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Original Article

Laparoscopic Incisional Hernioplasty

Hernioplastia Incisional por Videolaparoscopia

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ABSTRACT

Objectives: the open repair of large size incisional hernias is associated with significant morbidity. The authors describe the surgical technique and present their experience with laparoscopic correction of medium and large size abdominal wall incisional hernias. **Patients and Methods**: patients accumulated over 13 years were analyzed retrospectively. 46 underwent laparoscopic incisional hernia repair with a follow-up of at least one year. **Results**: twenty patients were male and 26 female. The mean age was 48 years (27-78 years). Hernia size ranged from 5 to 25 cm in diameter. The mean surgical time was 105 minutes (30-240 min). There was one conversion to open repair, and one procedure was interrupted due to intraoperative suspicion of acute myocardial infarction. In 41 cases, we used polypropylene mesh and in three cases, coated mesh (one case Marlex PTFE - *Dual-Mesh Bard*® and in two cases, polypropylene mesh with silicone - *Microval*®). All mesh were placed intraperitoneally and fixed with transparietal propylene sutures tied at the anterior aponeurosis. Complementary fixation using titanium clips occurred in the majority of the cases. In two cases, fixation only involved helicoidal clips. No drains were utilized. All patients were discharged within 72 hours of surgery, except one that developed an enterocutaneous fistula. Major post operatory complications were identified in six cases, including one death because of intestinal perforation. There have been no recurrences to date. **Conclusion**: Laparoscopic incisional hernioplasty is an excellent option for incisional hernias treatment, with acceptable morbidity.

Key words: Laparoscopic Surgery; Incisional Hernia; Ventral Hernia.

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INTRODUCTION

Conceptually the incisional hernia (IH) consists of the rupture or loss of continuity of fascial closure, and can occur in any abdominal incision, but is most common in midline or para-midline incisions.[1] Advanced age, male gender, obesity, abdominal distention, pulmonary diseases, jaundice, anemia, malnutrition, operative wound infections, longitudinal incisions, closure techniques, and suture material are factors which influence the emergence of this disorder.[1,20] Beyond the aesthetic considerations, incisional hernias can cause a clinical presentation of acute abdomen due to entrapment and strangulation of the bowel loops, requiring emergency surgical treatment.[3]

IH continues to be one of the most common complications of abdominal surgical procedures, representing a significant source of morbidity and time lost from productive activity. The economic impact of this disorder is very significant.[1] The exact incidence of IH still has not been well defined, but there are reports in the literature that vary from 3% to 13%,[4,5] and up to 23% when associated with operative wound infections.[6]

The treatment of incisional hernias is complex, as it is complicated by high rates of recurrence and surgical infection. Recurrence rates after primary

incisional hernioplasty range from 25% to 63%[4,7,8,9,10] and are directly related to the size of the fascial defect. The relapse rate after open surgical correction of recurrent incisional hernias can exceed 50%,[11] and infection rates can reach 10%.[12]

Ideally, the technique of the repair should resolve the loss of abdominal wall substance and restore its dynamics. The use of prosthetic material generally fulfills these two imperatives,[13] resulting in a lower recurrence rate than with primary repair.[14] The relapse rates associated with the use of mesh were reported as being approximately 10%.[1]

The open repair of large IH is frequently associated with a painful postoperative recovery and a slow return to normal activities.[15] Recurrence after open repair is less if a mesh is used, but requires an extensive fascial dissection with the creation of flaps, increasing the rate of complications. The laparoscopic technique offers an alternative.[11]

The laparoscopic repair of IH began to be performed in the 1990s, always using a mesh in the intraperitoneal position and leaving the hernia sac *in situ*. The expectation was that the recurrence rate would remain similar to that of the open technique – up to 11% [11,17,18] – with a shortening of the postoperative recuperation and a decline in the rate of complications associated with large dissections,[16] and the potential benefit of decreased pain and a shorter hospitalization.[19]

The objective of this article is to report our experience with videolaparoscopic incisional hernioplasty during a period of 13 years, in the pursuit of better management of this disorder.

PATIENTS AND METHODS

All cases of laparoscopic incisional hernioplasty performed from 1996 to 2009 – both in the authors' private clinical practice as well as in the public healthcare system, the *Sistema Único de Saúde* (SUS), were reviewed.

The technique used consists of approaching the peritoneal cavity by an initial puncture under direct vision with a 10 mm trocar to establish the pneumoperitoneum. This puncture is located in the flank, contralateral to the area with previous surgery when the hernia is in the midline. Next, a 30° optic is introduced, the abdominal cavity is examined, two 5 mm trocar ports are positioned under laparoscopic vision, parallel to the primary port taking into account the position of adhesions normally encountered in these patients (Figure 1). Adhesiolysis is then performed to permit adequate assessment of the wall defect, which is the most delicate and time-consuming step of the procedure. It is important to stress that at this point electrosurgery should be used as little as possible and with the utmost maximum caution in order to avoid thermal lesions of the viscera.

Completing this phase of the surgery, the pneumoperitoneum is reduced, and one proceeds with measurement of the hernia defect and the preparation of the mesh (Figures 2 and 3). The mesh dimensions should be large enough to extend at least 3 cm in all directions for an adequate tissue-mesh interface. At this point, the locations for the introduction of the transparietal sutures that will be used to anchor the mesh are marked on the skin. Using 2-0 polypropylene (*Prolene*®), two to four cardinal sutures are tied in advance at the ends of mesh. The prosthesis is then introduced into the cavity. Through 2 mm incisions in the abdominal wall, a needle specially developed for this procedure is introduced into the cavity under direct vision to grab and exteriorize the threads anchored to the mesh (Figure 4). As needed, other sutures are then introduced through new orifices transfixing the mesh; they are again exteriorized, so that they are 3 to 6 cm apart and 1 cm from the edge of the mesh. All sutures are tied and buried subcutaneously. When available, titanium staples – preferably helical – are used between the transparietal sutures for the finishing of the edges of the reinforcement to prevent bowel loops or omentum from entering between the wall and the mesh (Figures 5 and 6). These smaller incisions are closed with *Micropore* ® tape. The closure of the 10 mm port is carried out in planes; the other 5 mm ports are closed exclusively at the skin level.

The patients are followed for at least one year after the surgical procedure.

RESULTS

Forty-six (46) patients were operated over a period of 13 years. There were twenty men and 24 women. The mean age of the patients was 48 years (27 to 78 years). The hernias ranged from five to 25 cm in diameter. The average surgical time was 105 minutes (30 to 240 minutes). There was a surgical conversion due to the consideration that the defect was less than 2 mm in diameter, opting for an

Figure 1 – *Placement of the ports.*

Figure 4 – *Transparietal sutures being tied.*

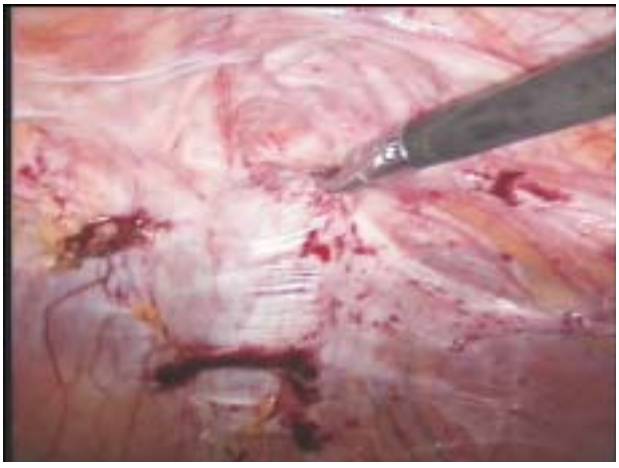

Figure 2 – *Hernia defect.*

Figure 5 – *Fixation of the mesh with helical staples.*

Figure 3 – *Hernia defect.*

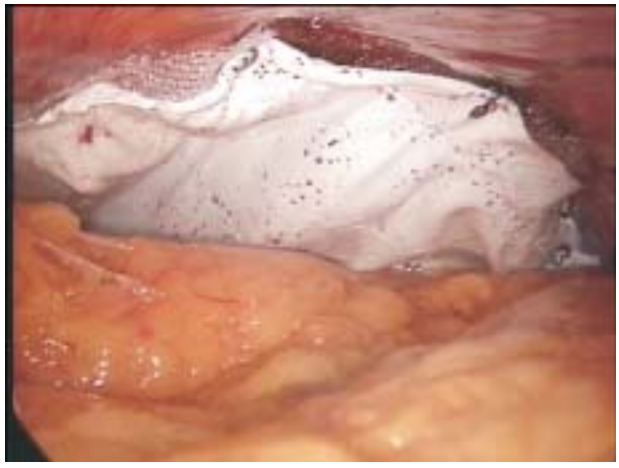

Figure 6 – *Final result: post-fixation of mesh with helical staples.*

open correction instead of an interior approach. Another patient, right at beginning of surgery, was suspected of having an intraoperative acute myocardial infarction. The surgeon opted to simply suspend the surgery; the diagnosis was subsequently "ruled out".

In 41 cases, a polypropylene mesh was used. In three cases coated meshes were used: in one case,

polypropylene and PTFE (*Bard Composix®)*) and in two cases, polypropylene mesh with silicone (*Microval*®). In all cases the mesh was positioned intraperitoneally and fixed with transparietal sutures tied in the anterior aponeurosis. Titanium staples complemented the fixation in most cases. In two cases, the fixation was performed with just helical staples. Drains were not used. All patients were discharged within 72 hours of the procedure, except one patient who developed an enterocutaneous fistula.

Major peri-operative complications were reported in six patients. There were two cases of operative wound infection, evolving with an abscess in the abdominal wall between the mesh and the skin. There was complete resolution after surgical drainage in one case, and in the other case partial removal of the mesh became necessary. There was one case of a lesion in the small intestine that went unperceived during the lysis of multiple adhesions that was complicated by an enterocutaneous fistula, partial infection of the mesh, and partial extrusion of the mesh. Another lesion of the small intestine occurred during the access to the peritoneal cavity under direct vision in the right flank of the abdomen. Once the lesion was perceived, it was sutured in two planes with absorbable surgical thread (3-0 Polyglactin) and the surgery proceeded with the execution of the planned procedure. There was one case of an incisional hernia in the site of the trocar. One patient with a large hernia in the midline corrected with a mesh that practically spanned the entire abdominal cavity returned five days after the surgery with a presentation of "acute abdomen". The patient was found to have diffuse peritonitis attributed to late perforation of the small intestine. The patient developed sepsis, was re-operated several times, but died on the twenty-fifth postoperative day. One patient who had undergone correction of a large midline incisional hernia that had recurred multiple times presented with a clinical picture compatible with an obstructive acute abdomen about three months after surgery and died before any new surgery, without having been evaluated by our service. All of the other cases were followed for at least one year, without any report of recurrence.

DISCUSSION

Hernioplasty of large incisional hernias is considered an advanced videolaparoscopic procedure that requires special equipment and instruments, and should be performed by surgeons trained and experienced in the technique. Access to the abdominal cavity should be done under direct vision, due to the risk of the visceral lesions, especially intestinal loops from the presence of peritoneal adhesions. Lesion of intestinal loops is a known complication of incisional hernioplasty with an incidence of 5% in open technique corrections and an incidence of 1% to 9.3% when the approach is laparoscopic. Patients with recurrent hernias, especially those that have previously used a mesh, should be approached with caution. If an enterotomy occurs during adhesiolysis, laparoscopic repair of the lesion is possible depending on the nature and severity of the lesion. In the presence of an enterotomy, options for the treatment of the hernia include a repair only with primary suture or, if this is not possible technically, the use of a mesh with absorbable material (*Vicryl Ethicon*®), followed by repair of the hernia months later. The use of conventional prostheses when faced with an enterotomy should, in general, be avoided due to the potential for infection. Alternately, some groups have used a mesh made of biomaterial in an attempt to achieve a lasting repair without running the risk of infection. In any case, any patient that presents complaints of abdominal pain, distension, or fever after a videolaparoscopic incisional hernioplasty should be evaluated for a possible intestinal lesion, especially if extensive adhesiolysis has been performed.[20]

One important aspect of the technique is that positioning of the mesh should be completely intraperitoneal. No sufficiently long follow-up of these patients exists that proves the long term safety of this technique, principally when using non-coated polypropylene mesh. The development of coated mesh in the late 1990s led to the intraperitoneal positioning of the mesh becoming more common. This technique permits a greater apposition of the mesh over the defect in the abdominal wall, which can reduce the chance of recurrence. Furthermore, the increase in intra-abdominal pressure keeps it in position, pressing it against abdominal wall, reducing possible separation of the mesh from the abdominal wall in the immediate post-operative period, facilitating its incorporation into surrounding tissues. The requirement that the mesh be placed intraperitoneally, directly adjacent to the intestine

can generate complications. Various experimental and clinical studies have shown that polypropylene and polyester mesh can cause severe intestinal adhesions, with devastating intestinal complications such as erosion and fistulas.[19] Polypropylene incorporates into the abdominal wall most efficiently, offering more resistance to traction. The disadvantage of this material has been the formation of dense adhesions between the mesh and the intra-abdominal content generating an abdomen potentially hostile to a new surgical approach, as well as the occasional enterocutaneous fistula.[21] Complications of subsequent surgical interventions after previous corrections of a ventral incisional hernia with polypropylene mesh positioned intraperitoneally were the focus of one study.[22] Repeat laparotomies after incisional hernioplasty with a polypropylene mesh – when the mesh is placed intraperitoneally – are associated with more intraoperative and postoperative complications. Therefore, intraperitoneal placement of polypropylene mesh in the repair of incisional hernias should be avoided, if possible.[22] Nevertheless, VRIJLAND and cols.[23] carried out a retrospective study of 136 patients with correction of incisional hernia using polypropylene mesh over a period of 16 years. The average follow-up was 34 months. No entero-cutaneous fistula developed. Operative wound infections occurred in 6% of the patients. Abdominal wall sinus occurred in two patients. There were no cases of persistent infection or cases where the mesh had to be removed due to infection. The authors concluded that the formation of entero-cutaneous fistula seems to be very rare after the correction of incisional hernias with polypropylene mesh, regardless of intraperitoneal placement, omental coverage, or closure of the peritoneum. BINGENER and cols.[24] sought to determine in incisional hernioplasty with the use of intraperitoneal polypropylene mesh if intestinal lesions and their complications can be impeded by the ultrasound guided interposition of omentum. Evaluating the results of 30 patients, the authors verified that 13 patients (43.4%) did not have a detectable ecographic signs of adhesions. Five patients demonstrated a piece between the match and the omentum. One patient developed adhesions between the left lobe of the liver and the mesh, and in only one case was adherence of the bowel to the edge of the mesh observed. The authors concluded that the laparoscopic repair of ventral incisional hernias with polypropylene mesh and interposition of omentum is not associated with visceral adhesions in the majority of patient. The polypropylene mesh can be used safely when omental coverage is available and sufficient. In a study reported by LEBER, polyester mesh has been associated with a greater risk of development of enterocutaneous fistula, infection, and recurrence of the hernia when compared with *Marlex*®, *Prolene*®, or *Gore-Tex*®.[25] In any case, it is recommended that mesh with these materials be separated, whenever possible, from the intestine. The majority of authors that describe a laparoscopic approach use compound mesh that provides a protective barrier to contact with intraperitoneal viscera. The *Gore-Tex Dual Mesh*® is composed of two layers of PTFE. One of the layers has 3 mm pores, which can be placed directly adjacent to the intestine. The other side has a microstructure that permits that the tissues develop adherence to the abdominal wall. There've been no reported cases of intestinal fistula secondary to intestinal erosion with this type of mesh. Other important property of the ePTFE is that it appears to be less easily infected then the other biomaterials. However, once an infection is established, this type of mesh should be removed. Another disadvantage of this type of mesh is its high cost, as well as the being relatively opaque, which generates technical difficulties during its placement.[19] Another type of mesh used is a compound of polypropylene on one side and ePTFE on the other (*Bard Composix*®). Ideally, this mesh combines the incorporation qualities of polypropylene with the greater resistance to adhesion is a property of ePTFE. Other compound mesh have been developed with these properties including *Composix Bilayer*® (polypropylene and ePTFE), *Proceed*® (low weight polypropylene and methylcellulose) and *Sepramesh*® (Sepra film and polypropylene). In our study, in all the cases in which polypropylene mesh was used, we sought to position the greater omentum between the intraperitoneal viscera and the mesh. Another option was to place methylcellulose (*Surgicel*®) on one of the sides of the polypropylene mesh, in order to try to diminish the incidence of adhesions.

One of the most critical aspects of laparoscopic technique which can affect the

recurrence rate is the method of fixation of the mesh. A variety of techniques are used to anchor the mesh to the abdominal wall. In the laparoscopic approach, the mesh is fixed using transparietal sutures and/or stapling. Staples are used in a uniform way, but the use of transparietal sutures varies from surgeon to surgeon, ranging from 26% to 97% of the cases. However, some authors have suggested importance of the fixation of anchoring transparietal sutures at intervals of 4 to 5 cm, circumferentially around the mesh to minimize the risk of migration.[20] The use of transparietal sutures is technically more complex, but reproduces an approach used in open surgery. The advantage of only stapling the mesh into position with various rows of staples is the ease of doing so, although some authors consider the depth of stapling to be insufficient. SOPER and cols.[21] in an experimental study demonstrated the quality of stapling in relation to transparietal suturing in terms of tensile strength, concluding that stapling was adequate for fixation of the mesh as long as they were helical staples. However, another experimental study in a swine model demonstrated that the tensile force of the transparietal fixation sutures is 2.5 times greater than that of the staples.[26] There are even clinical studies that report that the fixation of the mesh using just metal staples appears to be associated with an increase of recurrence.[16, 27]

In a randomized clinical trial BURGER and cols.[25] compared the rates of cumulative recurrence over 10 years in 181 patients that underwent hernioplasty without and with use of a mesh between 1992 and 1998. The recurrence rates were 63% and 32% respectively. Although there are no studies in the literature with a follow-up periods as long as this study, various other studies with two years or more of follow-up have shown recurrence rates of up to 11%[11,17,18] as well as a decrease in postoperative pain and shorter hospitalizations when the mesh was used for the repair of a hernia.[19] Another important aspect, that appears to be related with postoperative recurrence, is the positioning of the mesh in relation to the defect in the abdominal wall, suggesting that there should a mesh-tissue interface of at least 3 cm.[16] Laparoscopic techniques offer the additional advantage of identifying multiple defects that have not fully developed their hernia sacs and, therefore, still have not been identified on physical exam.

There are few articles in the literature comparing videolaparoscopic with open techniques in the treatment of IH, and most have low levels of evidence and low grades of recommendation. In their meta-analysis, CASSAR and MUNRO[15] found six articles comparing open incisional hernioplasty with laparoscopic hernioplasty which demonstrated a recurrence rate with laparoscopic surgery equal to or lower than open surgery. In five of the six articles a higher complication rate and a longer hospital length-of-stay in the group that underwent open surgery than in the group with mesh placement. The conclusion of the authors was that laparoscopic incisional hernioplasty is at least as effective and safe as the open surgery.

HENIFORD and cols.[27] published their nine year case series with 850 cases of videolaparoscopic incisional hernioplasty, with a complication rate of 13.2% and a recurrence rate of 4.7%, with the latter associated with large defects of the wall, obesity, previous repair, and perioperative complications. The average surgical time was 120 minutes and the mean hospitalization was 2.3 days. FRANKLIN in 2004, reported the findings of video-laparoscopic correction in 384 patients, after 11 years of experience, had a complication rate of 10.1%, and a recurrence rate of 2.9%, with a mean surgical time of 68 minutes and a hospital stay averaging 2.9 days.[28]

LOMATO and cols. compared the outcomes of 50 patients who underwent videolaparoscopic surgery with the outcomes of 50 patients who underwent the Rives-Stoppa open technique, with 20 months of follow-up.[29] The surgical time was similar for the two groups. The post-operative pain during the first 72 hours and the duration of the hospitalization were significantly shorter in the videolaparoscopic group. The complication rate (24%) and the recurrence rate (2%) of the videosurgery group was lower than that for open surgery (30% and 10%, respectively), with seroma the most frequent complication. In a cohort of 100 patients who underwent videolaparoscopic hernioplasty – of which 25 had a defect exceeding 15 cm – GIOVANNI and cols. found a complication rate of 23% and a recurrence rate of 3%, after 24 months of follow-up.[30] SOPER and cols. published their experience with 121 cases de videolaparoscopic incisional hernioplasty with a low conversion, short hospitalizations and acceptable complications and

recurrence rates.[20] The mean hospital stay of these patients was 1.7 days. The most common complication in the series was seroma, which occurred in 10.7% of the patients. Most of the seromas were described as small and self-limited, and were managed with observation, requiring aspiration in only six cases (5% of the repairs). In this series, 5% of the patients developed infections related to the hernia repair, including three cases in which the mesh needed to be removed. The patients that had their mesh removed ended up developing an incisional hernia again. Prolonged postoperative pain, greater than 6 to 12 weeks after the surgery, occurred in 3.3% of the patients. The principal location of the pain in these cases was close to the location of the trans-parietal sutures. Four enterotomies occurred, all in patients who had undergone repair of recurrent hernias, three of them already repaired with a mesh.

Videolaparoscopic surgery offers the benefit of avoiding large fascial dissections, thus diminishing dead space and avoiding the use of drains.[16] It also offers advantages in lower risk of surgical infection, less postoperative pain, and a shorter hospitalization.[29] And it allows a thorough inspection of the abdominal cavity and possible treatment of other diseases found. The laparoscopic approach seems to be effective in complex patients, such as the obese and in those in whom open repairs failed. Obese patients can especially benefit because of the small incisions, diminishing the complications of operative wounds.[20] Seromas are one of the most common consequences of videolaparoscopic incisional hernioplasty. This is due to the fact that the hernia sac is not dissected, leaving a chronic space where liquid can accumulate. Given the frequency with which this problem occurs, some authors have questioned its classification as a complication. The aspiration of the seroma should be reserved for those cases that persist or that are symptomatic or when there is diagnostic uncertainty. Steps to minimize the risk of infection should include the elimination of potential sources of infection before surgery, antibiotic prophylaxis, limiting the contact of the mesh with the skin, careful preparation of the skin, and general hygiene on the part of the patient.[20] The initial management of prolonged postoperative pain (more than 6 to 12 weeks after the operation) should be conservative with the administration of anti-inflammatory medications, applying ice to the affected area, and injection with local anesthetic or corticosteroids. Removal of the transparietal sutures can be necessary for persistent symptoms that don't respond to conservative treatment.[20]

CONCLUSION

Videolaparoscopic surgery offers obvious advantages demonstrated by different authors in their case series.[11,12,13,15,17,19,20,27,28,29,30] The technique produces a repair without tension, facilitates adhesiolysis by magnifying the image by using the videolaparoscope, and permits inspection of the entire abdominal cavity. It also eliminates the need for large fascial dissections and for drainage, diminishing the risk and the morbidity from a surgical infection. Thus, they tend to provide a faster postoperative recovery and a better aesthetic result.

Although our sample is relatively small, the findings corroborate the data found in the literature. The technique used in the same published by various authors with the placement of the mesh in an intraperitoneal position fixed by transparietal sutures attached to the aponeurosis and buried in the subcutaneous tissue and complemented with stapling preferably with helical staples. The results have been encouraging, as they associate the classic benefits of videolaparoscopic surgery to a low rate of recurrence and complications. Intestinal loop lesions are the greatest risk; the occurrence of such lesions is directly related to the number of intestinal adhesions secondary to previous surgery and the hernia defect itself.

The videolaparoscopic incisional hernioplasty seems to be a safe option for the treatment of incisional hernia, with recurrence rates similar to open surgery with lower morbidity. The principal limitations are the size of the hernia – which can hamper access by videolaparoscopy when very large – and the high cost of compound mesh. There is a dearth of randomized prospective studies with long term follow-up so that videolaparoscopic hernioplasty incisional can be recognized as the technique of choice in the treatment of this disease. Despite the technologic advances of videosurgery and prosthetic materials and the abilities of the surgeons, there still is not an ideal technique, free of recurrence and morbidity. Even with the growing number of publications addressing this subject, many of the fundamental questions continue without answers. Meanwhile, incisional hernias will continue to be a challenge for the general surgeon.

RESUMO

Objetivos: o reparo aberto de hérnias incisionais de grande porte está associado à significativa morbidade pós-operatória. The autores descrevem a técnica empregada e apresentam sua experiência com a correção de hérnias incisionais de médio e grande porte da parede abdominal por videolaparoscopia. **Pacientes e Métodos:** foram analisados retrospectivamente, ao longo de 13 anos, 46 pacientes submetidos à hernioplastia incisional videolaparoscópica, com seguimento pós-operatório mínimo de um ano. **Resultados:** vinte pacientes pertenciam ao sexo masculino e vinte e seis ao sexo feminino, com idade média de 48 anos (27-78 anos). The hérnias variaram de 5 a 25 cm de diâmetro. O tempo cirúrgico médio foi de 105 minutos (30-240 minutos). Houve uma conversão para cirurgia aberta e um procedimento foi interrompido por suspeita de infarto agudo do miocárdio trans-operatório. Em 41 casos foram utilizadas telas de polipropileno. Apenas em três pacientes, foram utilizadas telas revestidas (em um caso, polipropileno e PTFE - D*ual-Mesh Bard*® e em dois casos, telas de polipropileno e silicone - *Microval*®). The telas foram posicionadas intra-peritonealmente e fixadas por suturas de polipropileno passadas transparietais, atadas na aponeurose anterior, com fixação complementar de grampos de titânio. Em dois casos, fixou-se apenas com grampos helicoidais. Drenos não foram utilizados. Todos pacientes receberam alta em até 72 horas, exceto um que apresentou fístula enterocutânea. Complicações peri-operatórias maiores ocorreram em 6 pacientes, incluindo um óbito por perfuração intestinal. Não houve recidiva até o presente momento. **Conclusão**: a hernioplastia incisional por videolaparoscopia é uma boa opção para o tratamento das hérnias incisionais, com morbidade aceitável.

Palavras chave: Cirurgia Laparoscópica; Hérnia Incisional; Hérnia Ventral.

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