

CELIOSCOPIC CURATIVE MANAGEMENT IN INGUINAL PARIETAL DEFECTS - OBJECTIVES, PRINCIPLES, TECHNIQUES, COMPLICATIONS

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Abstract: Primary or incisional parietal defects are benign lesions, but their disposition to complications and recurrences always need surgical treatment. On the 2nd place, after apendectomy and representing between 10% and 15% from a general surgery department activity, the number of these defects is increasing proportionally to the medium life expectancy, technological progress and high addressability of the specialized medical services. Laparoscopic management of the inguinal hernias goes to the same principles of the classical techniques, but the minimal invasively approach, lower costs, short hospitalization and overall recovery of the patient, lead to the extension and improvement of these laparoscopic procedures. From the simple procedures, such as the “plug and patch” technique to the now-a-days extended and complex ones the improvement of these methods has been made along three decades, and now it is unanimously accepted that the laparoscopic treatment of these defects is higher than ever. The present article, based on a review of specialized literature, aims at establishing the optimal approach, the feasibility of these procedures, the technique and last, but not least, the immediate and remote complications that may occur when the laparoscopic surgery is the treatment of choice in inguinal hernias.

Cuvinte cheie: hernie inghinală, chirurgie laparoscopică, management curativ celioscopic

Rezumat: Defectele parietale primare sau recidivate sunt în principal leziuni benigne, dar prin tendința crescută la agravare, complicații și recidivă necesită întotdeauna tratament chirurgical. Ocupând locul al doilea după apendectomie și reprezentând între 10-15% din activitatea unui serviciu de chirurgie generală după diferiți autori, numărul acestora este în creștere proporțional cu creșterea duratei medii de viață, cu dezvoltarea tehnologică și cu posibilitatea crescută de a beneficia de servicii medicale specializate. Managementul celioscopic al herniilor inghinale respectă principiile chirurgiei clasice, dar abordul minim invaziv, costurile reduse și reintegrarea socio-profesională rapidă au dus la extinderea și perfecționarea acestor procedee. De la procedee simple, de umplere a defectului parietal, până la tehnicile complexe actuale, perfecționarea acestor metode s-a făcut de-a lungul a trei decenii, în momentul de față considerându-se ca s-a ajuns la vârful piramidei în ceea ce privește tehnica laparoscopică. Articolul de față încearcă, printr-un review al literaturii de specialitate, să stabilească abordul optim, fezabilitatea procedurii, tehnica și nu în ultimul rând să prezinte complicațiile imediate și la distanță ce pot apărea când se alege chirurgia laparoscopică în cazul herniilor inghinale

In 1982, Ger closed the deep inguinal orifice by using an improvised laparoscopic stapler, being considered a promoter of laparoscopic inguinal hernia cure in humans. In 1989, Bogojavalenski first described the concept of laparoscopic hernioraphy by introducing a rolled mesh in an indirect hernia bag, followed by suturing the deep inguinal orifice. In 1990, Popp uses a duramater, prosthesis of 4/5 cm, sutured with catgut to the peritoneum over the parietal defect. In 1991, Schultz has introduced a polypropylene mesh rolled in cigarette form, which filled the parietal defect, placing properitoneally a mesh of 3 / 5 cm, and closed the peritoneum with clips (“plug and patch” technique). Fitzgibbons, in 1990, uses an apolypropylene prosthesis fixed by stapler to the internal inguinal orifice peritoneum (intra-peritoneal onlay mesh IPOM). Subsequently, it has been demonstrated that the prosthesis may slip and acquire adherences with the abdominal viscera, reason for which, the

transabdominal properitoneal (TAPP) approach was used, which was applied by McKernan and M. Arregui in 1992. The TEP extraperitoneal technique proposed in 1990, was introduced into practice later on, at the same time with the discovery of the dissector trocar balloon.(1)

The **objectives** of the laparoscopic inguinal hernias cure are similar to those of the classical technique – bag dissection and prosthesis of the posterior wall in order to avoid recurrences. The most currently used technique is the transabdominal properitoneal technique (TAPP).(2) The patch used, preferably from polypropylene (stiff), have a minimum 5/10 inches and will cover all areas of potential hernia: medially 1 cm to the right abdominal muscle, inferiorly and medially 1 cm below the pubis, 2 cm higher to the arched line and laterally, it may reach the anterosuperior iliac spine. For bilateral hernias, the patch will have 7 / 25 cm.

Laparoscopic treatment **principles** are similar to those

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of the classical technique: convenient approach, precise identification of the anatomical elements, presacral lipoma resection, adapting the technique to the type of hernia and each patient in part.

Total extraperitoneal technique (TEP)

This technique begins with a 2-inch subumbilical, paramedian and transversal incision allowing the dissociation of the subcutaneous tissue and the incision of the anterior foil of the right abdominal muscle sheath. Then, the muscle will laterally retract, to digitally enter the back side of it, in order to create space for the insertion of the balloon blunt tip trocar slipping on the posterior foil of the right posterior abdominal sheath, until reaching the symphysis pubis. After having controlled the balloon distension by transparietal palpation, the blunt-tipped mandren will withdraw and the camera with a 30 ° inclination will be inserted. To achieve a sustainable dissociation of the properitoneal space, it is recommended to leave on the spot the balloon at least 3-4 minutes, then to replace the trocar with another one that has a distal balloon with a capacity of 30 ml.

Peritoneum rupture during these maneuvers requires the conversion to TAPP, in case of failure of gap suture. The patients with a history of surgery by subumbilical laparotomy, present the risk of visceral injury due to the tension exerted on the possible visceroparietal adhesions. Unlike the pubo-subumbilical laparotomy, Pfannenstiel incision does not interfere with the unilateral approach, but it may complicate the bilateral TEP. Thus sealed, the space obtained can be instilled. If during maneuvers, there is a breach in the peritoneum, pneumoperitoneum evacuation with Veress needle or with a plastic catheter inserted intraperitoneally may be tried.

A more laborious variant of TEP is the Dulucq technique that begins by introducing the Veress needle suprapubically, with the perforation of the right abdominal sheath and of the transversalis fascia, reaching the Retzius space, where approximately 1l of gas is pumped. Then, a subumbilical incision is made, with the insertion of the trocar entering the Retzius's space, by piercing the right abdominal muscle. By entering a camera of 0 °, the correct position in the plane of cleavage is checked, continuing the dissection by lateral movements of the camera and after obtaining a sufficient space, CO₂ is pumped. The second trocar is inserted in the mid-pubic ombilico space on the median line for bilateral hernia and paramedian contralaterally to a unilateral hernia. Herniabag dissection maneuver from the spermatic cord is identical to that of TAPP. Only in the case of a inguino-scrotal hernia, the bag will be proximally ligated and then resected.

Mesh disposition is identical to that of TAPP, but in case of choosing the disposition without fixing, the prosthesis edges will exceed the limits of the parietal defect with at least 2 cm. The presence of voluminous bilateral direct hernias, with a reduced width of the right abdominal muscle, requires fixing them to the Cooper ligament.(3-13)

Transabdominal Pre-peritoneal technique (TAPP)

TAPP involves peritoneum incision in the right of the inguinal fissures, dissection of anatomical regional elements, positioning and fixing the mesh and closing the peritoneum.

Peritoneum incision begins transversally, 1-3 cm above the profound inguinal orifice and extends medially up to the medial umbilical fold without intercepting it.

Complete dissection of the pre-peritoneal space with the removal of the adipose tissue from the lower edge of the transverse muscle, from the Cooper ligament, ilio-pubic tract and from the epigastric vessels.

Preparation of the hernial bag of the external oblique hernia, direct and femoral, is usually made by blunt dissection,

separating and dissecting the prehernial lipoma that frequently accompanies the bag. It should be also highlighted the ilio-pubic tract portion of spermatic cord laterally situated as it is one of the points of support for calibration by suturing the deep inguinal orifice.

Closing the hernial gap is considered a vital maneuver, which involves choosing an appropriate mesh type in terms of size and material, corresponding to the diameter, sutured with a monofilament thread, of 0 in thickness. Closing the deep inguinal gap is made laterally from the spermatic cord, by suturing the transverse muscle at the ilio-pubic tract, while the breaches of Hesselbach area, of direct hernias, are closed by suturing the lower edges of the muscle transverse to the ilio-pubic tract or to the Cooper ligament. Especially for direct hernias, the suture of transversalis fascia in X is useful, because the tension is generally higher.(6-8,14-17)

The mesh is introduced in the operator field, then the clips applicator is inserted, which allows a bilateral fixation. Experimental research shows that the fixation strength increases with the number of clips and is significantly higher two months later because of the deposited collagen. The prosthesis is applied on the Cooper ligament, on the ilio-pubic tract medially from the iliac vessels, on the lateral side of the right muscle and on the lower edge of the transverse muscle. No clips under any circumstances will be applied in the triangle bordered by the deferent duct and spermatic vessels because of the danger of major damage of iliac vessels, neither under the ilio-pubic tract, laterally from the spermatic cord, because it enters on the triangle area of pain, through which the genito-femoral and lateral femoral cutaneous nerves are passing.(3-5, 6, 18-21)

Finally, cavity drainage is practiced by placing a drain tube, inserted through a minimum incision, which descends along the epigastric vessels, to the most declivous point.

Peritoneum closure is necessary to avoid direct contact with of the mesh with the intestinal loops, this being possible only by clips or continuous suture, finished with an intracorporeal knot or blocked at the ends with clips.(3-5, 6-8, 14-17)

Intraperitoneal application of the net (IPOM)

This method has the advantage of speed being apparently simple, as in the case of the TAPP, with the difference that fixing is made without the dissection of the peritoneum from fascia transversalis. The main disadvantage is the direct contact of the mesh with the abdominal viscera, which predisposes to the adhesions appearance.(3-6,22-25)

Near-total-extraperitoneal technique

It starts by introducing a trocar intraperitoneally, supraumbilically, then entering by dissection with a Pean clamp, 1 cm above the McBurney point up to peritoneum level, then in the peritoneum space thus created, a blunt trocar of 10-11 mm will be inserted. The peritoneum from the epigastric vessels is dissected with a clamp by lateral movements up to the pubic symphysis, then connecting the insufflation at a pressure of 15 mmHg. The same will apply on the counter-lateral side, as well, while through a trocar of 10-11 mm, inserted in the subumbilical properitoneal space the dissection will be completed by using the camera and applying the same technique from TEP.(3-5,6, 9-13,22)

The "plug & patch" technique

It consists in introducing a roll of prolen in the hernia orifice over which a 5/5 cm small mesh is applied. Currently, the plug & patch technique was abandoned because of frequent relapses in the first year, but it has the benefit of leading to the improvement of TAPP.(3-6, 22, 26, 27)

Laparoscopic inguinal hernia assisted open cure

It allows the application of similar techniques to the Lichtenstein procedure, but with only 2 cm incision in the skin

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through which a laparolift and a 5 mm telescope will be introduced. Due to limited handling space, the fixation of the mesh will be made by clips.(3-5,22,28)

Laparoscopic hernioplastia versus open hernioplastia

Although laparoscopic surgical procedures of inguinal hernia are successfully applied in many centres, they are not universally accepted. One of the most important reasons is the availability of the classic techniques and the patients' acceptance regarding these methods. In order to expressly recommend the laparoscopic technique, it must have been proven its excellence to the classical ones; most published clinical studies could not confirm this until today.

Of the above procedures, TAPP is the most commonly used in surgery clinics due to low postoperative complications. The main disadvantage of the method is entering the peritoneal cavity, with the risk of visceral injury. This however is much lower in TEP. Properitoneal approach has comparable results with TAPP in terms of relapse, being released from complications and requiring high technical equipment. IPOM and the "Plug & Patch" technique were abandoned due to high incidence of recurrences.

In terms of frequency of complications from laparoscopic to the classic cure, there was a lower incidence of serious complications such as vascular lesions or ischemic orchitis with testicular atrophy. With a similar frequency of the traditional cures, neuropathy occurs as a result of the improper application of the clips in the inguinal region, but it can also be treated without surgery. If 4-6 weeks later, the desired results are not achieved, surgical re-exploration will be practiced with the removal of the clips. In 3-month old neuropathies, it should resort to the classical approach, with neurolysis practicing, as the simple removal of the clips cannot bring results. Minor complications, such as hydrocele, occur more frequently when using two overlapping meshes, and the testicular pain seems to be caused by a too tight calibrated incisures in the mesh.(29-35)

Complications of laparoscopic hernioplastias

Ischemic Orchitis and testicular atrophy: their clinical manifestations appear insidiously, with no symptoms for 2-5 days after hernioplasty. These include swelling of the testicle and of the spermatic cord, followed by increase consistency and sensitivity, eventually becoming painful. This process lasts between 6-12 weeks and may be resolved completely or may end in testicular atrophy. Gangrene is not frequent, and orchidectomy is rarely necessary. Testicle return to normal shape and size is not a self-limiting process development, and testicular atrophy may be asymptomatic for almost a year.

The etiology of ischemic orchitis is the spermatic cord thrombosis, secondary to the surgical trauma of the cord, while testicular damage involves intense venous congestion. Surgical trauma occurs within the dissection of an indirect or scrotal hernia sac with the injury of the pampiniform plexus veins.

There is no effective treatment for preventing testicular atrophy, therefore antibiotics, anti-inflammatory drugs and considerable doses of steroids are used. Fortunately, the incidence may be reduced by decreasing the surgical trauma of the cord, by the unexcision of the distal indirect hernia bag when not needed, avoiding the dissection below the pubic tubercle and avoiding dissection of the inguinal canal and spermatic cord of a patient who is prone to complications due to other inguinal or scrotal surgery.(3-6,22,36-42)

Neuralgia: Chronic residual neuralgia may be caused by surgical manipulation of sensory inguinal nerves during hernioplastia because of the contracted scar tissue or adjacent inflammatory granulomas. Intraoperative injury of the nerve, either by cutting, stretching, bruising or suture cannot be

appreciated in time. Pain may be localized, diffuse, projected on nerves or felt in the surrounding areas.

Treatment of residual neuralgia is difficult, often engaging to neurolysis, being more efficient if performed early. The affected nerve can be identified by nerve blocks with local anesthesia. Iliohipogastric and ilioinguinal nerves may be blocked or cut in the inguinal region, but certainly blocking the genitofemoral nerve in the inguinal region is impossible, neuralgia caused by this nerve being identified by L1 and L2 paravertebral blocking.(3-5,22,36-40,3,44)

Disejaculation: It is a burning sensation that occurs before and during ejaculation. Although it was reported first at Shouldice technique, it can be assigned to any type of hernioplastia, especially in case of recurrences. Symptoms begin 2-3 weeks after surgery, and in some cases it can be very painful, even disabling. Signs of improvement of the symptoms occur within a long period of time, between 1-5 years from their beginning.(3-5,22,36-40,45)

Prosthetic materials infections: The prostheses used in hernioplasty presented an infection rate of around 6%, being classified as the third complication associated to prosthetic hernioplastias. These are the result of the interaction of several factors such as the bacterial factors, factors related to the material, and those host-dependent, the responsible mechanisms being well demonstrated for two types of germs with a special interest in hernia surgery: Staphylococcus epidermidis and Staphylococcus aureus. The factors related to the material which favours bacterial adhesion are represented by the irregular surface of the material, polymerization and hydrophobic properties of the polymers. Immune-mediated phenomena from material implantation promotes bacterial persistence and lead to exacerbation of infection as shown by low opsonic complement-mediated activity and reduced bactericidal activity of leukocytes in tissues surrounding the implanted material.(3-5,22,36-40,46-49)

Recurrences: The recurrence rate of the conventional techniques ranges between 1-3% after a 10 year-follow up, but these are exceptional results; there are no adequate studies to support them. The causes of recurrence are excessive tension at suture place, the distortion of tissue structure, inadequate hernioplastias and undetected hernias. They are more frequent in the patients with direct hernia, especially when combined bilateral hernias, direct hernias with indirect hernias. Indirect hernia recurrences are determined by inadequate excision of deep ring and shutter mechanism atrophy. But recurrences are most direct and usually occur in the pubic tubercle, where the highest tension in the suture lines. For this, relaxing incisions are always useful, and simultaneously treatment of bilateral inguinal hernias, does not increase tension in the suture and does not a cause of recurrence itself.

For the successful treatment of recurrent hernias prosthetic materials should be used. Recurrences after hernioplastias with patch and after those with plugs, occur in areas where the miopectineal hole is not protected by prosthesis, as well as in the area of the deep ring. Paraprosthesis recurrences are caused by too small prosthesis size and recurrences after previous hernioplastias with prostheses are treated properitoneally with a second prosthesis or previously with plug type prosthesis. Recurrences after GPRVS (giant prosthetic reinforcement of the visceral sac) occurs if properitoneal space is not cleaved enough, if the size of the prosthesis is too small, if the prosthesis does not have the corresponding shape or if is incorrectly placed. Recurrences after GPRVS are previously addressed and treated by adding an extension to the existing prosthesis. Alternatively, another permanent prosthesis can be implanted transabdominally.(3-5,22,36-40,49-53)

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