

## Practique Clinique et Investigation

# Treatment of Preoperative Inguinodynia with Neurolytic Infiltration during Inguinal Laparoscopic Tapp Hernioplasty: Preliminary Report

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### ABSTRACT

**Introduction:** Moderate or severe preoperative inguinodynia (PI) associated with inguinal hernia is underestimated and often mistreated, because hernioplasty alone does not always guarantee pain resolution. Neurolysis used in other fields to treat chronic pain may be useful to deal with this kind of inguinodynia. The objective of this work is to report the preliminary results of a small series of patients with inguinal hernia and moderate or severe chronic PI treated with intraoperative infiltration with a neurolytic solution during laparoscopic transabdominal preperitoneal (TAPP) hernia repair.

**Material and Methods:** A retrospective study of patients with inguinal hernia operated with TAPP laparoscopic inguinal hernioplasty, complaining from moderate or severe PI for more than four weeks, who underwent intraoperative infiltration with a neurolytic solution of ropivacaine and 70% ethyl alcohol for partial neural block as a specific treatment for chronic PI. Pain was classified and later evaluated in the follow-up with the verbal rating scale of pain (VRS 0/10), being moderate (VRS 4-7/10), and severe (VRS 8-10/10). Follow-up was at day 0 at hospital and at postoperative day 7, 14 and 30 during office visit and further if necessary asking the patient to report any recurrent pain or side effects.

**Results:** 22 patients, 12 men (54.6%) and 10 women (45.4%), average age of 46.2 years old. Twelve patients who (54.6%) referred moderate PI, (VRS 4-7/10) and 10 (45.4%) severe PI (VRS 8-10/10) were infiltrated and their hernias laparoscopically repaired with TAPP technique. Fifteen (68.18%) had bilateral hernia and 7 (31.81%) unilateral. No patient in this series had incarcerated or strangulated hernia or any other identifiable cause of inguinal pain. All patients except one (4.5%) reported immediate significant relief of the inguinodynia (VRS  $\leq$  2/10), and remained without it during follow-up. Four patients (18.1%) with severe PI reported mild postoperative dysesthesia in the treated inguinal region and upper homolateral thigh that lasted 4 weeks in 3 cases (13.63%), and 4 months in another patient (4.5%), both patients showed progressive decrease of this symptom until total relief. All patients of this series are free of the inguinodynia.

**Conclusions:** Neurolytic infiltration with ropivacaine and 70% ethyl alcohol during laparoscopic TAPP repair seems to be an effective treatment with few side effects for patients with inguinal hernia who present chronic PI. However, prospective and controlled studies are needed to verify these results.

**Keywords:** *Preoperative inguinodynia; Inguinal hernia; Laparoscopy; TAPP hernioplasty; Neurolytic infiltration; Neurolysis*

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## INTRODUCTION

Moderate or severe PI associated with inguinal hernia it's a problem usually underestimated and often mistreated, different from the inguinodynia associated with effort or exercise that forces the herniated mass through the orifice and from postoperative inguinodynia as a result of surgery, because in the first case, hernioplasty not always guarantees the complete resolution of the pain, becoming a chronic problem difficult to manage that causes frustration for both the patient and the surgeon. Nerve infiltration with neurolytic solution has been used successfully in other fields to treat chronic pain, and may be useful to deal with this kind of moderate or severe inguinodynia. The objective of this work is to report the results of a small series of patients with inguinal hernia and moderate or severe inguinodynia treated with intraoperative infiltration with a neurolytic solution during laparoscopic transabdominal preperitoneal (TAPP) hernia repair.

## MATERIAL AND METHODS

A retrospective, observational, descriptive study of patients with inguinal hernia operated with TAPP laparoscopic inguinal hernioplasty carried out by a single surgeon at the Hospital Angeles Lomas from January 1, 2010 to March 30, 2019, complaining from moderate or severe PI for more than four weeks, without other known diseases and causes of this pain, who underwent intraoperative infiltration with a neurolytic solution for sensitive partial neural block as a specific treatment for chronic PI.

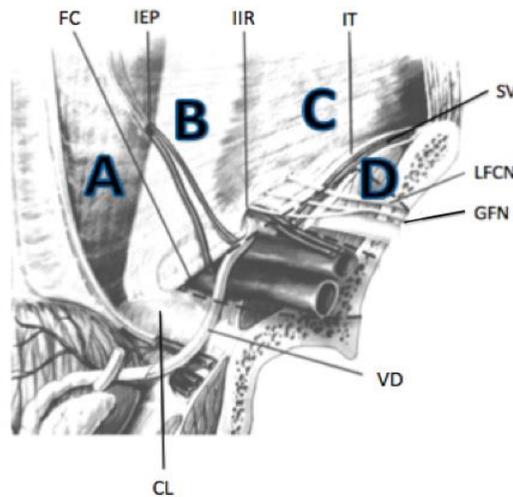
All patients had inguinal hernia detected clinically and with inguinal ultrasound, and chronic inguinal pain (more than four weeks), with no other detectable cause. Pain was classified and later evaluated in the follow-up with the verbal rating scale of pain (VRS 0/10), being moderate = VRS 4-7/10, and severe = VRS 8-10/10.

All patients were operated with the standard TAPP technique [1] with three trocars, one transumbilical 10-12 mm, and two 5mm trocars, midclavicular line 10 cm at each side of the umbilicus. After standard dissection of the peritoneum and hernia sac, revision of all possible hernia defects, excision of the lipoma in case of existing, and complete exposure of the entire inguino-crural area before placing the mesh [2], the abdominal muscular wall was infiltrated with a solution of 0.5% ropivacaine plus 70% denatured ethyl alcohol.



**FIGURE 1:** Infiltration of neurolytic solution with laparoscopic needle.

The dilution for patients with moderate IP (VRS 4-7/10) was 9 ml of ropivacaine and 1 ml of alcohol and for those with severe IP (VRS 8-10/10) was 8 ml of ropivacaine and 2ml of alcohol. The infiltration was performed under direct vision using a laparoscopic needle (Figure 1) in 4 specific points of the musculature of the inguinal wall (A, B, C and D); (A) 2 ml, 1 cm medial to the inferior epigastric vessels and 2 cm up from iliopubic tract; (B) 2 ml, 1 cm lateral to the inferior epigastric vessels and 2 cm up from iliopubic tract; (C) 3ml , 4 cm lateral to the inferior epigastric vessels and 2 cm up from iliopubic tract; and (D) 3 ml, 4 cm lateral to the inferior epigastric vessels, 2 cm under the iliopubic tract (Figure 2). A 15 × 13 cm polypropylene (Prolene® Ethicon®) mesh was placed over the inguino-femoral including Retzius area, and secured with 6 absorbable staples (Securestrap™, Ethicon® Johnson &Johnson EU). If bilateral hernia was detected the same procedure was performed on the other side. Only the side of IP was infiltrated as described, peritoneum was closed with running suture (Stratafix 2-0 Ethicon® EU). The follow-up was at day 0 at hospital and 7, 14 and 30 postoperative day during office visit and further if necessary, asking the patient to report any recurrent pain or side effects. The Students' t test was used to verify statistical significance of data.



**FIGURE 2:** Infiltration sites: A) 1 cm medial to the inferior epigastric vessels and 2 cm up from iliopubic tract; B) 1 cm lateral to the inferior epigastric vessels and 2 cm up from iliopubic tract; C) 4 cm lateral to the inferior epigastric vessels and 2 cm up from iliopubic tract; and D) 4 cm lateral to the inferior epigastric vessels, 2 cm under the iliopubic tract.

**Note:** FC: Femoral Canal; IEP: Inferior Epigastric Vessels; IIR: Internal Inguinal Ring; IT: Iliopubic Tract; SV: Spermatic Vessels; LFCN: Lateral Femoral Cutaneous Nerve; GFN: Genitofemoral Nerve; VD: Vas Deferens; CL: Cooper's Ligament.

## RESULTS

The 22 patients met these criteria, 12 were men (54.6%) and 10 women (45.4%) with an average age of 46.2-year-old (minimum 25 and maximum 73-years-old). Twelve (54.6%) referred moderate PI, (VRS 4-7/10) and 10 (45.4%) had severe PI (VRS 8-10/10) that were infiltrated and their hernias repaired as described. Fifteen patients (68.18%) had bilateral hernia and 7 (31.81%) unilateral, predominating indirect hernias. Two patients had multiple defects. No patient with bilateral hernia had IP in both sides (Table 1). The most frequent content found on the hernial defect was preperitoneal lipoma without vascular compromise; no patients in this series had incarcerated or strangulated hernias or any other identifiable cause of the inguinal pain.

All the patients except one (4.5%) reported immediate significant relief of the inguinodynia (VRS  $\leq$  2/10), and remained without it during follow-up. This patient had severe PI and had femoral hernia; she reported in the immediate postoperative period VRS 4/10, and referred progressive alleviation of the inguinodynia until complete relief at day 30. Four patients (18.1%) with severe PI reported mild postoperative dysesthesia in the treated inguinal region and upper homolateral thigh that lasted 4 weeks in 3 cases (13.6%), and 4 months in another patient (4.5%), both patients showed progressive decrease of this symptom until total relief. One patient referred slight discomfort until day 30, due to small seroma (4 cm  $\times$  1 cm) anterior to the mesh evaluated by ultrasonography that resolved spontaneously. The range time of follow-up was from 6 weeks to 7.5 years. All patients of this series are free of the inguinodynia they had preoperatively. Using Student' t test statistical significance was reached ( $p = 0.000$ ) in the relief of IP after intraoperative neurolytic infiltration.

<b>Patient Characteristics</b>	<b>N=22</b>	<b>Percentage</b>
Median Age (Range)	46.9 (25-73)	
<b>Gender</b>		
Male	12	54.60%
Female	10	45.40%
<b>Hernia Characteristics</b>		
Unilateral hernia	7	31.80%
Bilateral hernia	13	59.11%
Bilateral hernia with multiple defects (direct, indirect, femoral and obturador)	2	9.09%
<b>Pain Characteristics</b>		
Moderate (VRS* 4-7/10)	12	54.60%
Severe (VRS* 8-10/10)	10	45.40%

**Table 1:** Patient, hernia and pain characteristics. **Note:** \*VRS: Verbal Rating Scale of Pain.

## DISCUSSION

People with inguinal hernia who present moderate or severe inguinodynia for several weeks since the preoperative period represents a special group of patients whose frequency is unknown, scarcely reported and specifically treated [3]. This problem is clearly different from postoperative inguinodynia without previous pain due to the surgical procedure itself, which is one of the most frequent and feared complications of inguinal hernioplasty that compromises patient's quality of life and is one of the most common reasons for reoperation [4,5], and also is different from patients with the slight and transient pain that usually accompanies the hernia while doing physical efforts and that resolves completely with hernia repair.

It is assumed that in patients complaining of PI, the hernia is the causal factor when other factors such as osteoarthritis of the hip, symphysisitis, pelvic spondylitis, spinal column problems, tendinitis, tenoperiostitis, muscle tears and other factors producing pain that can coexist, have been discarded. Moderate or severe PI in patients with inguinal or femoral hernia, it's a problem frequently underestimated by surgeons and poorly mentioned in scientific papers, even though it is an undeniable fact known by surgeons and patients, that requires special consideration since hernioplasty alone does not always guarantee pain relief, and if it persists after surgery, is difficult to manage and causes frustration for both the patient and the surgeon [6]. This chronic inguinal pain may be due to damage of the regional nerves: lateral femoral cutaneous, ilioinguinal,

iliohypogastric, genitofemoral and those branches originated in the nerve roots between T12 and L2, although a specific nerve pattern seldom can be detected by clinical dermatome mapping in these cases [7]. This pain has specific characteristics such as chronicity, intensity, and may also present accompanied by paresthesias or dysesthesias, that not always follow a specific nerve path or cutaneous dermatome, although it seems to be a kind of neuropathic pain. In some cases, pain and discomfort may be so great that can be disabling and doesn't respond to treatment with common analgesics. Generally, PI can be distinguished from the pain produced by the hernia itself, because this pain is transient and not severe, and accompanies physical effort or straining. PI is probably a chronic neuropathic pain that usually does not disappear even after the patient has been adequately operated, so it is advisable to treat it in conjunction with the hernia repair, mainly when surgery is laparoscopic because access to do infiltration of the abdominal wall with neurolytic solution of this region is easier, safer, broader and superior than in open procedures from the anterior abdominal wall.

Postoperative inguinodynia is difficult to treat and results are often disappointing, so many options have been attempted to manage it: reoperation in case of confirmed nerve entrapment, analgesics or neuromodulator drugs, neurostimulation, nerve blocking aided with mapping of dermatomes, etc. and neurolysis or selective neurectomy in severe cases [8]. Some authors like Acevedo and others are even more aggressive and advice triple surgical neurectomy during open approach in order to prevent postoperative pain [9,10]. Any of these techniques is 100% effective and sometimes may have poor long-term effects since some patients report residual pain [11-14]. But PI is different from postoperative inguinodynia, because these patients look for hernia repair as well as pain relief, so if surgery is well executed but pain remains, it is a failure. That is why patients with PI need special management that has not yet been fully described in literature. As Hakeem points out, it represents an important problem, not only for the patient, but also for the surgeon, which inspired us to treat preoperative chronic inguinodynia in patients with inguinal hernia [15].

Laparoscopy provides an excellent opportunity in these cases to perform chemical neurolysis to prevent the persistent pain more directly and safer due to the direct vision of critical anatomic structures of the inguino-femoral region than from the anterior open approach.

Local anesthetics reversibly block nerve conduction around the site of administration, producing temporary loss of sensation in a limited area by inhibition of sodium channels in nerve endings and axons. This causes a decrease in the permeability of the cell membrane to sodium ions, possibly due to competition at the calcium binding sites that control the permeability of sodium. The change in permeability results in a decreased depolarization and an increase in the threshold of excitability that prevents the activation of nerve action potentials. This has enabled its use in various types of neuropathic pain, especially for diagnosis, which, from a therapeutic point of view, does not provide long-term analgesia [16].

Of the local anesthetics used mainly for the diagnosis of neuropathic pain, ropivacaine is a long-acting local type anesthetic [17]. The induced block affects all the nerve fibers in the following order: autonomic, sensory and motor, with the decrease of the effects in the reverse order. The loss of nerve function is clinically the following: pain, temperature, touch, proprioception and skeletal muscle tone. The nerve block causes interruption of the nerve impulse transmission; usually sensitive (nociceptive or painful) but can also block the activity of sympathetic or somatic motor nerves. This blockade with anesthetic can be performed for diagnostic, prognostic or therapeutic purposes in the treatment of severe pain to obtain prolonged relief with secondary degeneration of the nerve, but repeated injections are needed and permanent relief is not always achieved [18].

The nerve infiltration with alcohol has been shown to be an effective therapy for both diagnosis and treatment of patients with neuropathic pain intractable to other modalities to obtain results on the long term [6,8,19,20]. Ethyl alcohol produces a nonselective degeneration of nervous tissue by precipitating cell membrane proteins, extracting lipid compounds, demyelination, and Wallerian degeneration. The effect of a nerve block using alcohol can be influenced by factors as the volume, selection of the target nerve and injection site, dispersion of the liquid infiltrated, and concentration of the solution, being the commonly used range for treatments from 30% to 100% alcohol [21-24]. For this study we used 70% ethyl alcohol fully available in hospitals for disinfection, with the aim to obtain partial neurolytic effect, without other major side effects.

With the experience obtained in patients with chronic postoperative inguinodynia with neurolytic infiltration, in these small series we have used neurolytic solution infiltrated during the same surgical procedure in patients with moderate and severe PI with a two kind of dilution, 9ml of ropivacaine 0.5% and 1 cm 70% ethyl alcohol for moderate inguinodynia (VRS 4-7/10) and 8 ml of ropivacaine 0.5% and 2 ml 70% ethyl alcohol for severe (VRS 8-10/10) pain intraoperative before mesh placement assuming that neurolytic effect was needed more in severe pain. The results in the group of patients we present here seems to be useful for the relief of the pain in the short and long term for both patients with moderate and severe PI, without major side effects. The side effects as paresthesia and dysesthesia observed in 4 patients were mild and temporal, and probably secondary to the stronger combination of 8 ml of ropivacaine and 2 ml of alcohol for severe IP, so now we use in all patients only the 9 ml of ropivacaine and 1ml of alcohol with better results.

This is a preliminary report that suggests this treatment is a good alternative to manage PI. As far as we know this is the first paper to treat intraoperative this kind of pain, but controlled studies with larger series are needed to corroborate this.

## CONCLUSIONS

Neurolytic infiltration with ropivacaine and 70% ethyl alcohol during laparoscopic TAPP repair seems to be an effective treatment with few side effects for patients with inguinal hernia who present chronic PI, since hernioplasty alone does not guarantee total pain relief. However, prospective controlled studies are needed to verify these results.

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