EPIDEMIOLOGICAL ANALYSIS AND SELECTIVE FACTORS TO BE ADOPTED IN THE TREAT OF INGUINAL HERNIA

ANÁLISE EPIDEMIOLÓGICA E FATORES DE ESCOLHA DA TÉCNICA CIRÚRGICA A SER ADOTADA NO TRATAMENTO DA HERNIA INGUINAL

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ABSTRACT

The hernia is a protrusion of the organ or part of it through an orifice, being integrally conserved the peritoneum and skin. The objective was to describe the types of inguinal hernias, presenting epidemiological data and comparing the different surgical treatments. Bibliographical data were collected through the descriptors, "inguinal hernia", "inguinal hernia repair", “laparoscopic inguinal hernia repair”, "herniorrhaphy" in the Pubmed/Medline, Scielo and Scopus database. The results showed that hernias are more common in the abdominal wall, particularly in the inguinal region. Open inguinal hernioplasty consists of three parts: dissection of the inguinal structures, treatment of the hernia sac and reconstruction of the inguinal wall. Laparoscopic inguinal hernioplasty consists of transperitoneal access by video laparoscopy, reduction of the hernia and if necessary, ligation of the hernia sac and reconstruction of the inguinal wall. Laparoscopic surgeries can be performed by two techniques: the trans-abdominal pre-peritoneal, and the totally extra peritoneal. The kind of surgical technique adopted depends on the patient, the hernia and the health service. Although less invasive and with a faster recovery, the laparoscopic technique is still little used in public services, due to issues related to availability of materials, technical training of the surgeon and value of the procedure.

KEYWORDS: Inguinal hernia, Open hernioplasty, laparoscopic hernioplasty, herniorrhaphy.

1. INTRODUCTION

The hernia is an alteration, which the surgical treatment requires a perfect combination of anatomical knowledge and surgical skills[1,2]. It is defined as an abnormal protrusion of an organ or tissue by a defect in its surrounding walls. Although hernia can occur in different parts of the body, it is more common in the abdominal wall, particularly in the inguinal area[3,4].

Inguinal hernia occurs in 1.5% of individuals[1], and it may be of congenital origin or acquired during adulthood. When they originate in the intra uterine period, they may in some cases manifest only in adulthood, as a consequence of increased intra-abdominal pressure and dilation of the inner inguinal ring[4,5].

The main diagnostic finding in most inguinal hernias is a protrusion in the inguinal area[3]. This type of alteration affects the male gender more frequently in different age groups, being more common on the right side[3,6]. Surgical treatment should be used, unless there is a specific contraindication[5]. Annually, 20 million surgeries of inguinal hernias are performed worldwide, making it one of the most commonly performed surgeries in a general surgical service[7,8].

The abdominal wall hernias affect approximately 20 to 25% of the adult population, of which 75% occur in the inguinal region[9,10]. Some types, such as example the uretero-inguinal ones, are rare and may be difficult to diagnose[11].

Since the introduction of herniorrhaphy in 1884 by Bassini, inguinal hernia surgery has undergone drastic transformations[2,12,13]. Less aggressive techniques of surgeries and new materials have been increasingly used to improve results and support patients[10,14]. Currently the discussions around this theme are focused on the cost-benefit of minimally invasive (laparoscopic) techniques and the selection of the best technique to treat relapses[12.] Although there are different techniques described for the treatment of this pathology, it still represents a surgical challenge[2]. The aim of this study was to describe and discuss the different types of inguinal hernias showing epidemiological data, as well as the surgical approaches to correction, as focus on the advantages and challenges of using each method.

2. MATERIAL AND METHODS

2. 1 Strategy to find and select the articles

To perform this study, PubMed, Scopus and Scielo databases were searched for articles, published up to November 2018, and premised on the type of inguinal hernia and surgical technique adopted. The search strategy was based on three components: (i) type of inguinal hernia; (ii) surgical technique adopted to treatment of inguinal hernia; (iii) epidemiological data about inguinal hernia and surgical treatment. The search filters were developed according to synonym dictionary of the MeSH terms (Medical Subject Headings) platform of the digital library PubMed/Medline (US National Library of Medicine National Institute of Health). After that, these descriptors were adapted to the Scopus and the SciELO (Scientific Electronic Library Online) platforms. The following descriptors were used: "inguinal hernia", "open hernioplasty", "laparoscopic hernioplasty", "herniorrhaphy". Having then obtained an ample amount of data from these filters, there was a consensus reached as to which articles would meet the inclusion criteria. Neither language nor chronologic restrictions were applied when searching for the articles. The initial screening was carried out considering the title and abstract of all articles found. Duplicated studies were eliminated by contrasting authors, title, year and journal of publication. After this first selection, all potentially relevant studies were downloaded in their entirety to have their eligibility assessed.

2.2 Exclusion and inclusion criteria/ Data extraction

The exclusion of the articles was based on well-defined criteria, as follows: (i) studies that discussed inguinal hernia but had no relation to surgical technique adopted; (ii) epidemiological data about inguinal hernia but had no relation to kind of hernia or surgical treatment, and (iii) studies with incomplete texts or secondary studies (such as editorials, editors' letters, Master or Doctoral theses, book chapters, and articles whose complete text was unavailable). Reference lists of the selected articles were also examined to find potentially relevant documents. The criteria for including the articles were epidemiological data about inguinal hernia but related to kind of hernia or surgical treatment. Qualitative data was extracted from all the selected articles.

Qualitative data were extracted from all included articles. Data extraction was classified as follows: (i) Types of inguinal hernia; (ii) Treatments of Inguinal Hernia: Open surgery, and Laparoscopic Hernioplasty.

3. LITERATURE REVIEW and DISCUSSION

The results showed that hernias are more common in the abdominal wall, particularly in the inguinal region. Open inguinal hernioplasty consists of three parts: dissection of the inguinal structures, treatment of the hernia sac and reconstruction of the inguinal wall. Laparoscopic inguinal hernioplasty consists of transperitoneal access by video laparoscopy, reduction of the hernia and if necessary, ligation of the hernia sac and reconstruction of the inguinal wall. Laparoscopic surgeries can be performed by two techniques: the trans-abdominal pre-peritoneal, and the totally extra peritoneal. The kind of surgical technique adopted depends on the patient, the hernia and the health service. Although less invasive and with a faster recovery, the laparoscopic technique is still little used in public services, due to issues related to availability of materials, technical training of the surgeon and value of the procedure. The best approach to an inguinal hernia repair rests on the specific expertise of the surgeon[1] (**Figure 1**).

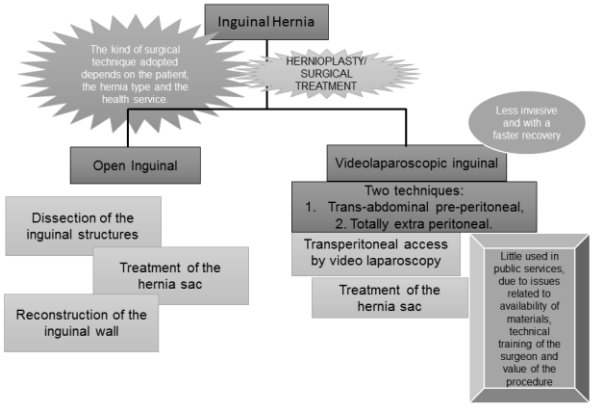

Figure 1. Schematic representation relating the type of inguinal hernia and surgical technique adopted.

3.1 Types of inguinal hernia

Hernia is defined as a protrusion of an organ or part of it through a congenital or acquired orifice, and with the peritoneum and skin integrally preserved[1,15]. The inguinal hernia is named for its location. This alteration affects 3 men to 1 woman, mainly due to the heavier work done by men and the persistence of the peritoniovaginal conduit[15,16]. Men represent approximately 85% of hospitalizations for inguinal hernia, and the most prevalent age groups are 50-59 years and 60-69 years. Mortality rates are higher above 80 years[17].

The easy diagnosis is due to the fact that the patient himself often perceives and reports an increase volume in the inguinal area that get worst with effort[1]. It is necessary to perform the physical examination with the patient sitting and lying down to evaluate the reducibility of herniated contents[12].

As the pathology progresses, there is pain in the area and the appearance of a tumor in the resting place, when intestinal loops enter the herniated sac, nausea and vomiting may occur[15,16]. Ultrasonography can also aid in the diagnosis, which is extremely important, since the unprocessed hernia will progressively increase the volume and may cause problems in the

adjacent area[1,10.]

In the case of inguinal hernia one of the main characterizations takes into concerns the location of the defect, being classifying as direct or indirect. This distinction is absolutely anatomical, since the operative repair is the same for the two types of hernia[6].

Indirect hernia is characterized by the protrusion of the hernial sac through the deep inguinal ring and towards the superficial inguinal ring and some within the scrotum[6]. In order for it to occur, partial or total persistence of the vaginal process is essential so that there is communication with the peritoneal cavity[18]. This failure occurs during fetal life. In men, this communication is necessary because the testicles are formed into the abdomen and, as the moment of birth approaches, they descend to the scrotal sac forming the inguinal canal[19].

This condition corresponds to two-thirds of inguinal hernias, regardless of gender and affects about 10% of premature infants less than 1 kg. Soon after birth, this duct closes and leaves only a hole[6,19].

The direct inguinal hernia comes from a weakened posterior wall of the inguinal duct that can rupture, providing the passage of a certain organ, such as the small intestine[18,19]. It is more common in older men, but can affect any age group[20]. One of its causes is the increase of the intra-abdominal pressure, which can be discarded due to strenuous physical exercise[19].

The hernias can still be classified according to their reducibility capacity in reducible, incarcerated and strangulated[21].

Reductive hernias are those that begin slowly and usually their contents can be placed back into the peritoneal cavity spontaneously or by external compression[6,22]. Thus, its symptomatology is devoid of significant repercussions for the general pathophysiology of the lesion, expressing only some discomforts such as aesthetics and demarcation of muscle activity[21].

The incarcerated hernias are those that with the progression of the pathology present progressive dilation of the ring and the hernial sac. Thus, adhesions may form between the herniated contents and the inguinal wall, causing the hernia to become permanent and irreducible[21,22].

The strangulated hernias are derived from acute incarceration through a narrow hernia ring, which hinders the return of herniated contents and compromises their blood supply[6,23]. The strangulation causes intestinal obstruction and can progress to total ischemia. Because it is an emergency, if not treated immediately, it progresses to necrosis and, consequently, to gangrene of herniated contents[23]. It is a potentially fatal complication and emergency surgery must be considered[6]. Morbidity and mortality after elective repair were only 0.2-0.5%, respectively, versus 4-5.5% after emergent repair (a 10-20-fold increase in mortality). Risks for increased morbidity and mortality observed include: age greater than 49 years and persistent symptoms[24].

3.2 Treatments of Inguinal Hernia

3.2.1 Open surgery

In the United States of America, about 87% of the corrections of inguinal hernias are done by the open surgery method[2]. Regarding postoperative complications is observed that the most common is the hematoma, followed by acute pain, testicular pain and postoperative infection, represented in **Figure 2**[25].

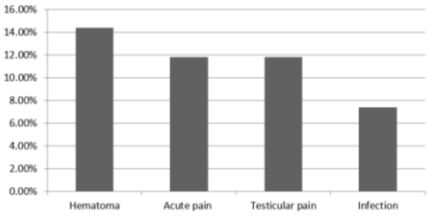

Figure 2. Postoperative complications of open surgery used as inguinal hernia therapy.

The price of an inguinal hernioplasty can fluctuate depending on different factors, among them the surgical technique. The values of the procedures depend on remunerates the surgical material producing company, the hospital where the surgery is performed, the main surgeon, the anesthetist and the assistant surgeon.

The surgery for inguinal hernias treatment consists of three parts, which will be better explained below: I) Dissection of inguinal structures; II) Treatment of the hernia sac; and III) Reconstruction of the inguinal wall.

I. Dissection of the inguinal structures

In the indirect hernia the incision is preferably parallel to the lower fold of the abdomen, just below and medial to the iliac spine, to the level of the pubic tubercle[1,26]. In direct hernia an oblique incision of the transverse fascia is made from the pubic tubercle to the internal inguinal ring[27].

The blade will cut the skin and the subcutaneous tissue constituted by the fascia of Scarpa and Camper to the deep lamina of the superficial fascia, proceeding to the preventive ligation of the subcutaneous vessels to the aponeurosis of the external oblique[1,6,27]. Very carefully the external oblique muscle is released and a small incision is made in the same direction of its fibers, to the external inguinal orifice[26]. Hemostasis of the subcutaneous vessels is preferably made by ligatures with absorbable thin strand instead of electrocoagulation[27]. At this time, it is also important to identify and isolate the ilio-hypogastric and ilio-inguinal nerves in order to avoid damage[6].

Each edges of the aponeuroses are fixed with two repair tweezers, followed by dissection of the loose tissue joining this aponeurosis to the underlying planes, medially until its fusion with the aponeurosis of the internal oblique muscle, and laterally to the deep face of the inguinal ligament and its expansion on the pubis[27]. The spermatic funiculus is evidenced in the pubic tubercle and its contour is displaced and isolated

with a Farabeuf retractor, passed under the funiculus, thus facilitating the exposure of the deep inguinal ring, which will be individualized by the observation of the inferior epigastric vessels[1,6,27]. This maneuver is indispensable, whatever the type of hernia being treated. The lower border of the internal oblique muscle is then displaced from the transverse fascia and aponeurosis of the transverse muscle[27]. The pubic tubercle and the pectineum ligament (Cooper's) are identified, without this entailing the transverse fascia section[27].

II. Herniary Bag Treatment

In the indirect hernia the hernial sac is usually found anteriorly and superiorly to the elements of the spermatic funiculus, contained by the common fibrous tunica and cremaster muscle in man and the round ligament in the female[1,6,27]. These two structures are sectioned and connected along the spermatic funiculum[1,27]. The hernial sac is easily recognizable by its white pearly appearance[26,27]. It must be opened and, if it contains viscera, it will be reduced to the abdominal cavity[27]. Then it is dissected and ligated from the cervix of the hernia sac under direct vision by transfixation with cotton thread to the deep inguinal ring at the level of the inferior epigastric vessels, where the sac should be connected and its excess is resected[1,26,27]. In the woman the same procedure is done, and when the hernia sac is connected the round ligament is also connected[1].

In direct hernias, the hernia sac is protruded through the posterior wall of the inguinal canal, located medially to the epigastric vessels, generally consisting of a diffuse or globular bulge of transverse fascia[6,27]. Its treatment consists in the removal of the injured segment and reduction of the hernia content, and there is no need to open it[1,6,27]. Direct hernias are also treated when reconstructing the posterior wall of the inguinal tract[27].

III. Reconstruction of the Inguinal Wall

Basically, the reconstruction of the inguinal wall consists of suturing one to another anatomical structures, with the purpose of suppressing weak points, where they can protrude, peritoneal recesses, forming new hernias[27]. The structures that can be used are, on one hand, the inguinal ligament and the pectineum ligament; and on the other hand, the aponeurosis of the external oblique muscle, the inferior border of the internal oblique muscle and the fibrosal transversal fascia[27]. A synthetic mesh may be used below the transverse and obliquely replacing the weakened portion of the wall and recreating the deep inguinal ring[1,6]. This technique is known as tension-free repair and decreases recurrence cases[6].

3.2.2. Laparoscopic Hernioplasty

Laparoscopic inguinal hernioplasty can be used in direct and indirect hernias[26]. Basically, it consists of transperitoneal access through video laparoscopy after dissection of the peritoneum that lines the posterior wall of the inguinal region, reduction of the hernia and, if necessary, ligation of the hernia sac and reconstruction of the inguinal wall with non-absorbable sutures[28]. The study by Gigerenzer *et al.* (2009) shows that the average use of Laparoscopic surgery in high resource countries is largely unknown, except for some examples such as Australia, Switzerland, the Netherlands and Sweden, with Sweden which has a national registry with full coverage, as observed in Figure **3**[29].

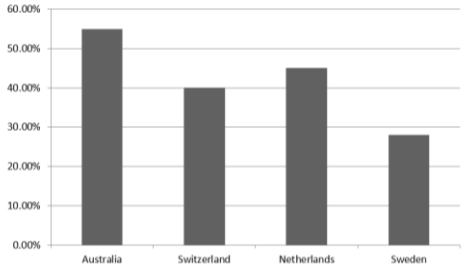

Figure 3. Percentage data on the use of the laparoendoscop surgical technique such as inguinal hernia treatment, in Australia, Switzerland, the Netherlands and Sweden.

Inguinal canal surgery has improved in recent years by introducing differents techniques to reduce the incidence of recurrence and other complications. That way, there is the increased use of this technique, Medicare Australia provides accurate figures on hernia repairs and laparoscopic hernia repair rates increased from 9.7% in 1994 to over 54% in 2016[30].

Laparoscopic correction of the inguinal hernia is a minimally invasive surgical procedure, where small incisions are made for the introduction of operative instruments and for the laparoscope, but several anatomical structures seen during open surgery are not visualized in the laparoscopic route[6,31]. Thus, complication rates are low and range from approximately 4% to 13.5%[32].

This technique has the advantage of less occurrence of trauma in the abdominal wall, with less pain, infections and hematomas; which has a lower risk of chronic pain. The main challenge is the professional's long learning curve[25]. Although the intraoperative complications of this correction, when they occur, are more severe than the complications of open repair. For example, injuries caused by trochanters, clipping of nerves and vessels[33].

The recurrence rate of inguinal hernia surgery in Australia has remained at 7.9% in the last 20 years. Despite the technological advances in minimally invasive surgery and improvements in mesh prostheses over the last 30 years, there is still a high failure rate[30].

Laparoscopic surgery requires a mandatory general anesthetic[28,34]. Since laparoscopic techniques are the most used for this repair: I) Trans-abdominal Pre-Peritoneal (TAPP); and II) Totally Extra Peritoneal (TEP).

Both techniques use mesh against the interior of the abdominal wall in the inguinal or inguino-femoral region, covering the defect of the opening or the hernia

behind[34].

I) Pre-Peritoneal Transabdominal Repair (TAPP)

The TAPP repair requires access to the peritoneal cavity by placing a mesh through an incision, which is placed in the preperitoneal space covering all potential sites of the hernia[31]. A fundamental knowledge of the inguinal anatomy is essential when approached later through the laparoscope.

The patient is placed in the supine position with the upper limbs attached to the body[6,26]. A small supra umbilical incision is made through which the 12mm diameter trocar is inserted for the passage of the camera and the carbon dioxide (CO_2) insufflator into the peritoneal cavity. At the level of a line that passes through the umbilical scar two more incisions are made, through which two trochanters, of 5mm[6] will be introduced. Diagnostic laparoscopy is performed in the hernial space in search of additional hernias[26]. And then an incision in the peritoneum, above the hernial sac, parallel to the arcuate line of Douglas that is connecting umbilical and extended towards the anterior and posterior iliac spine, dissecting and making an hernial sac[6]. A polypropylene mesh is attached to Cooper's cruciate ligament and to the transverse fascia with titanium clips[35]. The peritoneum is then held on the mesh with a continuous reabsorption suture or metal clamps, leaving them between the preperitoneal tissues and an abdominal wall, where it is incorporated by the fibrous tissue[31,35].

Contraindications of the TAPP repair include large colony-slipped hernias, irreducible inguino-scrotal hernias, ascites, and anterior supra-pubic surgery[26].

II) Totally Extra Peritoneal Repair (TEP)

The totally extra peritoneal repair differs from the transabdominal preperitoneal because it prevents entry into the abdominal cavity, consequently there is theoretically a lower probability of visceral lesion or incisional hernias[6,26].

First, the patient is placed supine with the upper limbs attached to the body[6].

An incision is made infra-umbilical and open the anterior ipsilateral sheath of the rectus abdominis muscle, then a blunt digital dissection is made in the preperitoneal space through the rectum sheath and a trocar 10mm in diameter. A balloon is used in the initial dissection to develop the preperitoneal space without entering the abdominal cavity[26,28]. The balloon is gradually inflated and during the insufflation the surgeon monitors the dissection by the laparoscope and then deflates and withdraws the balloon[26]. For insufflation the CO_2 insufflator is coupled, and a 30° laparoscope is inserted into the preperitoneal space[36].

The dissection continues using the laparoscope under direct vision and two trochanters 5mm in diameter are then introduced infra-umbilically into the preperitoneal space, the first two fingers above the tubercle of the pubis and the second five fingers above, just below the access path of the camera[26]. The preperitoneal space is dissected medially through the midline and laterally cranial to the anterior superior iliac crest[36].

The hernia sac is reduced and the peritoneum retracted cranially, so the polypropylene mesh is introduced to cover the three regions of the hernia (indirect, direct and femoral) in the preperitoneal space, where it is implanted with or without the use of staples[6,26,36]. Finally, all trochanter are removed, CO_2 is exsuflated and the anterior rectum sheath and skin are closed[6,36].

In the TEP correction, hernias incarcerated with intestinal ischemia are contraindicated[26].

4. CONCLUSION

The distinction as to the type of inguinal hernia, direct or indirect, has absolutely anatomical relevance, since the surgical repair is the same for both types. As for its reducibility, the laparoscopic technique, particularly TEP, is contraindicated for incarcerated and strangulated hernias, because they are emergency cases if not treated quickly.

In traditional hernioplasty, cases of relapse are minor, whereas in laparoscopic hernioplasty the intraoperative complications are smaller, but more severe than the complications of open repair. As for the recovery, being a minimally invasive technique laparoscopy provides a return of the patient to the labor functions faster.

In medical practice the choice of therapy for inguinal hernia depends on several factors. The main factors inherent to the patient are age and presence of comorbidities, the factors related to the hernia are the type and location, as well as factors related to the hospital such as material availability, technical training of the surgeon, and value of the surgery.

Finally, in terms of costs laparoscopic hernioplasty is significantly more expensive and perhaps this is the main reason to be so little used in poor regions in the world.

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