforms to the contour of the inguinal region, the possibility of mesh migration is minimal. We concur that it is large enough to cover all hernia spaces and proved to be favorable for laparoscopic handling.

TEP hernioplasty is an advanced laparoscopic procedure. Relative contraindications include patients unfit for anesthesia, obesity, large hernia, pregnant patients, patients with a history of lower abdominal surgery, recurrent hernia after laparoscopic hernia repair, and patients receiving anticoagulant treatment. We only operate symptomatic hernias.<sup>23</sup>

## CONCLUSION

Laparoscopic hernia repair is our favorite technique. TEP is preferred over TAPP as the peritoneum is not violated. However the dissection must always be done with the same stages, without monopolar diathermy, and the patient in a slight Trendelenburg position. With these tips, the TEP hernioplasty is feasible with fewer intra-abdominal complications. The patient must be advised about the possible complications.

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## RESUMO

**Revisão:** O reparo por laparoscopia totalmente extraperitoneal (TEP) é preferível ao reparo da hérnia pré-peritoneal transabdominal (TAPP) considerando que o peritônio não é atingido e existem poucas complicações intra-abdominais. Esta é sem dúvida a melhor técnica, porém a mais difícil de se executar. O objetivo deste estudo foi descrever e discutir nossas técnicas e modificações utilizando a tela 3-D no reparo da hérnia inguinal por TEP. **Métodos:** Pacientes que participaram no reparo eletivo da hérnia inguinal do Departamento de Cirurgia Abdominal do CHICAS (Centro Hospitalar Intercomunal dos Alpes do Sul), Gap, França e do Departamento de Cirurgia, Hospital Professor Edmundo Vasconcelos, São Paulo, Brasil no período de maio a dezembro de 2009 foram incluídos neste estudo retrospectivamente. A evolução cirúrgica e pós-cirúrgica foram estudadas. **Resultados:** Um total de 39 reparos de hérnias foram incluídas neste estudo. As hérnias foram corrigidas pela técnica TEP. A média de tempo cirúrgico foi de 45 min na hérnia unilateral e 62 min na hérnia bilateral. Não ocorreu nenhuma complicação séria. **Conclusão:** De acordo com a nossa experiência, nas mãos de cirurgiões laparoscópicos experientes, a TEP obteve poucas e aceitáveis taxas de complicações. O reparo da hérnia laparoscópica parece ser a modalidade preferível para a maioria dos tipos de hérnias inguinais, o paciente deve ser advertido sobre as possíveis complicações.

**Descritores:** Cirurgia laparoscópica, hérnia inguinal, tela cirúrgica.

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