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Routine Ilioingunial Neurectomy Eliminates Post Open Hernioplasty Chronic Groin Pain a Literature Review

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Abstract

Chronic Inguinal pain is the most common long-term complication post hernioplasty, additionally, the ilioinguinal nerve injury of entrapment is the most common cause of inguinodynia. Hence, the discussion of the prophylactic ilioinguinal neurectomy during opens hernioplasty as a solution to that dilemma. At this review, a total of 893 patients were involved: 476 neurectomy group A, and 417 the compared group B from various studies conducted in a narrow geographical area . All included studies analyzed the Lichtenstein procedure. Statistically at rest no significant change between two groups even at daily activities till 6 months. But that changed with vigorous exercise, at 4months till 12months inguinodynia varies from 17% to 15 % in group A (neurectomy group) , and varies from 50% to 37% in group B (preservation group). In conclusion, prophylactic ilioinguinal neurectomy shows significant decrease in the incidence of inguinodynia post open hernioplasty procedure, however, more studies are needed.

Keyword*: Inguinal Nerve and Hernia; Prophylactic Neurectomy and Hernia; Ilioinguinal Nerve and Chronic Inguinal Pain; Ilioinguinal Nerve and Neurectomy; and Hernia Repair and Inguinodynia.*

Introduction

Inguinal open hrenioplasty is the most common surgical procedures worldwide; this procedure has several complications that can result in a reduction in the quality of life. The most commonly known delay complications after the procedure are recurrent hernia and chronic pain. The Committee of the International Association for the Study of Pain defines chronic pain as a pain that is present or recur for more than 3 months **(**1**)**. The incidence of chronic groin pain **(**inguinodynia**)** in the interested studies ranges between 0% and 62.9%, which carries a significant effect on the life quality. Among these percentages, only 10% of the patients experiences a moderate to severe pain and 2%-4% of the patients have a inguinodynia affect their daily life activities.**(**2**)** . Eventually, referred to specialized pain clinics as many as 1% of these patients. These two last percentages showed a significant effect if we take into consideration the number of procedures done worldwide. Inguinal hernioplasty is a type of hernia repair in which the posterior inguinal wall is strengthened by autologous material or foreign material with or without herniotomy. Different hernioplasty techniques have been described to date and can be done either open or laparoscopically. However, the Lichtenstein technique is considered

the gold slandered operation .(3)also, according to the American College of Surgeons; National Institute of Clinical Excellence [NICE] in the UK ; and The National Agency for Accreditation and Evaluation in Health [ANAES] in France(4) . The idea of prophylactic neurectomy in surgery is not limited to the inguinal hernia repair procedurs only. For examble routine neurectomy of the greater auricular nerves , or the intercostobrachial nerves is often done during the neck and axillary dissections procedure(5). Therefore prophylactic ilioinguinal nerve section (neurectomy) was suggested as an effective method for reducing the incidence of inguinodynia.

This review article aim is evaluating the incidence of inguinodynia after the procedure of Lichtenstein inguinal hernia repair with elective ilioinguinal neurectomy compare to ilioinguinal nerve preservation during the surgery. To add, the discussion about paraesthesia or other long-term complication after nerve sacrifice is beyond this article's scope.

Method

A lecture review was undertaken; Researching for randomizing clinical trial compared the incidence of inguinodynia after neurectomy versus ilioinguinal nerve preservation as surgical step during the open hernia repair procedure (Litchtenstein procedure), which was published from 2011 till 2021 at PubMed, Google articles, Cairo university medicine journal, Ain- shamis medicine journal, Mounofia university medicine journal and Egyptian journal of surgery. The search terms conducted were inguinal nerve and hernia; prophylactic neurectomy and hernia; ilioinguinal nerve and chronic inguinal pain; ilioinguinal nerve and neurectomy; and hernia repair and inguinodynia. The criteria used to choose the study in this lecture review are, firstly the patient must be followed at least 6 months up to one year postoperative, secondly, the type of repair inguinal hernia must be Lichtenstein repair and lastly, ilioinguinal neurectomy must be on an elective basis not as treatment of complication. The exclusion criteria include: opinion articles, meta-analysis studies and non RCT. Pain scores reported by using the visual analog scale (VAS): 0 is no pain and 10 is the worst imaginable pain. Pain scores were recorded either during routine daily actions or after exercises or at rest. If the pain was scored using the verbal rating scale (VRS), which are arranged, as the follow: no pain, mild, moderate, or severe pain. It subsequently was converted to the VAS system. This conversion was based on Loos MJA et al study, in which the comparison between the VAS and the VRS in postoperative pain had been done. (6)

Result Analysis

So a systemic review of the published RCT studies on the designated sites and journals, hence, 8 randomized control trials were found to meet the set criteria. Two of these trials had done in Egypt **(**Monufia, Tanta university hospitals**)**; as well as another two had done in Pakistan **(**banazer buto and laiqaut national university hospitals**)**, India **(**multiple hospitals**)**, and one in Iran **(**Baqiyatallah University**)**. The rest had done in India collaboration between multiple hospitals.As shown in Table 1

Auther and publication year	Total number	Mean age	P-value
Allya Ishaq 2021 pakistan**(**15**)**	60	≈ 48.5	0.78
Atif sherif 2019 Pakistan **(**11**)**	180	≈49	<.001
Ashok kumar 2021 India**(**12**)**	80	≈unknown	0.49
Hareesh belagele 2018 India**(**5**)**	60	≈48	0.006
Kudva A 2015 india**(**14**)**	95	≈57.5	No p -value
Ahmed ElHodaky 2020 Tanta, Egypt**(**7**)**	240	≈42.5	>0.05
Ayman A omar 2017 Menoufia, Egypt**(**10**)**	40	≈34	<0.05
Hadi khoshmohabat 2012 Iran**(**13**)**	140	≈39	<0.05

Table 1: Summary of selected RCT

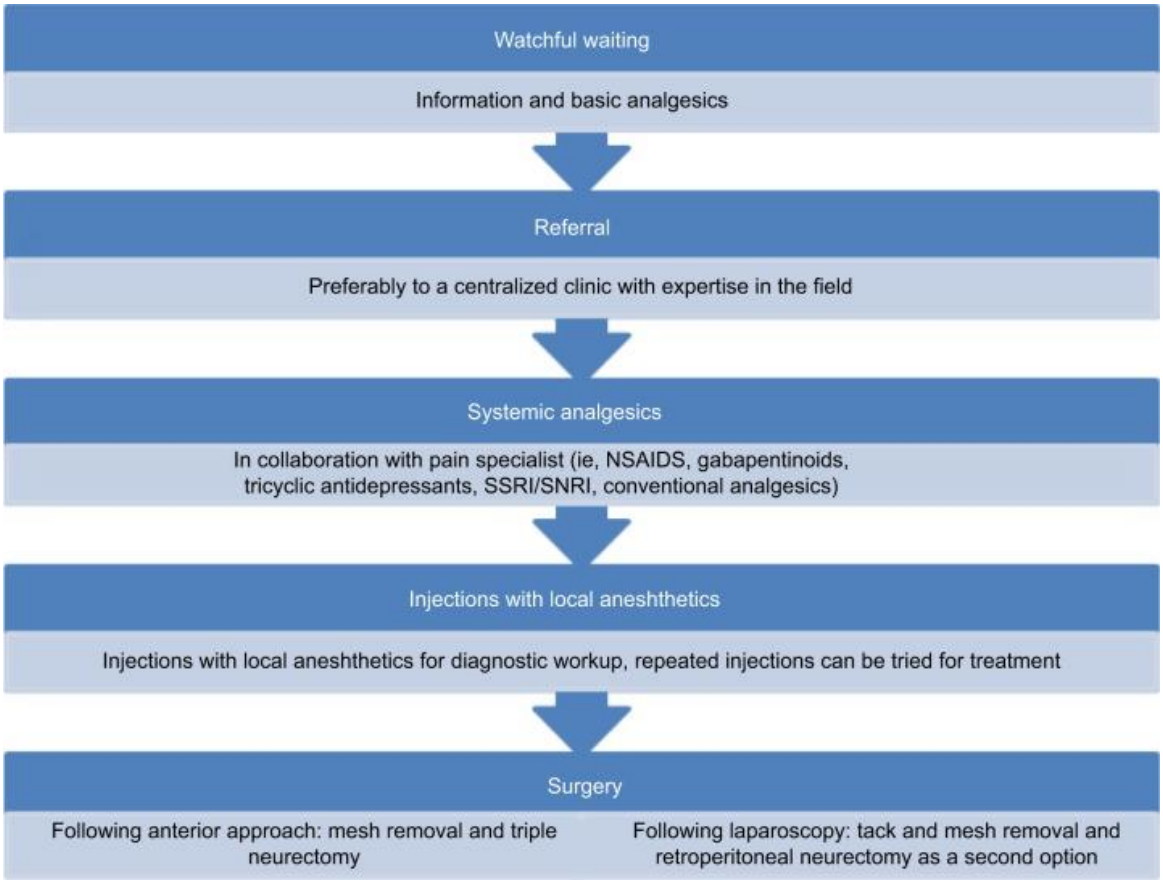

Figure 1: scaled approach for treatment of chronic inguinal pain as suggested by Kristoffer Andresen and Jacob Rosenberg

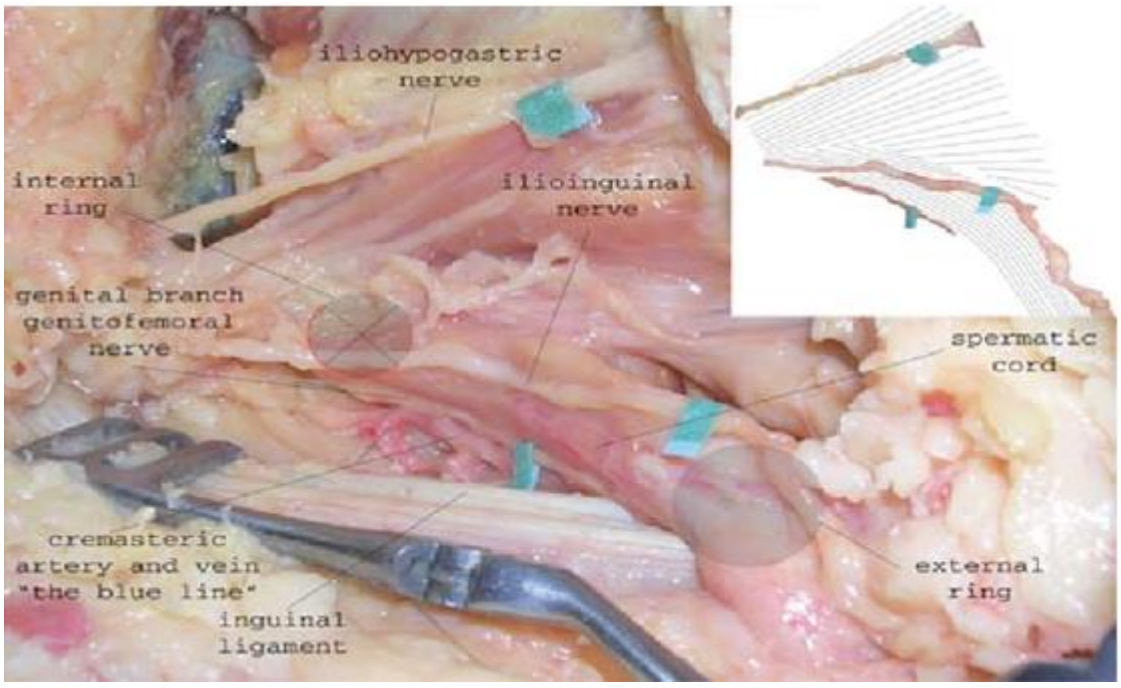

Figure 2: lateral view of surgical anterior anatomy of the inguinal canal from conferencin 2010

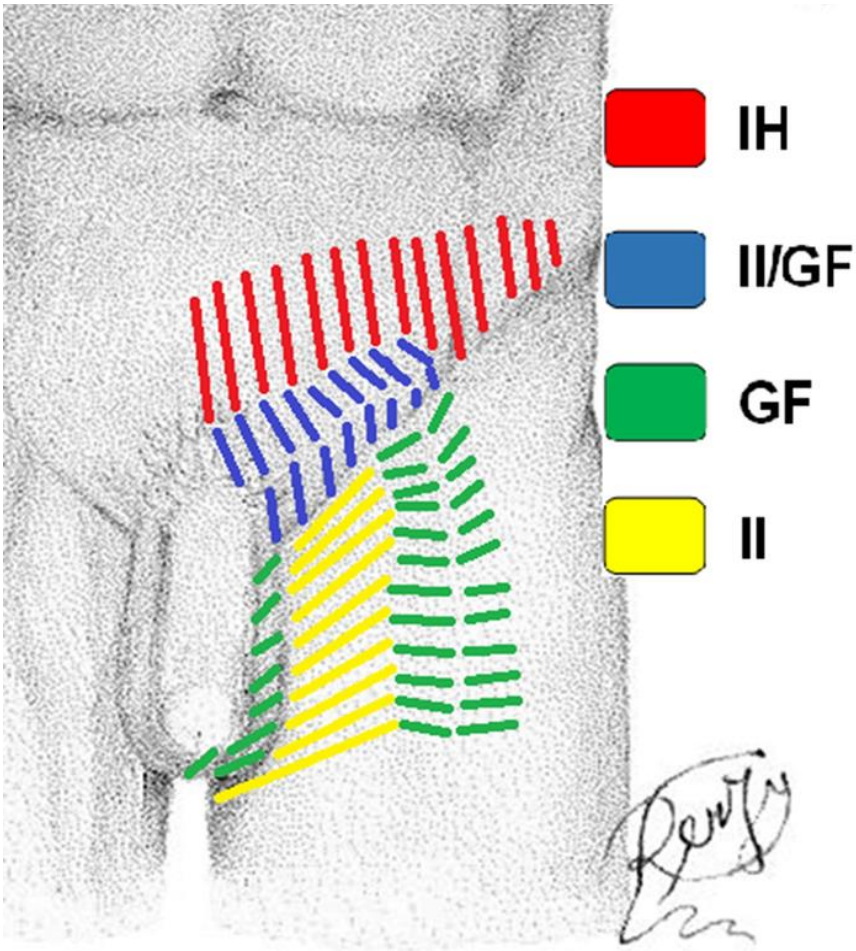

Figure 3: Dermatomes mapping of the inguinal nerves IH: illiohypogastric, GF:genitofemoral, II:illioinguinal**(**24**)**

893 patients in total and aged between 18-80 years old **(**mean age ≈43.52**)** were involved in these studies: 476 in the group A neurectomy group and 417 in group B control group. The Only study that involves female patients **(**4 patients**)** is one of the RCT from India**(**5**)** and the largest study done at Tanta university hospital involves 240 patients**(**7**)**. Although all patients are followed for 6 months, the RCTs had done in Idnia and Iran follows the patients for up to 8monthes and one year respectively. All the 8 RCTs had chosen patients experiencing unilateral inguinal hernia, which according to Nyhus classification are type 1, type 2, and type 3**(**A,B**)** as well as had excluded all bilateral, incarcenated , recurrent and femoral cases.

Nyhus classification (8)

- Type I : indirect hernia without any abnormalities of the internal ring mostly occurred in the infants and the children.
- Type II : indirect hernia with abnormalities in the deep ring as well as normal inguinal floor

- Type IIIa: includes all the small to medium sized direct hernias only without any weakness or protrusion of sac through deep inguinal ring.
- Type IIIb: is a large obligue hernia with a weakness in the inguinal floor causing direct hernia (pantaloon hermia)
- Type IIIc : femoral hernia
- Type IV: represents all the recurrent hernias classify as follow: IV-A, recurrent direct inguinal hernia; IV-B, recurrent oblique inguinal hernia; IV-C, recurrent femoral hernia; and IV-D, any combinations of these three regions.

As for the technique used in the fixation of the mesh, all of the chosen RCTs used the standard Lichtenstein tension-free operation, which used a non-absorbable mono-filament suture in fixing the mesh(9). The method of neurectomy was mentioned in 7 RCT, all of these studies divided the nerve just lateral to the deep ring sharply or by cauterization with the nerve end either lift free in the operative field (7) (10); or impended in the internal oblique muscle (11–14); or just ligated with suture (15). Statically, no significant change in incidence of inguinodynia, when using any of these neurectomy methods.

Result after 4 months:

One RCT (5) examine the patients after 4 months, it was a trial done in India 60 patients were evaluated using the Visual Analogue Scale (VAS). They divided them into two equal groups so there was no groin pain was during rest and normal daily activities in group A neurectomy group (0/30) and group B nerve preserving 10% of the patients (3/30) had moderate pain (3-7/10) during rest and normal daily activities p-value (0.2).While, after vigorous exercise group A shows pain in 17%(5/30), and group B shows pain in 50% (15/30) p-value (0.006).

Result after 6 months:

7 RCTs examine (5,7,10–15)the patients during this period .in total 680 patients were examined 412 in group A (neurectomy group), and 309 in group B (preservation).however, at rest no significant difference between the two groups. After moderate exercises like cycling for 10 minutes or coughing for 10 times, group A only 11% (47/412) had mild to moderate (1-7 on vas) groin pain .while, at group B 46%(143/309) had mild to moderate pain(1-7 on vas) and only 2 patient severe pain which needed nerve block at pain clinic p-value (< 0.005).

Result after 8 months:

During this period, one RCT **(**5**)**examine the patient. The results were the same as after 4 months, however, after vigorous exercise group A showed pain in 13%**(**4/30**)** and group B shows pain in 37% **(**11/30**)** p-value **(**0.04**)**.

Result after one year:

One RCT that follows the patients after one year**(**13**)** .it was the one done in Tehran with 140 patients in total, arranged into two groups : group A **(**neurectomy**)** 74 patients, group B **(**preservation**)** 66 patients . the result shows in group A 15% **(**11/74**)** had mild to moderate pain, while in group B 21%**(**14/66**)** had mild to moderate pain .p –value **(**0.05**)**.

Discussion

This review article lead us to analyze a significant number of patients ,who were included in the 8 RCTs that had been comparing ilioinguinal nerve neurectomy versus nerve preservation for inguinodynia after an open inguinal hernia repair operation **(** Lichtenstein**)** . Although this is a crucial subject, the strength and the value of this article are completely depending on the quality of how these various RCTs were done. One of the limitations that faced this review is that about 75% of the subjects contributing in these studies were from Asia and none from America or Europe or Australia **(**16**)**. Moreover, inguinodynia causes can be further categorize under two broad classification , firstly non-neuropathic causes including: pain from the mesh fixating suture, or staples inserted into the pubic tubercle periosteum ; excessive scar formation due to prosthetic mesh material, it was assumed that using low weighted large pore mesh may decrease mesh related scar formation according to Cn Brown study**(**17**)** ; ;and lastly bulky mesh , which lead to mechanical pressure on one of the inguinal nerves**(**18**)**; Here, the pain is dull-aching in charter over groin area , it usually described as throbbing ,pulling or tender **(**19**)** , which may be due to venous congestion or mesh-related inflammation, in which u/s and CT scans can be used as a diagnostic tool to identify most of those causes**(**2**)**.

Secondly, neuropathic causes: mostly due to damage one of the inguinal nerves ,which are the ilioinguinal, the hypogastric and the genital branch of geneto-femoral nerve, either due to trauma by retraction or dissection of the tissues at the procedure , or due to entrapment by post-operative fibrosis, and mesh-fixing sutures . To add , these neuropathic causes considered the most important factors of inguinodynia , especially in moderate and severe chronic groin pain**(**19**)**. The Iliohypogastric and the

ilioinguinal nerves are injured during the sheath dissection in the open hernioplasty procedure, while the lateral femoral cutaneous nerves and the genetofemoral nerves become endangered mostly during the laparoscopic tranabdominal preperitoneal procedure of the inguinal hernia. Among the first two, the ilioinguinal nerve is the most nerve injured because it lies immediately below the divided external oblique aponeurosis and can even be entrapped during closing suture of the external oblique fascia.**(**12**)**

Anatomically, the ilioinguinal nerve **(**L1**)** emerges with the ilio-hypogastric from the anterior ramus of the first lumbar nerve root in the lumbar plexus. After exiting the plexus, it emerges from the upper part of the lateral border psoas major muscle, then runs obliquely downward and laterally between the kidney infront and the quadratus lumborum muscle behind. After that, above the iliac crest it pierces the transverse abdominis and run between it and internal oblique muscle to become the content of the canal. It travels in the inguinal canal with the spermatic cord located superiorly until it leaves a superficial inguinal ring. It provides a sensory supply to the skin of the upper, medial parts of the thigh; and external genetalia.**(**20**)** Additionally, it gives motor branch to the transverses and internal abdominus muscles. According to a study by João et al the ilioinguinal nerve as well as the iliohypogastric nerve can be identified in 87% during elective surgery and 85.7% during emergency surgery while the genital branch of genitor-femoral nerve identified in 58.1% during elective and 28.6% during emergency surgeries **(**21**)** .based on that , Cirocchi R et al meta-analysis and systemic lecture review **(**16**)**concluded that Regardless of the chosen repair procedure, the nerve identification is recommended as an important operation step to decrease the incidence of inguinodynia especially due to the neuropathic causes: it has a proven efficacy ,additionally , some of the operation steps had been altered in hope to decrease the post operative neuropathic chronic inguinal pain including : using glue or absorbable sutures . , Somendra Bansal et al, found by using absorbable sutures to fix the mesh in open Lichtenstein hernioplasty, the incidence of inguinodynia decreased to 43% of total patients in comparison to 65% when using the slandered method at 6 months duration **(**3**)**. Here, a popular opinion was emerged that if we perform the ilioinguinal neurectomy, then the incidance of inguinodynia will almost become zero.

On other hand that is bring the matter of post neurectomy paresthysia/hypoesthesia. Cirocchi R et al meta-analysis found the incidences of paresthysia/hypoesthesia were more in the neurectomy groups, but it was not statistically significant. 6 studies from the chosen 8 RCT had discussed this matter and also reach the same result especially after 6 months **(**5,7,10,13–15**)**. H.Khoshmohabat et al study ,showed despite the incidence of numbness are more in neurectomy group ,the return to work were

earlier in comparing to the preservation group.(13).in light of the above, pain relieve seems more important to the patients than numbness.

Traditionally, treatment of the inguinodynia consists of two options, i.e, conservative and surgical. Conservative treatments were as the follow: analgesics (NSAIDS, antidepressants) , which is the first line of treatment , and a guided nerve block with local anesthesia , which preserved to severe cause(11) Kristoffer Andresen and Jacob Rosenberg review reported that guided block injection has a success rated 22% if compared to neurectomy even with multiple injected ,the study they write about used a mixture of corticosteroid , hyaluricacid and lidiocaine ,this mixture was injected up to 3 times over a 6 week duration(22). Also, transcutaneous electric nerve stimulation , pulsed radiofrequency by moderate heating (40c) either on the nerve trunk itself or the root ; and laser therapy .the second option is the surgical procedures like mesh removal if it form meshoma or the removal of fixation suture ;or selective neurolysis considered under trial procedure ; and lastly triple neurectomy of all three inguinal nerves , which is the proven surgical procedure for treat inguinodynia with a success rate from 80% to 95%. Hence , Triple neurectomy should be kept for those who had no respond to the conservative management , and were pain-free before their hernioplasty operation , or at least have a pain, but this pain should be different from their pre-operative pain, as well as have the features of neuropathic pain. (23).

Conclusion

Inguinal nerves identification in the Lichtenstein repair procedure, especially the illioinguinal nerve is the essential step for reducing or avoiding the chronic inguinal pain. Also, routine ilioinguinal nerve neurectomy appear to provide some supremacy regarding the Inguinodynia, although it might be possible that a number of cases experiences paresthesia and hypoesthesia, it still insignificant statistically. However, the samples in the reviewed studies ethnicity variation were less; further studies may be needed to establish their conclusion.

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