



## Comparison of Prophylactic Ilioinguinal Neurectomy and Ilioinguinal Nerve Preservation in Open Inguinal Hernia Repair: A Prospective Study

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### Abstract

*Chronic post hernioplasty groin pain is a significant complication following inguinal hernial repair lasting for more than three months after surgery.<sup>[1]</sup> Routine ilioinguinal neurectomy has been proposed as a means to avoid this complication.<sup>[2]</sup> The motive of this study was to evaluate prophylactic routine ilioinguinal nerve excision compared to nerve preservation of chronic groin pain and other sensory symptoms when performing the surgery.*

*Sixty patients who underwent unilateral open mesh repair of inguinal hernia were included in the study with an elective division of the ilioinguinal nerve in 30 patients (Group A) and preservation in 30 patients (Group B). The patients were evaluated for postoperative pain, other sensory symptoms, and interference with activities of daily living after 1 month, 4 months, and 8 months of surgery by using the SF36 questionnaire.*

*In our study, we found that the incidence, as well as the severity of pain, is far higher in the nerve preservation study group as opposed to the neurectomy study group.*

*Prophylactic neurectomy can be an appropriate solution in the prevention of chronic groin pain following Lichtenstein inguinal hernia repair. Hypoesthesia is not a significant complication following ilioinguinal neurectomy and does not add much to the morbidity of the patient. There is no marked difference in the health-related quality of life in either of the study groups.*

**Keywords:** Chronic, Groin pain, Ilioinguinal nerve, Neurectomy.

### Introduction

Hernias are among the oldest known afflictions of humankind, and surgical repair of inguinal hernias are among the most common general surgical procedures performed today.<sup>[3]</sup> Despite laparoscopic hernia repairs becoming popular today, Lichtenstein repair for inguinal hernia is the most commonly used to repair and is still the Gold Standard for Inguinal hernia repairs.<sup>[4,5]</sup>

Recently, with more attention to patient outcomes, Chronic post hernioplasty groin pain is a significant complication following inguinal hernial repair lasting for more than three months after surgery.<sup>[1]</sup> Several large series with systematic follow-up have reported pain rates ranging from 29% to 76%.<sup>[6,7]</sup> Chronic groin pain can be classified into neuropathic and nociceptive (somatic) pain. Neuropathic pain is caused due to

entrapment or direct nerve injury. Nociceptive (somatic) pain is caused by mesh-related fibrosis, mechanical pressure caused by a folded mesh, gradual mesh displacement or contraction, damaged surrounding structures such as periosteal layers, or musculotendinous tissues, or postoperative causes.<sup>[8]</sup> Traditionally, surgeons opt to preserve the ilioinguinal nerve at all times during repair because the nerve injury is often associated with cutaneous sensory loss and chronic groin pain. On the contrary, elective division of the ilioinguinal nerve to reduce the incidence of chronic post hernioplasty pain has been recommended. Recently reported randomized controlled trials have confirmed the benefits of neurectomy in chronic post hernioplasty pain.<sup>[9]</sup>

### Aim of the Study

This study aims at evaluating the long term outcomes of neuralgia and paraesthesia following routine ilioinguinal nerve excision, compared to nerve preservation while performing Lichtenstein's inguinal hernia repair and to conclude the best modality of treatment after comparison of morbidity and patient satisfaction related to these procedures and in relation to standard published material.

### Materials and Methods

The present study is a randomized study of 60 cases of inguinal hernias admitted in Great Eastern Medical School and Hospital, Srikakulam, during the study period of November 2018 to November 2019.

### Inclusion Criteria

All patients with a direct and indirect inguinal hernia in the age group of 18 to 80 yrs who underwent elective Lichtenstein hernia repair were included in the study.

### Exclusion Criteria

1. Irreducible/ strangulated hernia.
2. H/O Diabetes, COPD, Stroke, Peripheral neuropathy.
3. Impaired cognitivefunction.

4. Recurrent hernia.
5. History of any previous lower abdominal incision.
6. Patients having preoperative inguinal neuralgia.

All patients had given informed consent, underwent routine preoperative investigations, and preparation for surgery. Then patients were randomized into two groups without the knowledge of the principal investigators.

- Group A Ilioinguinal nerve neurectomy will be done
- Group B Ilioinguinal nerve preserved

Standard open mesh repair was the procedure performed under spinal anesthesia. The ilioinguinal nerve was identified in both groups and carefully preserved in group B during mesh placement to prevent it from being inadvertently taken in the stitches while fixing the mesh. In the neurectomy group, about 4 cm of the ilioinguinal nerve was excised laterally from the deep ring, and the cut ends were left alone without ligation. It was then sent for histopathology for confirmation. The rest of the operation in both groups followed the standard Lichtenstein repair. Patients were discharged when fit and were advised to return to a healthy lifestyle except for lifting heavyweights.

Patients were followed up at one month, 4 months, and 8 months after the operation. During the follow-up, the pain was assessed using the SF36 questionnaire. Paraesthesia was evaluated by the monofilament test and evaluated after comparison with the opposite side.

The age/sex incidence, mode of presentation, postoperative complications (like pain and paraesthesia), and quality of life were evaluated and compared with standard published literature. Four patients were not followed up regularly after discharge, and therefore, only one month's data were available for them and were not considered in the results of the study. The rest of the patients were followed for a period of 8 months.

### Statistical Analysis

All the statistics were carried out through the

SPSS for Windows (version 16.0). The Independent-Samples T-Test procedure compares means for two groups of cases. Excel 2016 used

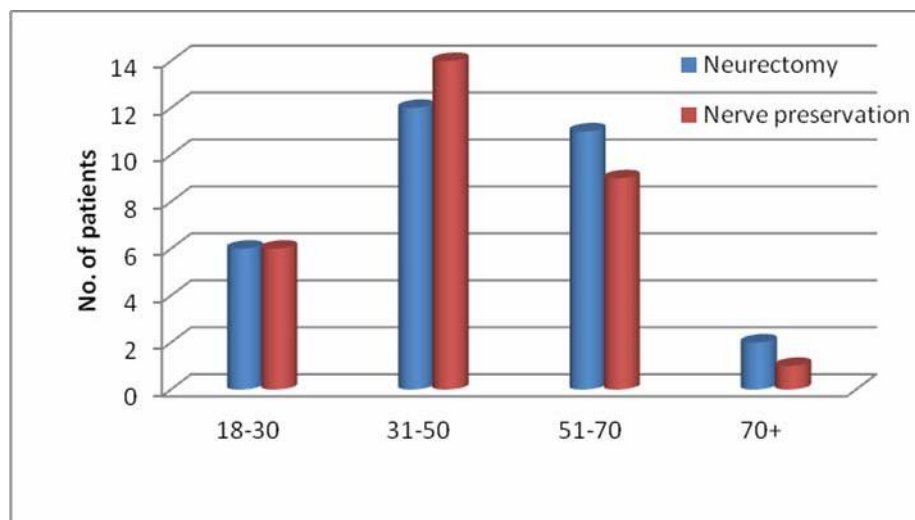
for mathematical calculations and graph pad calculator for statistical calculations.

**Observations**

**Table 1: Mean Age and Standard Deviation**

Group	N	Mean	Std. Deviation	Minimum	Maximum
Neurectomy	30	50.3000	15.20923	18.00	78.00
Nerve Preservation	30	45.1333	14.19503	21.00	72.00
Total	60	47.7167	14.81650	18.00	78.00

CC=0.113, P=0.855



**Graph 1: Age Distribution**

In this study, the minimum age of the patient with the inguinal hernia was 18 yrs in the neurectomy group and 21 yrs in the nerve preservation group.

In comparison, the oldest is 78 yrs in the neurectomy group and 72 yrs in the nerve preservation group.

**Table 2: Sex Incidence**

Sex	Surgery n(%)	
	Neurectomy	Nerve preservation
Male	29 (96.7)	30 (100)
Female	01 (3.3)	0
Total	30 (100)	30 (100)

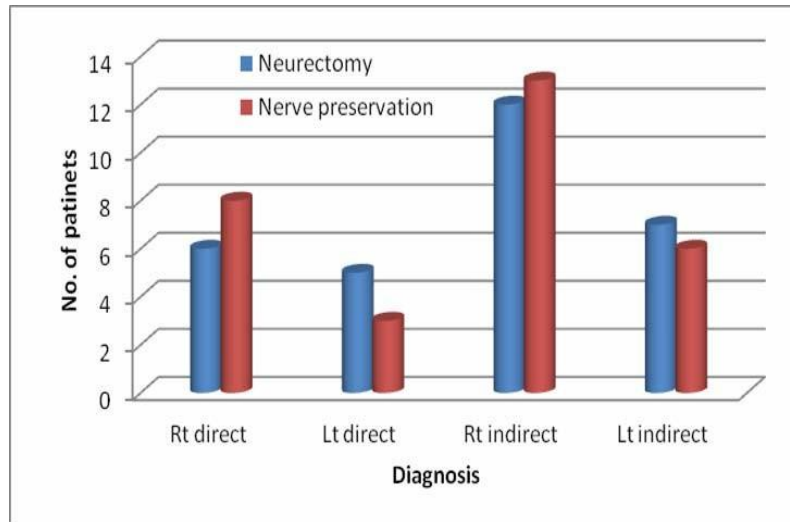
CC=0.129, P=0.313

In our study, only one female patient was present in the neurectomy group.

**Table 3: Diagnosis – Type of Inguinal Hernia**

Inguinal hernia	Surgery n(%)	
	Neurectomy	Nerve preservation
Right Direct	06 (20.0)	08 (26.7)
Left Direct	05 (16.7)	03 (10.0)
Right Indirect	12 (40.0)	13 (43.3)
Left Indirect	07 (23.3)	06 (20.0)
Total	30 (100)	30 (100)

CC= 0.12, P= 0.825



**Graph 2:** Type of inguinal hernia

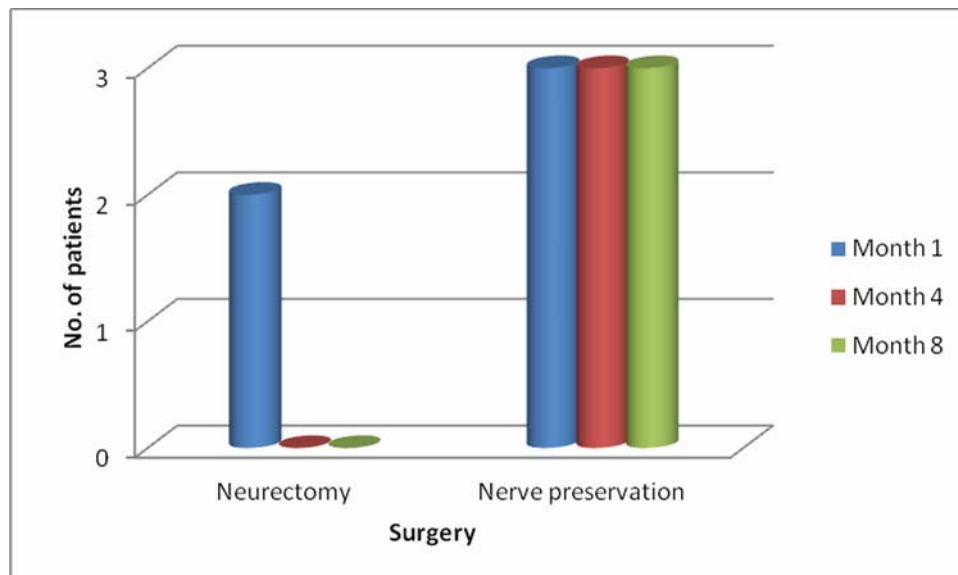
In this study, the incidence of right indirect hernia was the highest, being 40% in the neurectomy

group and 43.3% in the nerve preservation group. The least was of left direct hernia.

**Table 4:** Pain at Rest

Pain at Rest		Follow up n (%)		
		1 month	4 months	8 months
Neurectomy	Absent	28(93.3)	29(100)	26(100)
	Present	02(6.7)	0	0
	Total	30(100)	29(100)	26(100)
Nerve preservation	Absent	27(90.0)	27(90.0)	27(90.0)
	Present	03(10.0)	03(10.0)	03(10.0)
	Total	30(100)	30(100)	30(100)

CC= 0.206 , P= 0.05



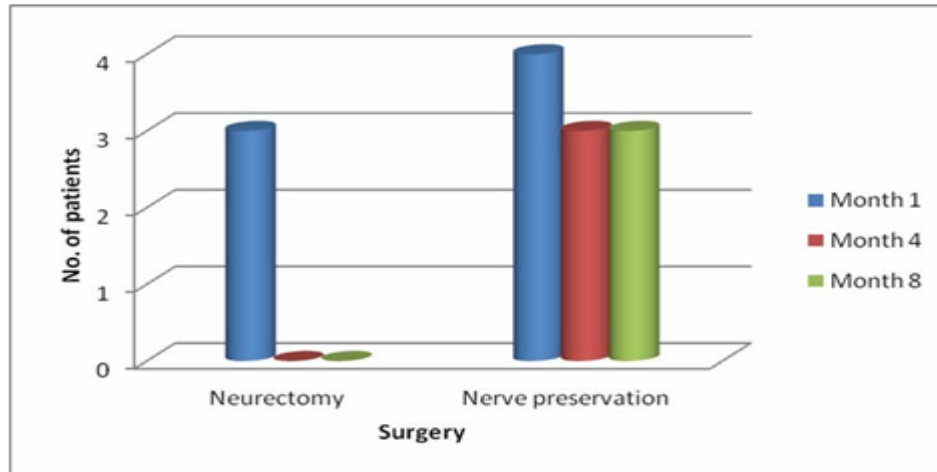
**Graph 3:** Pain at Rest

Pain at rest was present in 10% of the patients in the nerve preservation group after 8 months.

**Table 5:** Pain experienced during Normal Daily Activities

Pain during Normal Daily Activities		Follow up n (%)		
		1 month	4 months	8 months
Neurectomy	Absent	27(90.0)	29(100)	26(100)
	Present	03(10.0)	0	0
	Total	30(100)	29(100)	26(100)
Nerve preservation	Absent	26(86.7)	27(90.0)	27(90.0)
	Present	04(13.3)	03(10.0)	03(10.0)
	Total	30(100)	30(100)	30(100)

CC=0.25, P=0.058



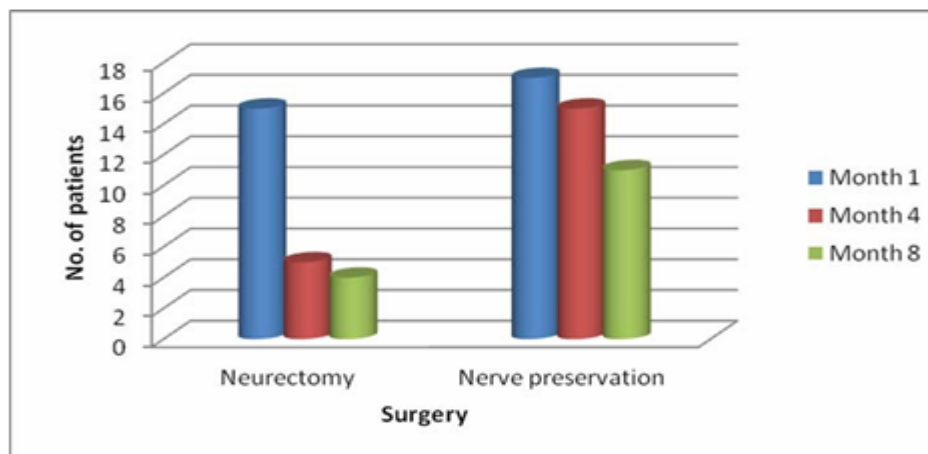
**Graph 4:** Pain during Normal Activities

Pain experienced during normal daily activities was present in 10% of the patients in the nerve preservation group after 8 months.

**Table 6:** Pain after Vigorous Activity

Pain after Vigorous Activity		Follow up n (%)		
		1 month	4 months	8 months
Neurectomy	Absent	15(50.0)	24(82.8)	22(84.6)
	Present	15(50.0)	5(17.2)	4(15.4)
	Total	30(100)	29(100)	26(100)
Nerve preservation	Absent	13(43.3)	15(50.0)	19(63.3)
	Present	17(56.7)	15(50.0)	11(36.7)
	Total	30(100)	30(100)	30(100)

CC=0.337, P=0.004



**Graph 5:** Pain after Vigorous Activity

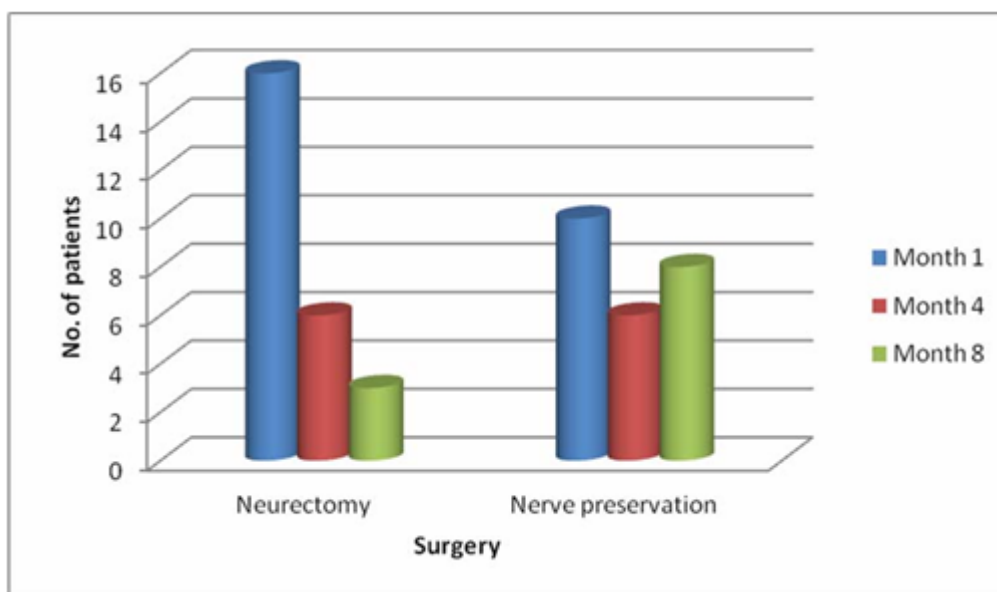
The incidence of pain after vigorous activity was almost equal in both the study groups at 1 month follow up. But the pain persisted in 11 patients in

the nerve preservation group as opposed to 4 patients in the neurectomy group at 8 months follow up.

**Table 7:** Pain on Walking

Pain on Walking		Follow up n (%)		
		1 month	4 months	8 months
Neurectomy	Absent	14(46.7)	23(79.3)	23(88.5)
	Present	16(53.3)	06(20.7)	03(11.5)
	Total	30(100)	29(100)	26(100)
Nerve preservation	Absent	20(66.7)	24(80.0)	22(73.3)
	Present	10(33.3)	06(20.0)	08(26.7)
	Total	30(100)	30(100)	30(100)

CC= 0.368, P=0.001



**Graph 6:** Pain on Walking

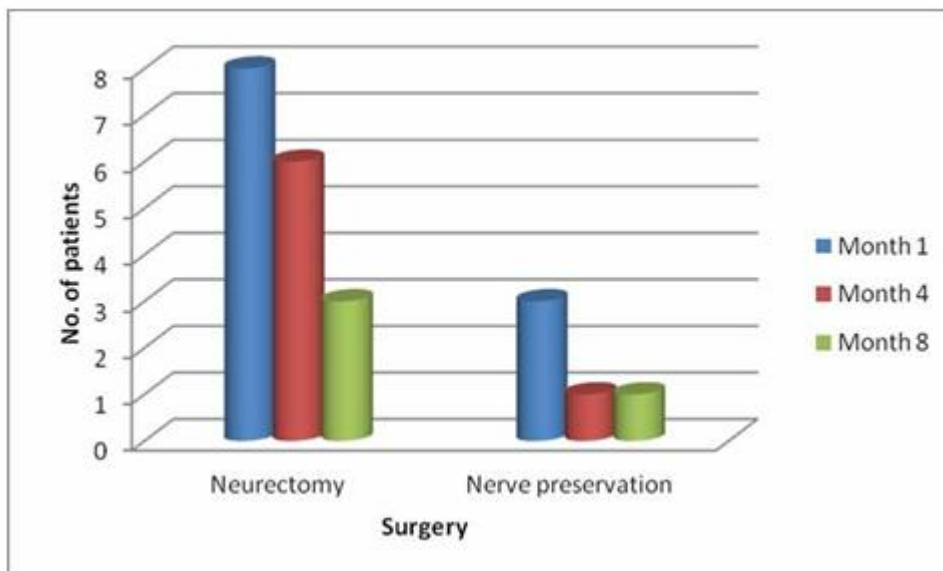
The incidence of pain on walking was 11.5% in the neurectomy group and 26.7% in the nerve

preservation group. This difference in the incidence was found to be significant.

**Table 8:** Post Operative Hypoaesthesia

Post Operative Hypoaesthesia		Follow up n (%)		
		1 month	4 months	8 months
Neurectomy	Absent	22(73.3)	23(79.3)	23(88.5)
	Present	08(26.7)	06(20.7)	03(11.5)
	Total	30(100)	29(100)	26(100)
Nerve preservation	Absent	27(90.0)	29(96.7)	29(96.7)
	Present	03(10.0)	01(3.3)	01(3.3)
	Total	30(100)	30(100)	30(100)

CC=0.152, P=0.367



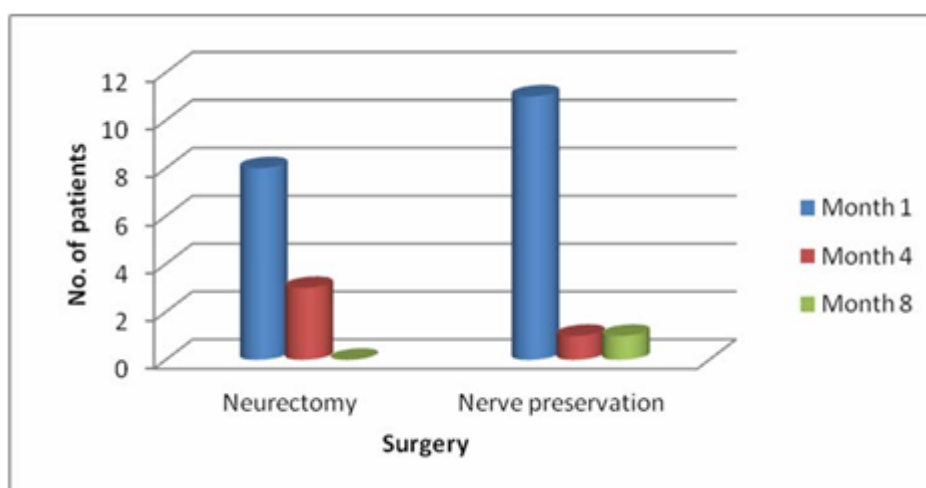
**Graph 7:** Post Operative Hypoaesthesia

The incidence of hypoaesthesia was 11.5% in the neurectomy group, whereas it was only 3.3% in the nerve preservation group at the 8 months follow up.

**Table 9:** Post Operative Hyperesthesia

Post Operative Hyperesthesia		Follow up n (%)		
		1 month	4 months	8 months
Neurectomy	Absent	22(73.3)	26(89.7)	26(100)
	Present	08(26.7)	03(10.3)	0
	Total	30(100)	29(100)	26(100)
Nerve preservation	Absent	19(63.3)	29(96.7)	29(96.7)
	Present	11(36.7)	01(3.3)	01(3.3)
	Total	30(100)	30(100)	30(100)

CC= 0.310, P=0.061



**Graph 8:** Post Operative Hyperesthesia

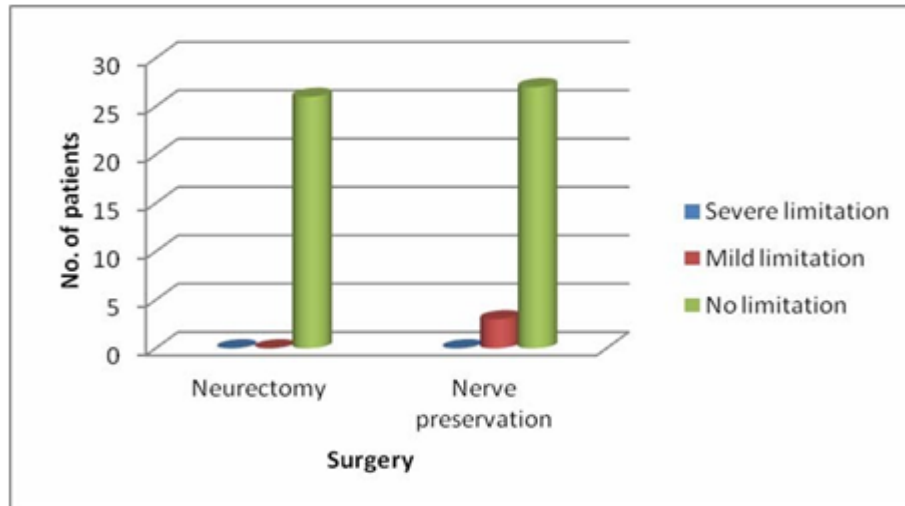
The incidence of hyperesthesia was high in both the study groups after 1 month follow up. At 8 months follow up, only one patient in the nerve

preservation group had persistent hyperesthesia at the operated site.

**Table 10:** Quality of Life – Physical Functioning

Physical Functioning	Surgery n(%)	
	Neurectomy	Nerve preservation
No Limitation of Activities	26 (100%)	27 (90%)
Mild Limitation of Activities	0	03 (10%)
Severe Limitation of Activities	0	0
Total	26 (100%)	30 (1majority o00%)

CC=0.296, P=0.097



**Graph 9:** Quality of Life- Physical Functioning

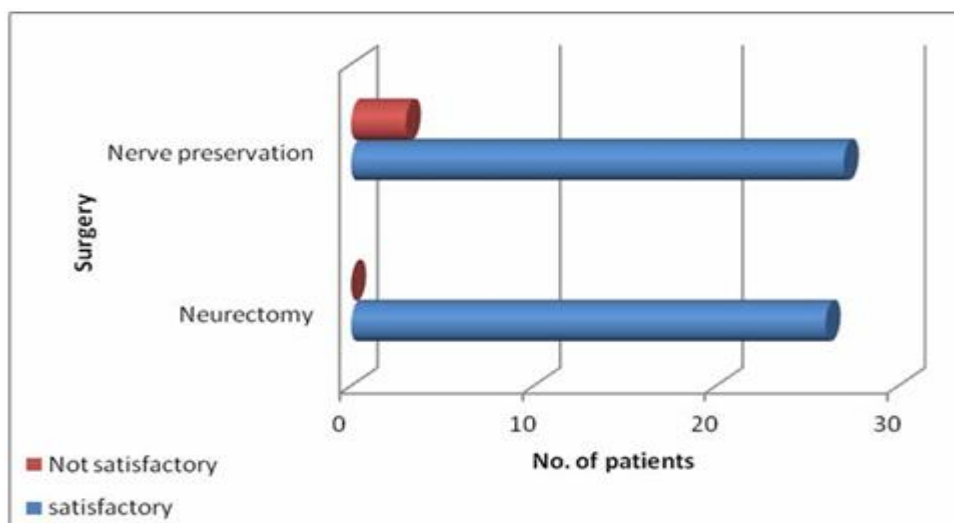
Majority of the patients had no effect on their physical functioning postoperatively, except 3 in the nerve preservation group, who complained of

mild limitation of their day to day work due to post-operative pain.

**Table 11:** Quality of Life- General Health

General Health	Surgery n (%)	
	Neurectomy	Nerve preservation
Satisfactory	26 (100%)	27 (90%)
Not Satisfactory	0	03 (10%)
Total	26 (100%)	30 (100%)

CC=0.296, P=0.097



**Graph 10:** Quality of Life- General Health

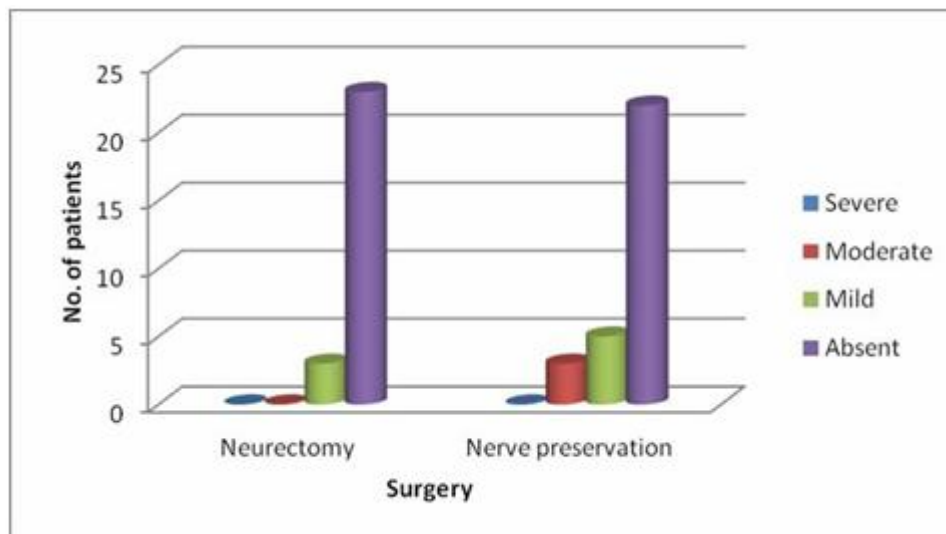


General health was found to be unsatisfactory only in 3 patients belonging to nerve preservation group in the entire study

**Table 12:** Quality of Life- Bodily Pain

Bodily Pain	Surgery n (%)	
	Neurectomy	Nerve preservation
No Pain	23 (88.5%)	22 (73.3%)
Mild Pain	03 (11.5%)	05 (16.7%)
Moderate Pain	0	03 (10%)
Severe Pain	0	0
Total	26 (100%)	30 (100%)

CC=0.234, P=0.097



**Graph 11:** Quality of Life-Bodily Pain

8 patients experienced mild body pain following surgery, out of which, majority were in the nerve preservation group (5/8). Only 3 patients had severe body pain in the nerve preservation group.

**Discussion**

Although chronic pain post hernioplasty can be controlled with analgesics, it has emerged as a significant clinical problem after an open mesh repair, significantly affecting patient’s satisfaction and quality of life.<sup>[10-12]</sup> The rate of chronic pain after inguinal hernia mesh repair can reach 51.6%.<sup>[13]</sup> Reasons for post hernioplasty chronic pain are mostly unclear; however, one of the proposed mechanisms is the inflammation and fibrosis induced by the mesh, which is close to the ilioinguinal nerve.<sup>[14]</sup> Additionally, there could also be an unintentional injury or strangulation of the ilioinguinal nerve during suturing.

**Patient Characteristics**

**Age**

In our study, the mean age of the individuals in the neurectomy group was 50 years, and the mean age of the individuals in the nerve preservation group was 45 years. When compared to a randomized controlled study by Malekpour F et al.<sup>[9]</sup>, wherein the mean study age was 45 ± 18years.

**Sex**

Of the 60 patients in the study, 59 were males. Only one female patient was present in the study, included in the neurectomy group. This is comparable with the study done by Malekpour F et al. <sup>[9]</sup>, in which 5% (6/120) of the study group were females. However, in the study done by Picchio et al. <sup>[15]</sup>, 27 out of the 813 patients were females. The sex incidence of our study does not correlate with the study above as a large number

of patients were included in their study, and also the reluctance of women in our demographic to seek medical attention.

#### **Pain at Rest**

In the neurectomy study group, pain at rest was present in 6.7% patients at 1 month, which subsided by 8 months, whereas in the nerve preservation study group, it was present in 10% patients at 1 month and persisted upto 8 months postoperatively. In the study by Picchio et al.<sup>[15]</sup>, pain occurred in 5% and 6% of the studied patients in the neurectomy and nerve preservation groups, respectively, at 1 month. This subsided to 3% (neurectomy study group) and 2% (nerve preservation group) of patients at 1 year.

Incidence of chronic groin pain at rest was similar between the neurectomy and nerve preservation groups ( $P = 0.153$ ), which compliment the findings of Mui et al.<sup>[16]</sup> ( $P = 0.056$ ) and Picchio et al.<sup>[15]</sup> ( $P = 0.56$ ). This observation also had supporting data from another study by Hsu et al.<sup>[17]</sup>

#### **Pain Experienced During Normal Daily Activities:**

In our study, at the end of 1 month, the pain was present in 10% of patients in the neurectomy study group and 13.3% of patients in the nerve preservation study group. After 8 months, the incidence of pain reduced to 0% in the first group and 10% in the second group. Mui et al.<sup>[16]</sup> found a high incidence of pain at the end of the first month, in both groups (66% v/s 74.5%). However, the incidence of pain drastically reduced by 6 months (0% v/s 2%).

The results are consistent with those of Mui et al.<sup>[16]</sup> ( $P = 0.24$ ) and were found to be insignificant between both the study groups ( $P = 0.058$ ).

#### **Pain after vigorous activity and on walking:**

Notable differences were found in the incidence of pain after vigorous activity, between the neurectomy group and the nerve preservation group (15.4% v/s 36.7%;  $P = 0.004$ ), as well as in the incidence of pain on walking (11.5% v/s 26.7%;  $P = 0.001$ ) with a noticeable decrease in the incidence of pain in the neurectomy group over

the 8 month follow up period.

These findings are consistent with those of Dittrick et al.<sup>[2]</sup> (3% v/s 25%;  $P = 0.003$ ) and Malekpour et al.<sup>[9]</sup> (6% v/s 21%;  $P = 0.033$ ); however, Picchio et al.<sup>[15]</sup> reported an almost equal incidence of pain after one year (18% v/s 21%).

Ravichandran et al.<sup>[14]</sup>, in a pilot study in the year 2000, compared the incidence of pain after preservation or division of the ilioinguinal nerve in hernia repair and found that the differences in both the groups were insignificant. These results were limited by a small sample size, which therefore fails to confer an adequate and strong statistical power.

#### **Postoperative Paraesthesia:**

In our study, at the end of the first month of follow up, incidence of hypoesthesia was higher in the neurectomy group (26% v/s 10.0%), but hyperesthesia was higher in the nerve preservation group (26.7% v/s 36.7%). At 8 months of follow up, the overall incidence of paraesthesia decreased, but hypoesthesia persisted in 11.5% patients of the neurectomy group as opposed to 3.3% patients of the nerve preservation group.

These results are comparable with those of Mui et al.<sup>[16]</sup> (26% v/s 18.4%) and G.W. Dittrick et al.<sup>[2]</sup> (13% v/s 5%). The study of Abdullah et al.<sup>[18]</sup> complements this finding, wherein the preservation or division of the intercostobrachial nerve in patients undergoing axillary node dissection (for invasive breast cancer), did not change the incidence of postoperative numbness. The explanation is that when sensory nerves are excised, there are usually abrupt patterns of numbness followed by a gradual recovery, based on the formation of collateral nerves.

#### **Quality of Life:**

In this study, there was no notable difference in the health-related quality of life between the two study groups, which complements the findings of Mui et al.<sup>[16]</sup>.

#### **Conclusion**

The present study has several limitations. Small sample size and short follow up period in limits

the extension of result from the current study is relatively short. Prophylactic studies in larger study samples with longer follow-up are needed. In summary, prophylactic excision of the ilioinguinal nerve during Lichtenstein mesh hernia repair decreases the incidence of chronic groin pain after surgery, without additional morbidities. Thus, we suggest routine ilioinguinal neurectomy to be a reasonable option in open mesh repair of inguinal hernia ilioinguinal neurectomy in patients undergoing anterior inguinal hernia mesh repair.

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