

Original article

INGUINAL HERNIA REPAIR: COMPARISON BETWEEN NERVE SPARING AND NEURECTOMY TECHNIQUES

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ABSTRACT

Abdominal wall defects are one of the most common surgical pathologies: inguinal hernia is the most frequently encountered of this type of disease. Every year, more than 20 million patients undergo inguinal hernioplasty, representing the most performed surgical procedure in the world. In Italy, an estimated 170,000 inguinal hernia repair operations are performed each year. Chronic groin pain is one of the most debilitating long-term complications after hernioplasty, which can significantly affect the patient's satisfaction and quality of life after the operation. An experimental retrospective study was conducted at the University Hospital of Catania, in patients operated on between September 2018 and June 2022. The experimental study compares two groups of patients operated on for inguinal hernioplasty. The difference between the two groups is the type of surgical technique chosen: one group will undergo neurectomy of the inguinal nerves, ileoinguinal (II), ileohypogastric (IH), and genitofemoral (GF), in the other group will be chosen the nerve-sparing procedure.

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1. Introduction

Abdominal wall defects are one of the most common surgical pathologies: inguinal hernia is the most frequently encountered of this type of disease. Every year, more than 20 million patients undergo inguinal hernioplasty [1], representing the most performed surgical procedure in the world. In Italy, an estimated 170,000 inguinal hernia repair operations are performed each year [2] and the incidence of inguinal hernia is 15 out of 1000 inhabitants [3], and the male: female ratio is 9:1. Treatment of inguinal hernia consists of the surgical repair of the underlined parietal defect. Among complications related to the surgical treatment of inguinal hernia, post-operative pain and paresthesia are sometimes complained by the operated patients.

These might be due to an involvement of the inguinal canal nerves during surgery procedure or in the post-operative period due to tissue regeneration, which could lead to nerve entrapment. In this experimental study, we will evaluate the onset of neuropathic inguinal pain and paresthesia as complications of inguinal prosthetic hernioplasty surgery. Chronic groin pain is one of the most debilitating long-term complications after hernioplasty, which can significantly affect the patient's satisfaction and quality of life after the operation [4],[5],[6],[7],[8]. An experimental retrospective study was conducted at the University Hospital of Catania, in patients operated on between September 2018 and June 2022. The experimental study compares two groups of patients operated on for inguinal hernioplasty.

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The difference between the two groups is the type of surgical technique chosen: one group will undergo neurectomy of the inguinal nerves, ileoinguinal (II), iliohypogastric (IH), and genitofemoral (GF), in the other group will be chosen the nerve-sparing procedure. The aim of this study is to compare the two surgical techniques evaluating the best outcome of patients in the 6 following months, by analyzing the chronic post-operative inguinal pain and paresthesia.

2. Material and methods

In this study, we evaluated and compared the results of two groups of patients operated on for repair of inguinal hernia with different methods of managing the nerves of the anatomic region. This is a retrospective experimental study on 114 male patients over the age of 18 years and with a confirmed diagnosis of Primitive Inguinal Hernia, operated on from 2018 to 2022 in the Department of General Surgery and medico-surgical specialties of the University of Catania by the same equips. In Group A we included 57 patients who underwent hernioplasty with nerve-sparing technique, whereas in group B 57 patients received an inguinal hernia repair with neurectomy by section or cauterization. All our patients, during the first control, at the time of their recruitment, were enrolled and the related data were inserted in a database specifically designed, where generalities (first name, last name, age) and comorbidities (such as the presence of diabetes or obesity), if any, were inserted. In the database was also mentioned the type of hernia, specifically if the hernia was direct or indirect or double direct and indirect. The database also considered other voices which were fulfilled during surgery or in the post-operative phase. Type of anesthesia, occurrence of post-operative pain, type of pain, and eventually site of pain were also considered. [9]. An example of the form used for each patient is reported below in Tables 1, 2, and figure 1.

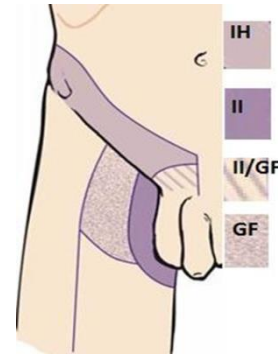


Figure 1. Localization pain by skin area

The technique used in group A started with the cutaneous inguinal incision. After a section of the Scarpa fascia, the opening of the inguinal canal was accomplished through the division of the aponeurosis of the external oblique muscle. At this point, the ilioinguinal nerve was isolated and preserved. The cremasteric muscle was then divided using cauterization. The iliohypogastric and genitofemoral nerves were also isolated and preserved. It is important to consider that the neuroanatomy of the inguinal canal is characterized by great variability [9],[10]. Therefore, identification of the nerves, especially the genitofemoral nerve, was sometimes difficult as reported also by other authors [11],[12],[13]. The repair of the hernia was accomplished through the isolation of the hernia sac from the elements of the spermatic funiculus and its reduction into the peritoneal cavity. At this point, a polypropylene plug was inserted into the internal inguinal ring and its fixation was achieved by a stitch. A preshaped mesh was then put below the conjunct tendon and was fixed by interrupted stitches or using fibrin glue. In a direct inguinal hernia, sometimes it was necessary to straighten the posterior wall of the inguinal canal by continuous suturing of the transversal fascia in 3/0 prolene before applying the mesh. [14],[15],[16]. The external oblique muscle aponeurosis was then closed taking care not to include in the continuous suture the nerve previously isolated, which therefore was left intact. The Scarpa fascia was then sutured leaving the spermatic cord and vessels above the external muscle aponeurosis. A running suture or interrupted skin suture was utilized to close the skin. In group B the technique utilized was similar to the one described above for patients of group A. In this group, however, after isolation of the nerves, they were interrupted through a neurectomy using section and cauterization. More precisely, we proceed as in the classic Trabucco surgery previously described, but in the opening phase of the aponeurosis of the external oblique muscle, the iliohypogastric and ilioinguinal nerves are removed through a wide resection that does not trap in the prosthesis network the proximal and distal stumps of these nerves. Resection of a third nerve, the genitofemoral, could be performed if its course was evident. Patients were usually discharged from the hospital one day after surgery. Drugs for pain were administered only on demand. To compare and evaluate the sensory and pain changes each patient of the two groups was investigated at least 6 months after surgery. Patients enrolled in this study underwent a telephone interview. The questionnaire used during the interview is reported below in Tables 3 and 4. [17]

Patient Data(first name-surname)			
Age			
Diabetes		yes	no
Type of hernia(EHS)		Reported in Table 2	
Type of anesthesia		Local	Spinal / General
Neurectomy	IH (iliohypogastric)		
	II (ileoinguinal)		
	GF(genitofemoral)		

Table 1. Sheet for data collection

		P	R		
	0	1	2	3	x
L					
M					
F					

P: primary hernia M : direct
 R: recurrent hernia L:indirect oblique external
 0: no hernia detectable F: femoral hernia
 1: <1,5 cm (one finger)
 2: <3 cm (two fingers)
 3: >3cm (more than two fingers)
 x: not investigated

Table 2. EHS Classification of Inguinocrural hernia

IPQ SHORT FORM MODIFIED	
Estimate of the worst pain felt in the inguinal region, in the post-operative phase, during this past week. (Follow-up 6 months)	Score
No Pain	0 pt.
Pain present but can easily be ignored	1 pt.
Pain present, cannot be ignored, but does not interfere with daily activities	2 pt.
Pain present, cannot be ignored, interferes with concentration on chores and daily activities	3 pt.
Pain present, cannot be ignored, interferes with most activities	4 pt.
Pain present, cannot be ignored, necessitates bed rest	5 pt.
Pain present, cannot be ignored, prompt medical advice sought	6 pt.
If you have experienced inguinal pain, to what extent has it limited your ability to perform following activities? More than one option may be selected.	
Getting up from a low chair	+1
Sitting down (more than 30 minutes)	+1
Standing up (more than 30 minutes)	+1
Going up or down stairs	+1
Driving a car	+1
Exercising or performing sport	+1
Total (0 to 12)	

Table 3. IPQ Short form modified

IPQ SHORT FORM PARESTHESIA MODIFIED	
Estimate of paresthesia in the inguinal region, in the post-operative phase, during this past week. (Follow-up 6 months)	Score
No paresthesia	0 pt.
Paresthesia present but can easily be ignored	1 pt.
Paresthesia present, cannot be ignored, but does not interfere with daily activities	2 pt.
Paresthesia present, cannot be ignored, interferes with concentration on chores and daily	3 pt.
Paresthesia present, cannot be ignored, interferes with most activities	4 pt.
Paresthesia present, cannot be ignored, necessitates bed rest	5 pt.
Paresthesia present, cannot be ignored, prompt medical advice sought	6 pt.
If paresthesia is present in the inguinal region, indicate which of these types is present. More than one option may be selected.	
Tingling sensation at rest	
Sensation of itching	
Unpleasant sensation (of discomfort) to the touch, compared to the contralateral region	
Loss of tactile and/or thermal sensitivity to the contralateral region	
Increased tactile and/or thermal sensitivity to the control side region	
Other (specify the feeling)	
Total (0 to 6)	

Table 4. IPQ Short form paresthesia modified

A score was obtained as mentioned in the tables. The Inguinal Pain Questionnaire (IPQ) used, was developed as a modification of that proposed by Kehlet and colleagues [18], [19]. IPQ uses a fixed 7-point scale for pain assessment, in which each point correlates with pain quality and behavior rather than frequency or verbal description [20]. In addition to the questionnaire, an assessment was made of the topographical location of the pain, distinguishing between seven possible skin regions, to best identify, already in the pre-operative phase, what might be the territory of innervation subjected to the greatest suffering. The 7 skin regions examined refer to the innervation regions of the nerves Ileoinguinal (II), Ileo hypogastric (IH), and Genitofemoral (GF) individually or in association with each other. In the interview, six months after hernioplasty surgery or more, therefore, two types of questionnaires were administered concerning the possible onset of the chronic postoperative pain accurately described, localized, characterized, and the possible appearance of paresthesias of various natures (hyposthesias, hyperesthesias, alterations of sensibility, inequalities): the modified IPQ Short Form [14] and the modified IPQ Short Form Paresthesia are separately reported in Tables 3 and 4. The former tends to assess the presence or absence of postoperative pain, assigning a score from 0 to 6 points to the mode and intensity in which pain arises during the day. It starts from a parameter where the pain is absent (0 points) to gradually more severe parameters where the pain cannot be ignored and, indeed interferes with daily activities, requires bed rest, and requires medical consultation (1-2-3-4-5-6 points).

If there is the presence of pain, we move on to the second part of the questionnaire in which the patient is asked what daily activities were most impaired such as getting up from a low chair(+1), standing or sitting for more than 30 minutes(+1), climbing or descending stairs(+1), driving a car(+1), and engaging in physical activity or sports(+1). Again, a score of N.1 point was given for each impaired activity among those mentioned. This score is added to the previous one, resulting in a total score ranging from 0 to 12. The modified IPQ Short Form Paresthesia questionnaire is less detailed than the pain questionnaire described above. To assess the presence or absence of paresthesia in the inguinal region, again in the questionnaire we evaluated 7 different parameters and gave each of them a score from 0 to 6 points. It always starts from a situation in which paresthesia sleeps absent (0 points) to paresthesia that cannot be ignored and arrives at a clinical picture in which paresthesia is increasingly invasive (the parameters are scored from 0 to 6 points). In the second part of the questionnaire, patients experiencing this discomfort are asked about the type of it based on what is described. More precisely, whether paresthesia can be likened to an electric shock sensation, a tingling sensation, an itching sensation, or, again, a loss or increased tactile and/or thermal sensitivity concerning the counter lateral region. If paresthesia was identified, the patient was requested to describe the type in the second part of the questionnaire the possible types are attributable to feeling electric shock to the touch, feeling tingling at rest, feeling itching, unpleasant feeling to the touch, loss or increase of tactile and/or thermal sensitivity as compared to the counter lateral region, or other nonspecific sensations. For quantitative data, if normally distributed, the mean and standard deviation were used, the student t-test for unpaired data; if not normally distributed, the median and interquartile range were preferred, with Mann-Whitney's U test. A P value less than or equal to 0.05 was considered significant. The Kolmogorov-Smirnov test was used for the normality test, which shows that normality belongs only to the data referable to the age of the patients (P>0.05). Our statistical results show that using the Mann-Whitney U-test, there is a significant age difference: one group is older than the other, this is a bias. For the adjacent tables referable to the presence of diabetes mellitus, size and type of hernia, and sense of heaviness before surgery, Pearson's chi-square test was used. If 25% of the cells were greater than 5%, the use of this test was not possible. For comparison between two the groups for qualitative data, then, the Chi-square test with Yates' correction was used, and where necessary Fisher's test was used. It is necessary to utilize the percentage table regarding the two IPQ questionnaires.

3. Results

Our study's patients were all males over the age of 18, with a diagnosis of non-recurring inguinal hernia. In group A, consisting of 57 patients, the mean age of the patients was 63.74 years +/- ES 1.763 with a minimum age of 22 years and a maximum age of 88 years, with a median of 65 years and a standard deviation SD of 13.309. The C.I. confidence interval here is also 95%. Two patients reported diabetes in anamnesis, thus representing 3.5%. 59.6 percent of population A under review, that is 34 patients, had the hernial defect at the level of the right inguinal canal, and the remaining 40.4 percent (23 patients) had the pathology on the left.

The mean age of patients in group B, 57 patients, is 57.58 years +/- ES 1.514 (range 29 - 81 years), with a median of 56 years, a 95% C.I. and an SD of 11.427. 7% of them, or 4 patients, were found to have diabetes mellitus. In group B, 61.4%, of 35 patients, had the disease on the right side, and the remaining 38.6% (22 patients) on the left side. 59.6% of group A, that is, 34 patients, had an external oblique herniated defect, 21.1% of them, that is, 12 patients, had an external oblique direct inguinal hernia, and finally 19.3%, corresponding to 11 patients, had a direct hernia. Turning to the control group B, also composed of 57 patients, we note that 61.4%, i.e. 35 patients, had an external oblique inguinal hernia, 21.1% (12 patients) had a direct external oblique hernia, and lastly 17.5%, corresponding to 10 patients, had a direct inguinal hernia. In the telephone interview, 26.3% of the patients, 15 patients, reported that they felt a sense of weight on the side affected by the hernia pre-surgery, in contrast to the remaining 73.7%, or 42 patients, who did not report such a symptom before surgery. In Figure 2 comparisons of patients of group A and group B are demonstrated as far as age and frequency of the inguinal hernia pathology is concerned.

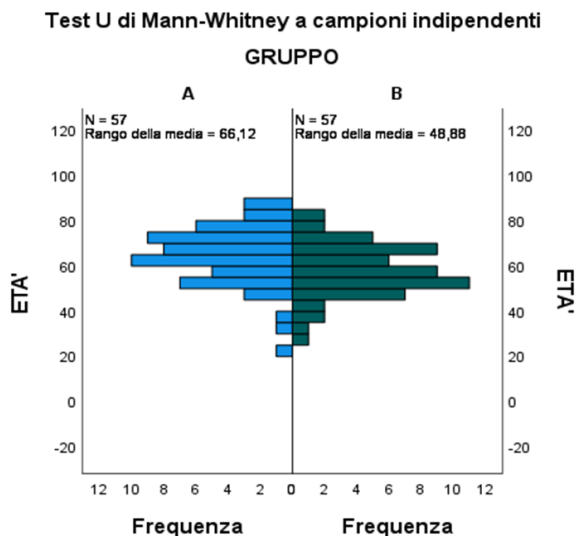


Figure 2. Comparison of age distribution between the two groups.

All data on patients' age, laterality of pathology, presence or absence of diabetes, and sensation of weight in the region affected by the inguinal hernia, the IPQ for pain and paresthesia, was validated. Of my entire case study, 6 patients, 5.3% of the total, had type 2 diabetes mellitus. IPQ pain is a scale; its mean and standard deviation, referring to the total number of patients, 114, are 0.60 and 1.348, respectively, with C.I. at 95% (0.35-0.85). Similarly, the mean and standard deviation referred to the paresthesia IPQ of all patients is 0.54 and 0.833, respectively, with C.I. at 95% (0.38-0.69). For qualitative data, absolute frequency and percentage frequency were calculated: 60% of surgeries were performed under local anesthesia, 37% under spinal anesthesia, and only in two cases the general anesthesia regime was necessary. The results of questionnaires (IPQ Short Form modified and IPQ Short Form Paresthesia modified) after at least six months after surgery are shown in Tables 3 to 8.

Taking into consideration the first questionnaire (IPQ Short Form Modified) appeared that in group A 66.6% of the patients (38 patients) indicated a score equal to 0 in the estimation of pain (no pain); 22.81% (13 patients) indicated a score equal to 2 (pain that cannot be ignored but does not interfere with daily activities), one of these only when the weather changes and one only applying pressure on the zone of interest. Only 2 patients (3.5%) indicated a score equal to 8 (pain that cannot be ignored and interfere with daily activities) describing the appearance of pain in standing for more than 30 min (+1) and during physical activity (+1), thus needing to continue medical consultation and treatment; only 7.02% (4 patients) indicated a score equal to 3 (pain that cannot be ignored, which doesn't interfere with daily activity). Taking into consideration the first questionnaire (IPQ Short Form Modified) appeared that in group B 84.2% of the patient (48 patients) showed a score equal to 0 (no pain) in the estimation of pain; 10.5% (6 patients) indicated a score equal to 1 (negligible pain) and only in 2 of those six it was necessary to type the appearance of pain, which was described when the patient was standing up for more than 30 min in one case (+1) and a burning sensation in the other (+1); 3.5% (2 patients) indicated a score equal to 2 (pain that cannot be ignored but does not interfere with daily activities) describing the appearance of pain when standing up for more than 30 min in one case (+1) and during physical activity in the other (+1); only 1.7% (1 patient) indicated a score equal to 4 (pain that cannot be ignored, which interferes with most activities) again expressing the occurrence of pain when standing up for more than 30 min (+1). To summarize, patients in group A who reported a score of 1 or more (persistent or intermittent pain) were 19 (33.3%), whereas in group B they were 9 (15.7%). With Yates correction, a significant difference with $P=0.05$ was obtained (C.I. 95%). Regarding the IPQ Paresthesia questionnaire related to group A, out of 57 patients, 30 of them (52.63%) reported no change in sensation after 6 months after surgery; as many as 11 patients (19.3% of patients) gave a value of 1 as IPQ score, 14 patients (24.56%) reported paresthesia that cannot be ignored but does not interfere with normal daily life. Specifically, 1 patient among them reported a tingling sensation, 4 patients reported numbness of the affected skin and slight loss of tactile and pain sensation, 1 patient defined paresthesia as an itchy and/or foreign body sensation, and 1 of the patients reported its presence only during weather changes. Only 3.5% of patients in group A (2 patients) had a value of 3 to their paresthesia, defining it as the presence of a foreign body that, especially during nighttime hours, forced the patient to maintain a lateral position on the side contralateral to the affected side. None of the patients report alterations in sensitivity on the contralateral side to the one operated on for hernioplasty. Analyzing the second questionnaire on the presence of paresthesias (IPQ Short Form Modified Paresthesia) in the group B, 79% (45 patients) indicated a score equal to 0 reporting no presence of paresthesia and describing no alterations in sensitivity; 15.7% (9 patients) indicated a score equal to 1 (presence of paresthesia but which can be ignored) describing in three of these cases a slight reduction in sensitivity compared to the contralateral region, in two other cases a slight feeling of falling asleep in the inguinal region is described, in one case a slight tingling sensation and in another case a slight hyperesthesia under stress, in two cases nothing was described; 3.5% (2 patients) indicated a score equal to 2 (presence of paresthesia but not affecting in daily activities) describing in a single case a reduction in sensitivity in the region undergoing surgery compared to the counter-lateral.

Finally, 1.7% (1 patient) indicated a score equal to 3 (presence of paresthesia that interferes with concentration and daily activities), standardizing paresthesia as an alteration of sensitivity to the contralateral region. When reviewing the second questionnaire regarding the presence of paresthesias (IPQ hort Form Modified Paresthesia), patients in group B reporting paresthesias (score 1 or more than 1) were 12 (21%), whereas in group A they were 27 (47.36%). Applying Yates correction, a highly significant difference was demonstrated with a $P < 0.01$ ($P = 0.0057$).

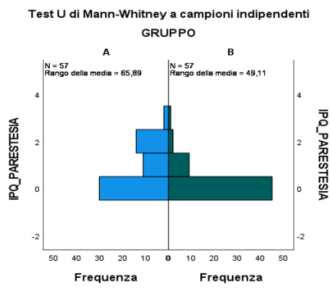


Figure 3. Comparison of IPQ distribution between the two groups

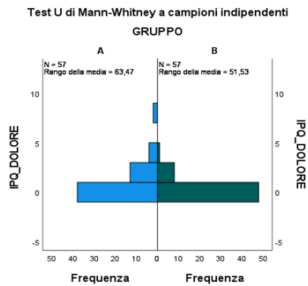


Figure 4. Comparison of IPQ Paresthesia distribution between the two groups

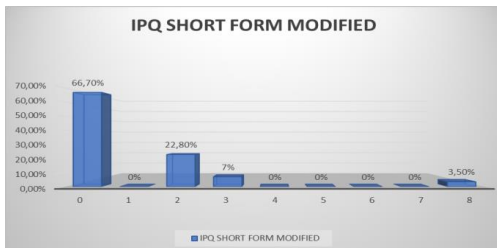


Figure 5. Results IPQ Short Form Modified administered in Follow Up to 6 months after surgery in the group A

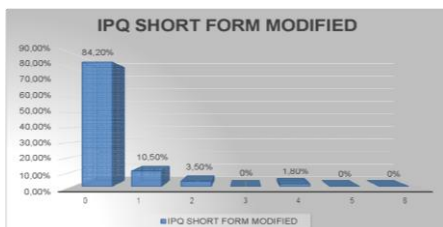


Figure 6. Results IPQ Short Form Modified administered in Follow Up to 6 months after surgery in group B

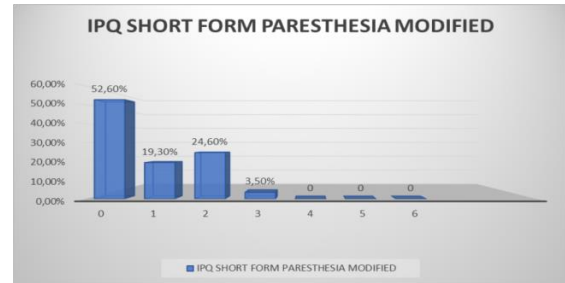


Figure 7. Results IPQ Short Form Paresthesia Modified administered in Follow Up to 6 months after surgery in the group A

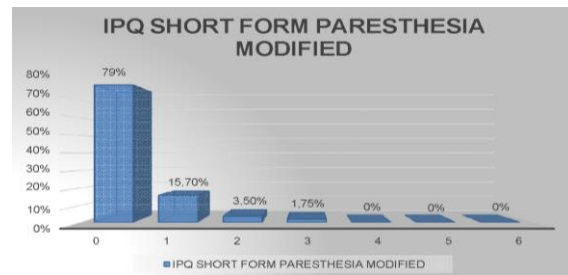


Figure 8. Results IPQ Short Form Paresthesia Modified administered in Follow Up to 6 months after surgery in group B

4. Discussion

During the postoperative period, the patient may present acute pain that occurs early and resolves spontaneously in the first month or is otherwise managed by the administration of analgesics. So, in the first instance, it is necessary to differentiate between acute postoperative pain and moderate or severe chronic pain that presents in the 3 months after surgery and lingers for a minimum of 6 months. It should be emphasized that there is still no definition of chronic pain accepted by the entire scientific community in the literature [21]. The incidence has increased with the rise in the use of Mesh during hernioplasty surgery [22],[23] and is between 19% and 62.9% [17],[24]. In severe cases, it can be a debilitating condition from a mental and physical point of view; the patient will be unable to attend ordinary daily and work occupations [25], [26]. Chronic pain in most cases does not respond to common analgesic treatments, consequently, the patient be treated according to a multidisciplinary approach. Available surgical choices are neurectomy, neurolysis, and neurinoma excision [27],[28]. To date, according to the literature, no type of treatment guarantees a satisfactory success rate and there is no clear-cut algorithm to follow, however as Beel and Berrevoet report in their systemic review, "the use of triple surgical neurectomy seems effective and useful in a high percentage of patients with CPIP [28], [29]. Another major study also confirmed that triple neurectomy has 87 % of the examined patients achieved marked improvement or complete disappearance of chronic pain, while only 4.3% did not achieve benefit. Specifically, a technique with simultaneous dual anterior and posterior access to the inguinal canal is performed where the ileo-hypogastric and ileo-inguinal nerves are resected through an anterior approach and the genito-femoral nerves through the posterior pre-peritoneal approach [22],[30]. This technique allows for an accurate view of the inguinal region and simple and precise identification of nerves [22].

As described in the previous paragraphs, neuropathic pain results from nerve involvement during inguinal hernioplasty surgery. According to a study conducted by Alfieri et al, one of the predisposing factors for chronic pain is the failure to identify nerves during surgery and resection of these determines [22]. The study concludes by arguing that identifying and not dissecting nerves during surgery significantly reduces the occurrence of chronic inguinal pain. This study contrasts with a comparative analysis published a few years later by Zannoni et al. [31] that compares the technique of wide inguinal neurectomy with removal between 3-8 cm, a length that ensures we avoid nerve-prosthesis contact and simple neurectomy. The study ends by pointing out that chronic pain in the group where wide inguinal nerve removal was performed had a significantly lower risk of developing chronic post-surgical pain than with simple nerve resection and also there was no association with severe sensory changes or that they did not resolve within 6 months after surgical treatment. According to Chevrel and Gatt, we can classify the types of pain into [32]:

-Neuroma pain: this is the typical pain, determined by the attempted proliferation of nerve fibers following a section, even a partial section of the nerve.

-Deafferentation pain: also given by the section of the nerve

-The projected pain: the nerve is intact, and the pain is caused by a simple tactile stimulus

-Referred pain: the injury is at a distance

An increase in the frequency of chronic pain has been found in the years '90 and some authors have attributed it to the greater use of mesh in the hernioplasty operation [22]. Chronic pain differs according to nerve involvement, so we can distinguish: ilioinguinal, iliohypogastric, and genitofemoral nerve neuralgia, described for the first time by Magee[33] and Lyon [34]. The former is characterized by a stinging, stabbing neuropathic pain radiating to the thigh, associated with loss of sensation with hypo/hyperesthesia; the trigger point is located below and medial to the anterosuperior iliac spine. If the nerve involved is the iliohypogastric we will have the trigger point in the superior area of the inguinal ligament; the pain has the same characteristics as ileoinguinal neuralgia but is localized above the pubis. Genitofemoral neuralgia is defined as "genitofemoral syndrome," the pain is piercing, and stinging and the trigger point is the external inguinal ring. The diagnosis of chronic pain is based on clinical evidence and patient history. Among the treatment choices, we find medical and surgical therapies. According to P.J. O'Dwyer and M.G. Serpell, medical therapies can be grouped into four classes: physical, pharmacological, nerve-block, and psychological [35]. Acupuncture and transcutaneous nerve stimulation, are two simple procedures that are part of medical therapies and are well-accepted by patients. The mechanism of action of acupuncture is to act by stimulating endogenous opioid secretion, the same as transcutaneous stimulation with the only difference being that the latter also acts on the neurons conducting the pain stimulus, blocking them. In cases of moderate-to-severe pain, radiofrequency may also be used, which has a neuro-destructive action with the aim of blocking pain transmission. Through electrodes on the skin is applied a high frequency (500khz) direct electric current, high temperature (80-82 C) with a neuro-destructive action, which interrupts the transmission of pain. Following treatment for 4-6 months the patient may have an area of hyposthesia, with a subsequent return to normal sensitivity and pain reduction [35]. The most commonly used drugs are membrane stabilizers such as Carbamazepine, Oxcarbazepine, phenytoin, pregabalin, and gabapentin.

Carbamazepine acts almost exclusively on Na channels but also on Ca²⁺ channels, so it is used in the treatment of neuropathic pain. Oxcarbazepine is a derivative of carbamazepine although it has different pharmacokinetics, i.e., it undergoes clearance less rapidly and allows constant levels over time although less, so it is useful in chronic therapies. Pregabalin and Gabapentin are Ca²⁺ channel inhibitors that also inhibit glutamatergic transmission, they are gaba analogs so they prevent presynaptic glutamate release. They can be used in neuropathic pain. Phenytoin blocks Na⁺ channels reducing nerve transmission. Indicated in neuropathic pain and trigeminal neuralgia, may have serious adverse events, and also has a low therapeutic index. When medical therapies become refractory or ineffective, surgical treatment is opted for, this occurs with a frequency of 30-40% [36],[37]. The traditional surgical approach to neuralgia consists of drug therapy followed by groin exploration, mesh removal, and nerve resection [22]. In cases where the nerve is incarcerated in the prosthesis used in hernioplasty, the surgery involves total or partial removal of the mesh associated or not with nerve neurectomy. In addition, rarely after hernioplasty surgery, hyperplastic Schwann cell formation termed neuroma is possible; it is a benign condition determined by the proliferation of Schwann cells and nerve fibers after trauma and represents an ineffective attempt to regenerate the injured nerve, in which case to prevent recurrence the nerve is dissected and electro coagulated at high energy [38]. It is of paramount importance before surgical action to make an accurate diagnosis by identification of the traumatized nerve, sometimes this can be difficult due to the presence of fibrous shoots, and post-surgical adhesions. [39],[40]. In 1988 Lichtenstein et al. proposed an algorithm for the treatment of chronic inguinal pain that consists of administering a local anesthetic such as bupivacaine medially to the anterosuperior iliac spine to block the ilioinguinal nerve [41-43]. Bupivacaine can cause loss of sensation in a limited region of the body without leading to loss of consciousness. It has a similar amide structure to lidocaine, however, it is 7 times more arrhythmogenic. The patient may benefit from prolonged and repeated administration may reduce or even eliminate pain. In the case of therapeutic failure, there is an indication to perform a neurectomy using medial access to the iliac spine without intervening in the previously applied prosthesis, except if the nerve is trapped in the wire mesh [42]. If the block does not resolve the chronic pain, a second genitofemoral nerve block or section is performed using a posterior approach at the L1 and L2 levels. Nonsteroidal anti-inflammatory drugs or psychotherapy may be used as palliative treatment.

5. Conclusions

Based on our experience and the results of our study we would advise prophylactic neurectomy with total removal of the inguinal canal nerve during prosthetic inguinal hernioplasty. In fact, comparing the two groups we obtained that the patients of the group B had the better outcome after 6 months post-operative with a clear reduction of the incidence of chronic inguinal pain and sensitivity alterations.

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