



A Comparative Study of Prophylactic Neurectomy and Nerve Preservation in open Inguinal Hernia Repair

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Abstract

Background: Chronic post operative groin pain is a significant complication following inguinal hernial repair. Recently, with more attention to patient outcomes, chronic groin pain has replaced recurrence as the primary complication after open inguinal hernia repair and has emerged as a common and sometimes severe problem that can significantly affect a patient's, health-related, quality of life. 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 and etcetera. Traditionally, surgeons opt to preserve the nerves 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 nerves to reduce the incidence of chronic post operative pain has been recommended. Recently reported randomized controlled trials have confirmed the benefits of neurectomy in chronic post op pain.

In our institution, open inguinal hernia repair is one of the most common surgeries performed. This study aims at evaluating the long-term outcomes of neuralgia and paraesthesia following routine nerves excision, compared to nerve preservation.

Aims and Objective

To compare and correlate the therapeutic effectiveness of neurectomy versus nerve preservation with respect to -
Post operative groin pain.

-Post operative par aesthesia.

- Post operative patient satisfaction and wellbeing.

Materials and Methods: The present study is a randomized study of cases of inguinal hernias admitted in Katihar Medical College Katihar, during the study period of January 2021 to August 2022. 50 cases for the purpose of the study were selected on the basis of the random sampling method and after taking valid inform consent.

Patients with inguinal hernia underwent open hernia repair were with either prophylactic triple neurectomy (group A) or nerve preservation (group B) during operation. All operations were performed by surgeons specialized in hernia repair under local anaesthesia or spinal anaesthesia. The primary outcome was the incidence of chronic groin pain at 6 months. Secondary outcomes included incidence of groin numbness, postoperative sensory loss or change at the groin region, and quality of life measurement. All follow-up and outcome measures were carried out at 1 and 6 months following surgery.

Results: The incidence of chronic groin pain at 6 months was significantly lower in group A than group B. No significant intergroup differences were found regarding the incidence of groin numbness, postoperative sensory loss or changes at the groin region, and quality of life measurement at 6 months after the operation.

Conclusions: Prophylactic neurectomy significantly decreases the incidence of chronic groin pain after open hernia repair without added morbidities. It should be considered as a routine surgical step during the operation.

Introduction

Recently, with more attention to patient outcomes, Chronic post operative groin pain is a significant complication following inguinal hernial repair^[1]. A hernia is a protrusion of a viscus or part of a viscus through an abnormal opening in the walls of its containing cavity. The external abdominal hernia is the most common form, the most frequent varieties being the inguinal, femoral and umbilical. Groin pain has replaced recurrence as the primary complication after open inguinal hernia repair and has emerged as a common and sometimes severe problem that can significantly affect a patient's, health-related, quality of life^[2]. Surgical repair of inguinal hernias are among the most common general surgical procedures performed today.^[3] 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.^[4,5]

Several large series with systematic follow-up have reported pain rates ranging from 29% to 76%.^[6,7] 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. Traditionally, surgeons opt to preserve the nerves 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 nerves to reduce the incidence of chronic post operative pain has been recommended. Recently reported randomized controlled trials have confirmed the benefits of neurectomy in chronic post op pain.

In our institution, inguinal hernia repair is one of the most common surgeries performed. Open inguinal hernia mesh repair is the standard procedure that is followed. This study aims at

evaluating the long term outcomes of neuralgia and paraesthesia following routine nerves excision, compared to nerve preservation when performing open inguinal hernia repair and to arrive at a conclusion as to the best modality of treatment.

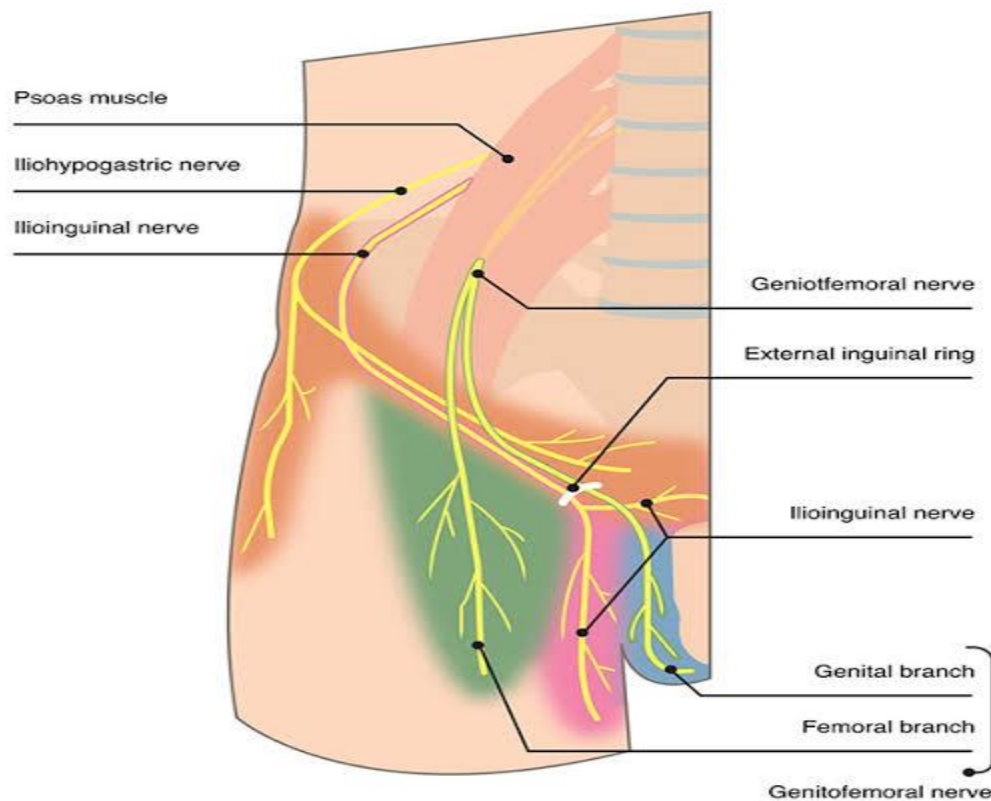
Aims and Objectives

- 1) To compare and correlate the therapeutic effectiveness of triple neurectomy versus nerve preservation with respect to-
Post operative groin pain.
Post operative paraesthesia.
Post operative patient satisfaction and wellbeing.
- 2) To arrive at a consensus concerning management of the nerves during hernia repair and try to provide uniform terminology to be used in this context.

Triple Neurectomy

There are three nerves come in the course of open inguinal repair namely iliohypogastric nerve, ilioinguinal nerve and genital branch of genitofemoral nerve.

Triple neurectomy refers to division and excision of all three nerves during open inguinal hernia repair. Inguinal canal lining traversed by last two nerves. To reach the skin above the genitalia iliohypogastric nerve dose not travel through inguinal canal, it supply the sensory to skin over the lateral gluteal and hypogastric area and motor to int oblique and transvers abdominis. Ilioinguinal nerve supply sensory to anterior perinium as well as medial and upper aspect of thigh, it also enhances the sensation over anterior scrotum in men and labia majora and mons pubis in female.



Materials and Methods

Study area and population: All Inguinal Hernia patients were treated at Katihar Medical College and Hospital's Department of General Surgery.

Study duration: January 2021- August 2022

Sample size: 50 patients of Inguinal Hernia

Sample Design: All the patients in sample population were given same surgery. The results in terms of specific objectives were analysed.

Study design: The results were analysed in a prospective and observational method.

Inclusion Criteria

All patients with direct and indirect inguinal hernia who underwent open inguinal hernia repair were included in the study.

Exclusion Criteria

Patients underwent only herniotomy and recurrent hernia.

The data was collected in a prepared proforma. After explaining the procedure and proposed outcomes to the patients, they were divided into two groups, patients underwent open inguinal hernia repair with neurectomy [A] or nerve preservation group[B].

Post op hospital stay were closely monitored and discharged when fit and asked the patients to come for regular follow up and at 1 month, and at 6 months. The patients were advised to return to pre-hernia lifestyle except lifting of heavy weights.

The primary outcomes were the incidence of groin pain while the secondary outcomes numbness, sensory change at groin region and quality of life. All the follow up and measurements were carried out at the end of define period and results were compiled, tabulated and compared between two groups.

Results and Observation

A total of 50 patients were eligible for the study during the 18 months of study period.

Table: 1 Distribution of study population (n=50)

Group Distribution	No of cases
Group A- Undergoing neurectomy with lichenstein’s mesh repair	25
Group B- Preserving the nerves in lichenstein’s mesh repair	25
Total	50

Table: 2. Age Distribution Among Study Population

Age in year	Neurectomy (n=25)		Preserving the nerves repair(n=25)	
	No of Cases	Percentage	No of Cases	Percentage
18 – 30	2	8.0	4	16.0
31 – 70	23	92.0	21	84.0
Total	25	100	25	100
Statistical inferences	Chi- square- 0.7575 P Value- 0.384			

Table: 3. Sex Distribution Among Study Population

Sex distribution	Neurectomy (n=25)		Preserving the nerves repair(n=25)	
	No of Cases	Percentage	No of Cases	Percentage
Male	25	100.0	21	84.0
Female	00	0.0	4	16.0
Total	25	100	25	100
Statistical inferences	Chi- square- 4.3478 P Value- 0.037			

Table: 4. Distribution of Location

Location	Neurectomy (n=25)		Preserving the nerves repair(n=25)	
	No of Cases	Percentage	No of Cases	Percentage
Right side	16	64.0	15	60.0
Left side	9	36.0	10	40.0
Bilateral	0	0.0	0	0.0
Total	25	100	25	100
Statistical inferences	Chi- square- 0.0848 P Value- 0.770			

Bilateral inguinal hernia was not noted.

Table:6. Pain at rest

Pain at rest	Neurectomy (n=25)		Preserving the nerves repair(n=25)	
	After 1month	After 6months	After 1month	After 6months
Present	1(4.0%)	0(0.0%)	2(8.0%)	1(4.0%)
Absent	24(96.0%)	25(100.0%)	23(92.0%)	24(96.0%)
Total	25(100.0%)	25(100.0%)	25(100.0%)	25(100.0%)
Statistical inferences	Chi- square- 2.0833 P Value- 0.555			

The difference was not statistically significant (p value= 0.555).

Table: 7 Pain during normal daily activities

Pain during normal daily activities	Neurectomy (n=25)		Preserving the nerves repair(n=25)	
	After 1month	After 6months	After 1month	After 6months
Present	12(48.0%)	3(12.0%)	15(60.0%)	6(24.0%)
Absent	13(52.0%)	22(88.0%)	10(40.0%)	19(76.0%)
Total	25(100.0%)	25(100.0%)	25(100.0%)	25(100.0%)
Statistical inferences	Chi- square- 15.625 P Value- 0.001			

Pain during normal daily activities is mention in table no. 7. The difference was statistically significant (p value= 0.001).

Table:8. Pain after moderate activity

Pain after moderate activity	Neurectomy (n=25)		Preserving the nerves repair(n=25)	
	After 1month	After 6months	After 1month	After 6months
Present	11(44.0%)	4(16.0%)	17(68.0%)	6(24.0%)
Absent	14(56.0%)	21(84.0%)	08(32.0%)	19(76.0%)
Total	25(100.0%)	25(100.0%)	25(100.0%)	25(100.0%)
Statistical inferences	Chi- square- 17.1477 P Value- 0.0006			

More number of patients had Pain after moderate activity in Preserving the nerves repair group compare to Neurectomy group after one and six months of follow-up. It was statistical significant different found in between the groups p value was 0.0006.

Table: 9. Pain on walking

Pain on walking	Neurectomy (n=25)		Preserving the nerves repair(n=25)	
	After 1month	After 6months	After 1month	After 6months
Present	8(32.0%)	2(8.0%)	12(48.0%)	5(20.0%)
Absent	17(68.0%)	23(92.0%)	13(52.0%)	20(80.0%)
Total	25(100.0%)	25(100.0%)	25(100.0%)	25(100.0%)
Statistical inferences	Chi- square- 11.111 P Value- 0.011			

More patients in the Preserving the nerves repair group reported pain upon waking. Significant differences between the groups have been found. The significance level was 0.011.

Table: 10. Post-operative hypoesthesia

Hypoesthesia	Neurectomy (n=25)		Preserving the nerves repair(n=25)	
	After 1month	After 6months	After 1month	After 6months
Present	7(28.0%)	3(12.0%)	1(4.0%)	0(0.0%)
Absent	18(72.0%)	22(88.0%)	24(96.0%)	25(100.0%)
Total	25(100.0%)	25(100.0%)	25(100.0%)	25(100.0%)
Statistical inferences	Chi- square- 11.746 P Value- 0.008			

The Neurectomy group had the highest incidence of post-operative hypoesthesia. In contrast, the nerves-repair group was preserved over the subsequent evaluation phase. The p value was 0.008, hence the result was reliable.

Table: 11. Post-operative hyperesthesia

Hyperesthesia	Neurectomy (n=25)		Preserving the nerves repair(n=25)	
	After 1month	After 6months	After 1month	After 6months
Present	6(24.0%)	1(4.0%)	8(32.0%)	2(8.0%)
Absent	19(76.0%)	24(96.0%)	17(68.0%)	23(92.0%)
Total	25(100.0%)	25(100.0%)	25(100.0%)	25(100.0%)
Statistical inferences	Chi- square- 9.2841 P Value- 0.025			

Post-operative hyperesthesia was more common in the nerve-preservation group than the neurectomy group. The p value indicated a statistically significant difference between the two groups. (0.025)

Table: 12 Surgical satisfaction

Surgical satisfaction	Neurectomy (n=25)		Preserving the nerves repair(n=25)		p value Chi- Square- 0.3546 P Value- 0.551
	No of Cases	Percentage	No of Cases	Percentage	
Yes	24	96.0	23	96.0	
No	1	4.0	2	4.0	
Total	25	100.0	25	100.0	

Surgical satisfactions is statistically not significant with p value=0.551.

Table: 13 Quality of Life

Physical functioning	Neurectomy (n=25)	Preserving the nerves repair(n=25)	P Value
No limitation	24(96.0%)	22(88.0%)	Chi-square- 1.0869 p value- 0.297
Mild Limitation	01(4.0%)	03(12.0%)	
Severe limitation	00(0.0%)	00(0.0%)	
General Health: Satisfactory			
Satisfactory	23(92.0%)	21(84.0%)	Chi-square- 0.7575 p value- 0.384
Not Satisfactory	02(8.0%)	04(16.0%)	
Bodily Pain			
Absent	22(88.0%)	19(76.0%)	Chi-square- 1.5052 p value- 0.471
Mild	02(8.0%)	05(20.0%)	
Moderate	01(4.0%)	01(4.0%)	
Social Health			
No limitation	25(100.0%)	24(96.0%)	Chi-square- 1.0204 p value- 0.312
Mild Limitation	00(0.0%)	01(4.0%)	
Role emotional			
No effect	25(100.0%)	23(92.0%)	Chi-square- 2.0833 p value- 0.148
Mild effect	00(0.0%)	02(8.0%)	

The results suggest that there were no significant differences between the two groups in most categories.

Discussion

The study was conducted in a surgery department where 50 participants were divided into two groups. One group underwent neurectomy with mesh repair while the other group underwent preserving the nerves in mesh repair.

In the present study, we found Age incidence of the study participants is mentioned in Table 2. Patients aged 31-70 years formed the maximum number of this study 92.0% of neurectomy with lichenstein’s mesh repair group and 84.0% of Preserving the nerves in lichenstein’s mesh repair

group followed by 18-30 years involving 8.0% of neurectomy with lichenstein's mesh repair group and 16.0% of Preserving the nerves in lichenstein's mesh repair group respectively. The difference in the age between the two groups was not statistically significant (p value=0.384). Male were predominately higher than female, among two groups. 100% male patients were present in neurectomy group. And 84% were male and 16.0% were female in preserving the nerves repair group. It was statistically significant between the group p value was 0.037.

The findings of this study suggest that the incidence of inguinal hernia repair is higher among middle-aged and elderly males. This is consistent with the results of a study conducted by **Memon et al. (2016)**, which found that the incidence of inguinal hernia repair was highest among males aged 40-59 years.^[8]

In addition, the study found difference in the gender distribution between the two groups, with a higher proportion of males in the neurectomy group compared to the nerve preservation group. This finding is in agreement with a study by **Charalampakis et al. (2019)**,^[9] which also found that males were more likely to undergo neurectomy during inguinal hernia repair compared to females.

In the present study, 64% of inguinal hernias occur on the right side, and 36% were on the left side, in Neurectomy group, on the other hand 60% of inguinal hernias occur on the right side and 40% were in left side in preserving the nerves repair group. Bilateral inguinal hernia was not noted.

The finding that the majority of inguinal hernias occur on the right side is consistent with previous studies. For example, **Charalampakis et al. (2019)**^[9] reported that 60-70% of all inguinal hernias are right-sided. This may be due to the fact that the right testicular vein is longer and enters the vena cava at a higher level than the left testicular vein, which can result in increased pressure in the right inguinal region and a higher likelihood of herniation (**Memon et al., 2016**).^[8]

The finding that there was no statistically significant difference in the incidence of pain at rest between the two groups is consistent with some previous studies. A study by **Schmedt et al. (2005)**^[10] found no significant difference in the incidence of chronic pain between patients who underwent neurectomy and those who did not. Similarly, a systematic review and meta-analysis by **Poobalan et al. (2007)**^[11] also found no significant difference in the incidence of chronic pain between neurectomy and non-neurectomy groups.

In the present study, 12(48.0%) patients had pain during normal daily activities After 1month follow-up and After 6months of follow-up there was 3(12.0%) pain during normal daily activities in Neurectomy group. On the other hands 15(60.0%) patients had pain during normal daily activities after one month follow-up and after six months of follow-up 6(24.0%) cases had found pain during normal daily activities in preserving the nerves repair group. This difference was statistically significant (p value= 0.001).

The finding of this study that a higher number of patients in the preserving the nerves repair group experienced pain during normal daily activities compared to the neurectomy group is consistent with other studies. **Schmedt et al. (2005)**^[10] conducted a systematic review of randomized controlled trials comparing nerve-preserving techniques with neurectomy in inguinal hernia repair and found that nerve-preserving techniques were associated with a higher incidence of postoperative neuralgia. **Poobalan et al. (2007)**^[11] also conducted a systematic review of randomized controlled trials comparing the same techniques and found a similar trend of higher incidence of postoperative pain with nerve-preserving techniques.

In the present study, the finding that more patients in the Preserving the nerves repair group had pain after moderate activity compared to the Neurectomy group is an important one. This suggests that preserving the nerves during mesh repair may not necessarily lead to better outcomes

in terms of pain after moderate activity. . It was statistical significant different found in between the groups p value was 0.0006.

This is consistent with the findings of a meta-analysis by **Huang et al. (2020)**,^[12] which compared the outcomes of neurectomy versus preservation of the ilioinguinal and/or iliohypogastric nerves during open inguinal hernia repair. The study found that while nerve preservation may result in less acute postoperative pain, there was no significant difference in chronic pain or quality of life between the two techniques.

In the present study, Compared to the Neurectomy group, more patients in the Preserving the nerves repair group reported pain upon waking. Significant differences between the groups have been found. The significance level was 0.011.

Previous studies have also examined the effect of nerve preservation during surgery on postoperative pain. For example, a study by **Wang et al. (2020)**^[13] found that nerve-preservation surgery led to a higher incidence of postoperative pain as compared to neurectomy.

In the present study, the Neurectomy group had the highest incidence of post-operative hypoesthesia. In contrast, the nerve-preservation group was had less over the subsequent evaluation phase. The p value was 0.008, hence the result was reliable.

In the present study, post-operative hyperesthesia was more common in the nerve-preservation group than the neurectomy group, based on data collected from the first and sixth months after surgery. The p value indicated a statistically significant difference between the two groups. (0.025)

The finding that both the neurectomy with mesh repair group and the nerve preservation group had a high level of surgical satisfaction is a positive result. It suggests that both surgical approaches were acceptable to the majority of patients and that patients were generally satisfied with their surgical outcomes.

However, the lack of statistically significant difference in surgical satisfaction between the two

groups (p value=0.551) is also an important finding. While both groups had high levels of satisfaction, the lack of difference between the groups suggests that one approach may not be clearly superior to the other in terms of patient satisfaction.

Conclusion

In conclusion, this prospective and observational study compared neurectomy with lichenstein's mesh repair to preserving the nerves in lichenstein's mesh repair in patients with inguinal hernias.

- The results showed that preserving the nerves repair group had less pain during daily activities, less post-operative hypoesthesia, and shorter hospital stays compared to the neurectomy with mesh repair group.
- On the other hand, the neurectomy with mesh repair group had less pain at rest and less post-operative hyperesthesia compared to the preserving the nerves repair group. There were no significant differences between the two groups in most categories, including physical functioning, general health, bodily pain, social health, and role emotional.
- Surgical satisfaction was high in both groups. Overall, the study suggests that both neurectomy with mesh repair and preserving the nerves in lichenstein's mesh repair are viable options for patients with inguinal hernias, and the decision should be based on individual patient characteristics and preferences.

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