

Original Research Article

Incidence and management of inguinodynia after inguinal plasty

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ABSTRACT

Background: Hernia is defined as a defect of fascial and muscle-aponeurotic structures, allowing the protrusion of elements. The most frequent is inguinal region, prevailing in men 3:1 vs female. The most frequent complications are persistent chronic pain.

Methods: A descriptive, prospective and cross-sectional study was performed in postoperative inguinal plasty patients, using a laparoscopic approach and open approach, the presence or absence of inguinodynia was studied using the visual analogue pain scale (VAS) and the Semmes-Weinstein monofilament, in addition to a systematic investigation in the following PubMed, Medline, Clinical Key and Index Medicus databases, with articles from July 2019 to April 2020.

Results: Inguinodynia was present in laparoscopic surgery and open approach, 58 patients had inguinodynia at two weeks associated with the inflammatory response of the tissues and the presence of a foreign body (mesh), 77% of the patients with persistence of pain at 3 months reported mild pain (VAS 1-4), 21% moderate pain that did not limit their daily activities (VAS 5-8) and 2% of the patients reported severe pain which limited physical activity and effort (VAS 9-10).

Conclusions: Inguinodynia has an impact on hospital costs and quality life, we consider it is essential to domain the anatomical variants of the region. We propose an extensive follow-up of this group of patients, to make a comparison of diagnostic methods, as well as conservative management vs. modern techniques for pain control.

Keywords: Hernia, Inguinal, Inguinodynia, Lichtenstein, Mesh, Neurectomy

INTRODUCTION

An abdominal wall hernia is defined as a defect in the continuity of fascial and/or muscle-aponeurotic structures, allowing the protrusion or exit of elements that normally do not pass through them; In order of frequency depending on their location are inguinal hernia (70-75%),

femoral hernia (6-17%), umbilical hernia (3-8.5%), and other less common forms (1-2%).^{1,2}

The hernias of the inguinal region are classified by anatomy in femoral and inguinal, the latter being subdivided into direct and indirect hernias, according to their medial or lateral relationship to the lower epigastric

vessels respectively. The indirect inguinal hernia protrudes through the internal inguinal ring along with the cremasteric fascia and extends downwards over the spermatic cord, may be limited to the groin area or spread through the outer inguinal ring and descend to the level of the testicles. Direct inguinal hernia protrudes medially through the posterior wall of the inguinal canal into the lower epigastric vessels in the Hesselbach triangle, through the transverse fascia and the femoral hernia protrudes through the transverse fascia medially to the femoral vein into the femoral canal, below the inguinal ligament.³

Inguinal hernias predominate in the male sex with a ratio of 3:1 with respect to the female sex, being more frequent during the productive life, and presenting 40-50% of the hernias in patients between 30 and 59 years of age.⁴ It is estimated that inguinal hernia has a risk of occurrence in males of 20%, where 25% of them will develop an inguinal hernia at some point in their lives, placing hernioplasty as one procedure performed in surgery most frequently performed in children and adults globally, this being the treatment of choice. Nonetheless, multiple factors may be involved in the presence of possible complications, such as the type of approach (laparoscopic or open), use of prosthetic material (use of light or heavy mesh), the surgical technique used, among others, in the long term the most common complication in the postoperative patient is the presence of postoperative "inguinodynia", which can become even more disabling than the hernia itself, or even generate medico-legal issues.⁵⁻⁸

This article aims to publicise the current incidence of inguinodynia mainly in the Latin American population; despite several previous publications it is estimated that the lack of knowledge by the medical community (General doctors and Surgeons) about the factors associated with the persistence of pain turn inguindynamics into an underdiagnosed pathology, directly affecting the quality of life and significantly increasing hospital stay, costs and follow-up visits.

METHODS

A descriptive, observational and prospective study was carried out with 275 patients operated by the same surgeon for unilateral inguinal plasty in various public and private institutions in Mexico City. 215 patients underwent inguinal plasty by laparoscopic approach and 60 patients by open approach. To those who provided informed consent, a questionnaire was applied to know the absence or presence of pain and its intensity using the visual analog pain scale (VAS) as a quantitative and symbolic variable and complementing their assessment with the Semmes-Weinstein monofilament at 2 weeks and later at 2, 6, 12, 18 and 24 months after surgery.

Patients were randomly recruited prior to surgery over a 5-year period from January 2015 to January 2020.

The inclusion criteria for this study were: male patients, aged between 25 and 55 years, postoperated from inguinal plasty, use of light mesh, USG of the postoperative abdominal wall that ruled out the presence of complications.

Exclusion criteria: significant previous comorbidities, mainly (autoimmune diseases, chronic inflammatory processes, collagen diseases, myopathies, fibromyalgia and mental diseases), as well as emergency inguinal plasty due to incarceration or strangulation.

The repair technique was tension-free Lichtenstein type, with polypropylene mesh, with classic fixation, applying continuous 2-0 polypropylene suture to the inguinal ligament and simple stitches to the rectus abdominis and minor oblique.

For the statistical analysis of these variables, the Student's t test was used with a confidence interval of 95%, using the SPSS program, to verify the statistical significance of the data. This work was approved by the Ethics and Research Committee of the participating institutions.

The limitations of our study are determined by obtaining the various pain intensity scores on the AVE scale which are of a subjective nature. We also consider a possible bias in the face of the misinterpretation of this scale in patients with illiteracy and the use of analgesia continues with drugs from the second and third steps of the WHO Analgesic Scale.

RESULTS

The inguinodynia was presented in 27 patients, 12 after laparoscopic surgery and 15 after open approach, 58 patients developed inguinodynia in the first two weeks probably associated with inflammatory tissue response and presence of foreign body (mesh), however after conventional analgesia 17 patients persisted with pain in the inguinal region at two months, 13 patients at four months, which according to the definition referred to in this publication are considered patients with inguinodynia proper, considered 100% of our population with inguinodynia, calculating a cumulative incidence of 0.04 or 4% to 24 months (Figure 1), of which 10 patients despite recommending the use of the second step of pain relievers persisted with pain at six months, 9 patients at 12 months and 5 patients persisted with algesia at 18 and 24 months (Table 1).

To its evaluation by physical examination, by means of medium and deep palpation, as well as the use of the monofilament of Semmes-Weinstein in inguinal region bilaterally 77% of the patients with persistence of pain to 3 months reported mild pain (VAS 1-4), 21% moderate pain that did not limit their daily activities (VAS 5-8) and 2% of patients reported severe pain that limited physical activity and effort (VAS 9-10) (Figure 2).

Table 2: Incidence of postoperative inguinodynia, case comparison, laparoscopic approach vs open plasty.

Surgical Approach	Laparoscopic	Open	Total
Immediate inguinodynia	12	15	27
inguinodynia 2 weeks	26	32	58
inguinodynia 2 months	7	10	17
inguinodynia 4 months	5	8	13
inguinodynia 6 months	3	7	10
inguinodynia 1 year	3	6	9
inguinodynia 1.6 years	1	4	5
inguinodynia 2 years	1	4	5

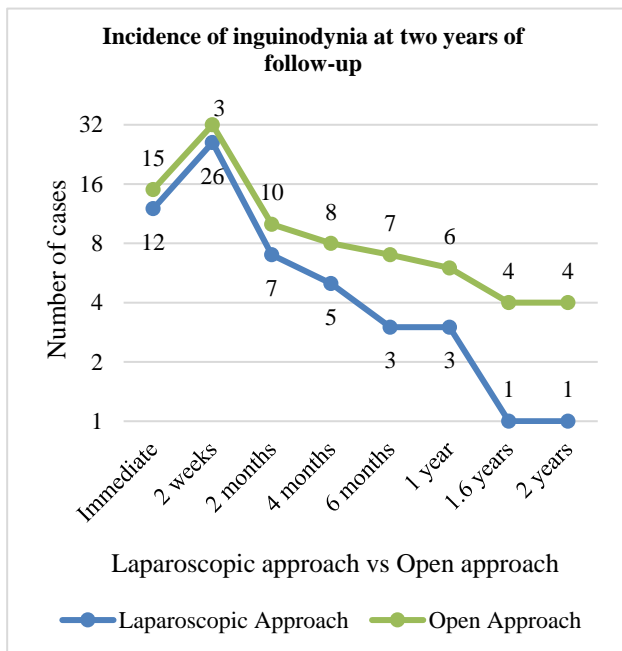


Figure 1: Comparison inguinodynia incidence, laparoscopic approach vs open, in relation to time 2 weeks to 24 months.

The presence of inguinodynia is not an uncommon entity, where the identification of anatomical structures is crucial, as is the surgical technique, type of approach, the use of prosthetic materials and their characteristics. The management of patients with persistent pain should be closely monitored, authors such as Nikkolo et al reported in their three-year follow-up study, the presence of pain with mainly in physical activities compared to others such as being at rest, coughing, sitting up after lying down; although during this follow-up the incidence of chronic pain was significantly reduced, the incidence of foreign body sensation did not decrease.¹²

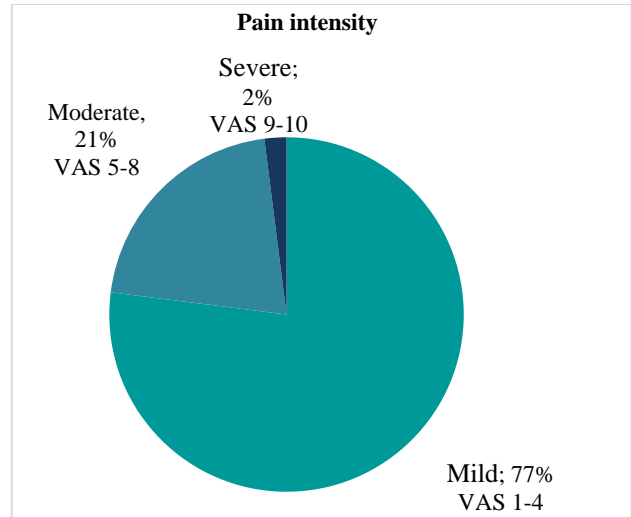


Figure 2: Pain intensity VAS scale, patients with inguinodynia following inguinal plasty.

DISCUSSION

Inguinodynia is defined as a painful and late syndrome of the pre-operated inguinal region, which is characterized by a sensation of pain or paraesthesia, and which can be irradiated to the genitals and thighs.⁹ In recent years the international association for the study of pain (IASP) described chronic inguinodynia as pain in the groin reported by the patient no later than 3 months after repair of inguinal hernia, this temporality is currently the cut-off point for differentiating between patients with postoperative pain and chronic inguinal pain due to various causes. The self-assessment tools in inguinodynia are the visual analog scale for pain (VAS) and the McGill Pain Questionnaire (Table 1), which have demonstrated reliability, validity and consistency.^{10,11}

The chronic postoperative pain of the inguinal region, can be classified as three types of pain, neuropathic or neuralgic pain, somatic pain, "dysejaculation or deafferentation", the first of them neuropathic or neuralgic pain is the most important, not only because of its prevalence but also because of its incapacitating potential, which is related to injury to the ilio-spinal, ilio-gastric and genitofemoral nerves, in addition to their involvement in scar tissue or neuroma formation. The second type of pain is the somatic, present in ligamentous inserts of the pubic tuber. At rest, there is a slight sensation of pain in the medial insertion of the inguinal ligament, but the pain is intense with movement, when the traction of this ligament occurs. The third type ("dysejaculation or deafferentation"), is less frequent (0.04%), characterized by a painful burning sensation during ejaculation.⁹

Due to the emergence of the three nerves involved in the inguinal region (T12-L1 nerve roots), it is difficult to identify the exact nerve involved in causing pain due to anatomical variation and the absence of one or more

nerves, hence, the general consensus is to identify the three nerves during inguinal hernia repairs, to avoid iatrogenic injuries. Objective evaluation of pain and hypoesthesia by von Frey monofilament before and after surgery has been shown to provide extensive clinical information; In addition, both ultrasound and computed tomography favor the diagnosis of chronic inguinal pain by identifying possible origins and related factors. According to international literature, the incidence of chronic pain in the inguinal region is up to 51.6%, with the sensation of foreign body being reported in 43.8%, which are associated with traumatic injuries of nerve structures (ilioinguinal nerve, iliohipogastric nerve and genital branch of genitofemoral nerve) derived from surgical technique during tissue dissection or retraction, entrapment of nerves by postoperative fibrosis, mesh-related fibrosis or sutures used to fix the mesh, the type of foreign material used in alloplasty, but also the use of a mesh can reduce chronic pain by reducing tension between suture lines.^{12,13} Any partial or complete transection of the nerve leads to the formation of neuromas and brings pain along the distribution of that nerve.

Epidemiology

According to figures from the national health Information system of Mexico, in 2006 there were 100,774 hospital discharges in public institutions related to inguinal plasty procedures, which affects approximately 10-15% of the general population, with a significant impact on the social and labour performance of up to 25% of the economically active population.¹⁴ Countries like the United States spent more than \$48 trillion of their health budget in 2005 to cover expenses related to inguinal hernioplasty, which represented a substantial cost with important clinical and economic implications.¹⁵ Chronic pain has a significant impact on quality of life, being identified for the first time as a quality factor by Cunningham and Pooblan, with a prevalence of 0 to 63% at one-year follow-up, and with 10% of patients reporting moderate to severe pain 18, however, only 2-4% of patients are negatively affected by pain in their daily lives.^{16,17}

Associated factors

Numerous studies have tried to determine with certainty the cause of inguinodynia, today we know that it is given by multifactorial causes, the use of lighter meshes has been proposed to reduce the inflammatory response, as well as ilioinguinal nerve section, which is a reproducible, easy-to-perform procedure that decreases the intensity of post-operative pain in patients undergoing inguinal repairs.⁸

The surgical approach to inguinal hernias with lower complication rate (inguinodynia) has been shown to be the Lichtenstein technique (tension-free hernioplasty) described in 1989, is the gold standard due to its technical

simplicity, reproducibility, few or no contraindications, high efficiency and low cost.¹⁹ The principle of Lichtenstein hernioplasty is the reinforcement of the tension of the abdominal wall covering the transverse fascia and the oblique muscles with a mesh. Recurrence rates after Lichtenstein operation are significantly lower compared to open suture repair and equal to laparoendoscopic techniques, reporting a 50-75% reduction when mesh is used than when not used.²⁰ Compared to laparoscopic techniques, Lichtenstein's operation is associated with less severe visceral lesions but with earlier postoperative and chronic pain; however, chronic pain rates in long-term follow-up studies are comparable, being considered the most common morbidity.^{16,21}

The technique employed by the surgeon is considered by some authors as Schmedt et al a possible cause of recurrent pain, for which they report an incidence of chronic pain of 7.6% after hernia repair by laparoscopic or totally extraperitoneal technique, and 12.5% after the Lichtenstein procedure; in this regard, Nienhuijs et al performed a meta-analysis of 29 studies related to inguinal repairs with open mesh and laparoscopic technique, observing an incidence of chronic pain of 11%, considered mild in 74%, moderate in 17%, moderate to severe in 8% of the patients analyzed, finding two factors involved: the use of high weight meshes and the open surgical technique (Figure 2).²²⁻²⁴

Important factors related to non-neuropathic causes include reaction to mesh, periostatic reaction of sutures or staples inserted into the pubic tubercle and the coiled mesh causing mechanical pressure, in addition to factors inherent in the material used such as fixing the mesh. Randomized controlled trials have shown that the use of staples reduces intraoperative time with early return to normal patient activities, without significant differences in complications or rates of postoperative pain compared to other techniques; sutured fastening on one side of the mesh and use of glue on the opposite side showed less inflammatory reaction and inguinodynia at the end of the human fibrin, without increased recurrence rates, forming a fibrotic reaction sufficient to provide the required tensile strength without evidence of harmful effects on the nerve.²⁵ In certain cases the use of mesh in inguinal repair has been related to venous congestion or inflammation of the spermatic cord resulting in diffuse pain in the proximity of the spermatic cord and contributing to sexual dysfunction with symptoms of chronic genital pain, erectile dysfunction and dysejaculation, so as a general consensus, the use of mesh in hernia repair technique is considered more effective in reducing recurrence and chronic inguinal pain compared to no mesh repair.^{26,27} To avoid bias corresponding to the invasive mesh attachment technique in the development of inguinodynia, Bittmer et al fixed the meshes using a non-invasive technique using human fibrin glue, demonstrating a lower incidence of chronic pain, foreign body sensation and inguinal numbness.²⁵ Regarding the

type of mesh used, the use of light mesh has been reported for its decrease in the incidence of chronic pain and foreign body sensation in some studies as well as an increase in the rate of early and medium-term recurrence of the hernial defect due to its lower tensile strength the use of polypropylene is associated with a strong foreign body reaction and the increased amount of material used in the mesh significantly influences the formation of scar tissue and inflammatory reaction.^{29-31,22}

The European Hernia Society indicates that the risk of chronic pain decreases with age; whereas the presence of preoperative pain and early severe postoperative pain increases the risk of developing chronic pain after hernia surgery, it is also mentioned among their guidelines of open hernia repair with a grade A recommendation, the use of non-absorbable synthetic flat mesh or composite mesh with a non-absorbable element.^{24,32} Among the factors associated with the presence of chronic pain, the type of mesh, has a greater association in cases where light mesh was used (24%) compared to high weight (12%), contrary to what Bringman S33 observed. O' Dwyer et al. who associated the highest rate of chronic pain recurrence in the light mesh group with a technical error in transoperative 30. Despite the above mentioned, there are 3-month follow-up studies that demonstrated the advantages of light mesh with respect to physical activity, daily life activities and pain, with no advantages to follow-up 12 months with respect to chronic pain, but presenting a lower sensation of foreign body in the inguinal region with the use of light mesh.^{27,24-37} A relevant point to highlight is the technique used for fixing the meshes, because invasive fixing devices could be a significant risk factor for the development of chronic pain from nerve damage or compression of tissue produced by the device, being currently employed as effective fibrin glue by experiencing a lower incidence of chronic pain. In addition, when performing laparoscopic hernia repair, the intensity and frequency of chronic pain are very low, regardless of the type of mesh implanted and using a non-invasive fixing technique with fibrin glue. It is generally accepted that the implantation of reduced material mesh may improve patient comfort during the early postoperative period, but the type of mesh does not play a major role in terms of the frequency and intensity of long-term pain following hernia repair. The differences between studies are due to the number of patients included in the studies, the heterogeneity of the population, short-term follow-up, lack of description of the mesh fixing technique.³⁸

Regarding management, international guidelines recommend surgical treatment not earlier than 1 year after the operation when the inflammatory response has decreased.¹² Surgical treatment is recommended when pain affects the patient's daily activities and when conventional treatment fails.³⁹ For this reason, it is of great importance to differentiate early postoperative pain from chronic inguinal pain, being the first to be relieved with analgesics, while chronic pain requires an additional

comprehensive evaluation for specific medical-surgical intervention. Zieren et al. evaluated post-herniorrhaphy sexual function with respect to elective ilioinguinal nerve preservation or division, demonstrating that prophylactic elective excision of said nerve structure leads to the reduction of post-surgical sexual symptoms.⁴⁰

To decrease the risk of inguinodynia Hakeem & Shanmugam recommend leaving the cremastomeric layer to protect the ilioinguinal nerve; not to recreate an external ring too small to prevent the constriction of the ossal ilioinguinal nerve and suitable to avoid lesions on the limbs of the ilioinguinal nerve or iliohipogastric nerve that emerge prematurely; and avoid suturing the lower edge of the internal oblique muscle to the inguinal ligament as sutures can cause injuries to the intramuscular portion of the ilioinguinal nerve.²⁴

CONCLUSION

Addressing inguinodynia has been a complex issue over the years, however, the persistence of pain has a significant impact in terms of hospital costs, follow-up and quality of life of the patient. Inguinodynia is a multifactorial pathology, failure to correctly identify the nerves involved in the region lead to the presence of high rates of postoperative inguinodynia, so the anatomical knowledge of the region helps to avoid damage to nerve structures with meshes or sutures, in addition to understanding that neurectomy only causes hypoesthesia of the region, while nerve damage causes pain 24. We consider it essential that the surgical team must be prepared to face anatomical variants with dominance of the inguinal region; however, based on the universal literature and on the experience of the team, we consider some recommendations essential to reduce the risk of inguinodynia; the laparoscopic approach, the Lichtenstein technique have shown a lower index of inguinodynia as well as the use of light mesh and the use of human fibrin glues to fix the mesh, they are associated with lower adhesions, inflammatory processes and fibrosis, however their main disadvantage is the unavailability in most hospital centers in developing countries, but with great advantages over the lower incidence of pain, foreign body sensation and groin numbness. We propose to carry out an extensive follow-up of this group of patients at three and five years where the tissues have recovered their structure, to make a comparison of diagnostic methods as well as conservative management vs. modern techniques for pain control, which allow the surgeon to reestablish quality of life of the patient.

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