

# SINGLE-INCISION VIDEOLAPAROSCOPIC APPENDECTOMY WITH CONVENTIONAL VIDEOLAPAROSCOPY EQUIPMENT

*Videoappendicectomy por incisão única com material de videolaparoscopia convencional*

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**ABSTRACT - Background:** Acute appendicitis is the most common surgical emergency in daily practice, and is approached laparoscopically in many centers. Efforts have been undertaken for the development of minimally invasive techniques that reduce tissue trauma and offer improved cosmetic results, one of such being the single-incision laparoscopic surgery (SILS). **Aim:** To present a minimally invasive technique for appendectomy (SILS) undertaken with conventional instruments. **Method:** Eleven patients were treated in the emergency care center presenting abdominal pain in the right iliac fossa that was suggestive of appendicitis. Diagnostic investigation was subsequently conducted, including physical examination, laboratory and imaging exams (CT scan with intravenous contrast or total abdominal ultrasound), and the results were consistent with acute appendicitis. Thus, after consent, these patients underwent SILS appendectomy under general anesthesia with three trocars (two 10 mm and one 5 mm), using conventional and optical laparoscopic tweezers (10 mm, 30°). The base and pedicle of the appendix were ligated with titanium LT 400 clips. The procedure occurred uneventfully. Inclusion criteria were absence of diffuse peritonitis, BMI (body mass index) less than 35 and absence of serious comorbidities or sepsis. **Results:** Seven men and four women were operated with average age of 25.7 years and underwent appendectomy through this technique. Mean procedure duration was of 37.2 min. Regarding surgical findings, three had appendicitis in stage 1, four in stage 2 and four in stage 3. All patients improved well, without surgical complications, and did not require conversion to open surgery or conventional laparoscopy technique. **Conclusion:** Appendectomy conducted through Single Incision Laparoscopic Surgery is a feasible and promising technique that can be performed with conventional laparoscopic instruments.

**HEADINGS** - Laparoscopy. Appendectomy. Appendicitis. Minimally invasive surgery.

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**DESCRIPTORES** - Laparoscopia.  
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**RESUMO - Racional:** Apendicite aguda é a emergência cirúrgica mais comum na prática diária, sendo em muitos centros, abordada por laparoscopia. Esforços têm sido voltados para o desenvolvimento de técnicas minimamente invasivas, reduzindo o trauma tecidual e melhorando os resultados cosméticos, dentre essas, a “single incision laparoscopic surgery” (SILS). **Objetivo:** Apresentar técnica minimamente invasiva para apendicectomia com incisão única e com instrumentos convencionais. **Método:** Onze pacientes foram atendidos em serviço de emergência devido à dor abdominal em fossa ilíaca direita sugestiva de apendicite. Procedeu-se a investigação diagnóstica, incluindo exames físico, laboratoriais e de imagem (tomografia computadorizada com contraste venoso ou ecografia de abdome total), cujos resultados foram compatíveis com apendicite aguda. Assim, após consentimento, esses pacientes foram submetidos à apendicectomia por SILS, sob anestesia geral, com dois trocarêres de 10 mm e um de 5 mm, com uso de pinças laparoscópicas convencionais e ótica de 10 mm e 30°. A base e o pedículo do apêndice foram ligados com cliques de titânio LT 400, sem intercorrências. Critérios de inclusão foram pacientes com apendicite aguda mas sem peritonite generalizada com índice de massa corpórea menor que 35 e ausência de comorbidades graves e ou sepse. **Resultados:** Foram operados sete homens e quatro mulheres com idade média de 25,7 anos com esta técnica. A duração média do procedimento foi de 37,2 min. Em relação aos achados cirúrgicos, três pacientes apresentavam apendicite em fase 1, quatro em fase 2 e quatro em fase 3. Todos evoluíram bem, sem complicações cirúrgicas e não houve necessidade de conversão da operação para técnica aberta ou mesmo para laparoscopia convencional. **Conclusão:** Apendicectomia por “single Incision Laparoscopic Surgery” é técnica viável e promissora, podendo ser realizada com instrumentos da laparoscopia convencionais.

## INTRODUCTION

Laparoscopic appendectomy, due to its advantages over open techniques, is considered the gold standard treatment for acute appendicitis in many centers<sup>3,11,12</sup>. Since the introduction of the laparoscopic approach, efforts have been directed towards the development of minimally invasive techniques that can reduce the number and size of ports, decrease tissue trauma and improve cosmetic outcomes<sup>9</sup>.

Single Incision Laparoscopic Surgery (SILS) is a new technique that uses a single incision, preferably in the navel, to perform laparoscopic operations without the need for additional incisions. This new method has been used in a wide variety of laparoscopic procedures, including tubal ligation<sup>26</sup>, hysterectomy<sup>14</sup>, appendectomy<sup>7,19</sup>, cholecystectomy<sup>13</sup>, gastrectomy<sup>18</sup>, colectomy<sup>4</sup> and nephrectomy<sup>17</sup>. Some advantages have been observed with the use of a single incision, such as reduction of postoperative pain and of the complications involving tissue damage at the incision sites and better cosmetic results<sup>5</sup>.

A number of different pieces of equipment and materials have been used to facilitate and/or enable the use of this technical arrangement, but are not essential or indispensable for it.

The objective of this paper is to present the technique and preliminary results of the use of SILS in patients with acute appendicitis using conventional laparoscopic materials and instruments.

## METHOD

Eleven patients, seven men and three women, with mean age of 25.7 years (12-44), were treated between May 2010 and January 2011 for abdominal pain in the right iliac fossa suggestive of appendicitis. Diagnostic investigation was conducted with physical, laboratory and imaging tests. Physical examination was performed with abdominal palpation and searching for the presence of the Blumberg sign or of abdominal pain without irritation. The clinical tests requested to confirm the diagnosis or rule out differential hypotheses included EAS, CBC, beta-HCG (in women of childbearing age), electrolytes and coagulation tests. The imaging exams requested included: total abdominal ultrasound and/or the abdomen and pelvis CT with intravenous contrast.

Patient selection criteria were adopted in order to avoid increased operating time and maintain safety. They were: absence of diffuse peritonitis, BMI (body mass index) of less than 35 and absence of comorbidities, or sepsis.

### Surgical technique

All patients were operated under general anesthesia. The access of choice was through the umbilicus, with intraumbilical linear or italic "S" incision, the latter

providing for greater skin flexibility and triangulation area. Two 10-mm trocars were used (one 10 mm and one 5 mm), as well as conventional and optical laparoscopic tweezers (30° and 10 mm, Figure 1). Pneumoperitoneum was performed by closed technique. After the incision (straight or "S"), circular subcutaneous periumbilical areas and areas close to the aponeurosis were dissected, where the trocars were introduced through direct puncturing of the area (providing for better room for the instruments and greater triangulation). The peritoneal cavity was investigated and the diagnosis was confirmed. The appendix was seized by the left hand of the surgeon and the pedicle was subsequently dissected, with release of adhesions and the peritoneum. The base and pedicle of the appendix were ligated with LT 400 titanium clips (Figure 2). After resection of the specimen, it was accommodated in a bag made from latex glove. Once the specimen was removed, hygiene and hemostasis were performed. If deemed necessary, the closure of the aponeurosis was performed within its 10 mm puncture sites, with subsequent closure of the skin and simple stitching using the surgeon's thread of preference. Dressing was made with a small bundle of gauze and tape.

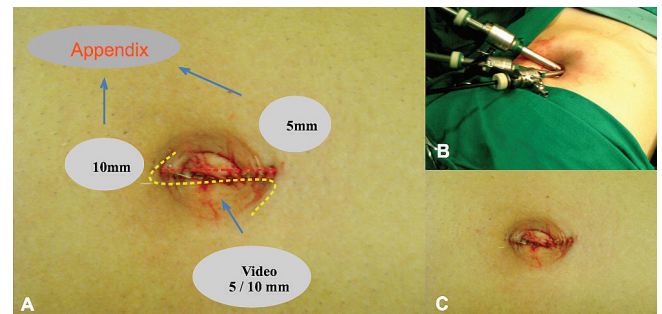


FIGURE 1 – A) Position of the trocars throughout linear or italic "S" single umbilical incision; B) photograph of trocars in position; C) immediate aspect of the surgical wound

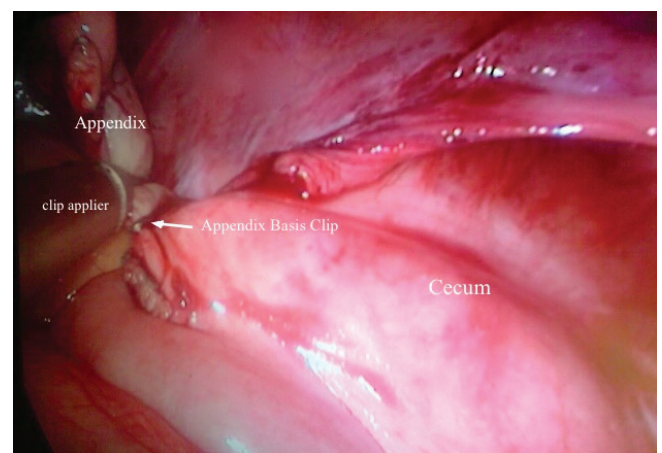


FIGURE 2 - Clamping of the appendix.

Surgical time, complications and adverse findings were noted.

## RESULTS

Physical examination showed abdominal pain with peritoneal irritation signs in all patients. The results of medical tests were consistent with acute appendicitis, with differential diagnoses such as urinary infection and topical or ectopic pregnancy being ruled out. The imaging tests showed signs suggestive of acute appendicitis or inflammation in the right iliac fossa.

Regarding surgical findings and data, three patients presented appendicitis in stage 1, four in stage 2 and four in stage 3. All patients progressed well without complications, except for two surgical wound infections in patients under stage 3 (which were compatible with cavity infection already contracted). There was no need for conversion to laparotomy or even for conventional laparoscopic procedure (Table 1, Figure 1).

**TABLE 1** - Characteristics of patients undergoing SILS appendectomy

Gender	Age (years)	Operation time (min)	Stage of appendicitis	Complications
Female	20	40	1	--
Male	15	40	2	--
Male	39	50	3	--
Female	20	35	2	--
Female	38	35	1	--
Male	44	40	3	Surgical wound infection
Male	13	35	2	--
Male	13	35	3	Surgical wound infection
Male	40	35	3	--
Male	12	30	1	--
Female	29	35	2	--

## DISCUSSION

Acute appendicitis is the most common surgical emergency in daily practice. The disease can occur at any age and requires surgical treatment in all diagnosed cases. Depending on inflammatory findings, appendicitis can be classified into Grade 0 (normal); 1 (hyperemia and edema); 2 (fibrinous exudate); 3 (segmental necrosis); 4A (abscess); 4B (regional peritonitis); 4C (necrosis of the appendix base); 5 (diffuse peritonitis)<sup>8</sup>. The operation is often performed laparoscopically because of its advantages when compared to laparotomy, such as greater diagnostic accuracy, reduced risk of surgical wound infection, shorter hospital stays, patients enjoying faster return to daily life, lower incidence of adynamic ileus and lower risk of incisional hernia<sup>10,22</sup>. These risks are even lower if a single incision is used. This is the reason for the increased interest in even less invasive techniques in various surgical procedures, including

SILS appendectomy<sup>25</sup>.

Pelosi et al.<sup>15</sup>, in 1992, first described a single-incision laparoscopic appendectomy on a child. Valla et al.<sup>23</sup> in 1997 presented a case series of 200 pediatric patients who underwent using single-incision laparoscopic appendectomy with externalization of the appendix. Ates et al.<sup>1</sup>, in 2007, described a fully intra-abdominal single-incision appendectomy technique. Since then, many technical variants have been described but there is still no established standard.

The recent interest in SILS has led many surgeons to use existing conventional tools when performing single-incision laparoscopies and, in turn, the industry has developed a large variety of new tools to facilitate these procedures. Some types of ports are already being marketed, such as the TriPort (Advanced Surgical Concepts, Wicklow, Ireland), the SILS port (Covidien, Norwalk, Conn.), the Uni-X Single Port System (Pnavel Systems, Inc., Morganville, New Jersey), the Anchorport (Surgiquest Inc., Orange) and the Gelport (Applied Medical, Rancho Santa Margarita, California)<sup>6</sup>. However, it has been observed that SILS can be accomplished with existing technology and without the need for new instruments by surgeons with experience in conventional laparoscopy or who have received specific training or expertise.

The biggest challenge to be overcome in SILS is to avoid conflict between the instruments and optics and to reduce stress during surgery, the latter caused by the limited space offered by a single incision, which makes the work of the surgeon and his assistant harder. For this reason, some studies have been proposed using endoscopic cameras and semi-flexible tweezers, making the procedure supposedly more comfortable<sup>9</sup>. In addition, there are some difficulties or problems in accessing the abdominal cavity using a single incision, such as small umbilical rings, high BMI, adhesions from previous operations, availability of the port, lack of angled instruments, the short length of the instruments, inadequate imaging, small incision for the extraction of the specimen, and leaks in the pneumoperitoneum<sup>20</sup>.

The advantages of SILS appendectomy are primarily related to better cosmetic results due to the reduced number of skin incisions. A single incision is made on a natural scar - the umbilicus - with results almost invisible a few months after surgery, preserving the patient's body image. Furthermore, it is believed that SILS provides less postoperative pain by eliminating muscle damage and reducing tissue damage due to the non-introduction of other ports, in addition to presenting less risk of bleeding of the epigastric vessel<sup>2,16,21,24</sup>.

In this initial study, it was observed that it was possible to perform the procedure with existing materials and equipment in a timely and safe manner, provided that it be performed by experienced staff.



It is worth highlighting that selection criteria were adopted for this initial group of patients in order to avoid increased operating time and maintain safety. They were: absence of diffuse peritonitis, body mass index of less than 35 and absence of comorbidities and/or sepsis.

## CONCLUSION

SILS appendectomy is a feasible and promising procedure, and can be performed with conventional laparoscopic instruments.

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