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ILIOINGUINAL NERVE PRESERVATION VERSUS ELECTIVE NEURECTOMY IN LICHTENSTEIN HERNIOPLASTY: A PROSPECTIVE RANDOMIZED STUDY ON POSTOPERATIVE PAIN AND SENSORY DISTURBANCES

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ABSTRACT

Background: Chronic postoperative groin pain (inguinodynia) remains a significant complication following Lichtenstein tension-free mesh hernioplasty, with ilioinguinal nerve involvement being a primary etiological factor. This study aimed to compare the effects of elective ilioinguinal neurectomy versus nerve preservation on postoperative pain and sensory disturbances.

Methods: A prospective randomized study was conducted at a tertiary care center, enrolling 150 male patients with unilateral uncomplicated inguinal hernia. Patients were randomized into two groups: Group A (nerve preservation, n=75) and Group B (elective neurectomy, n=75). All patients underwent Lichtenstein tension-free mesh hernioplasty. Postoperative outcomes including pain (assessed by Numerical Rating Scale, NRS), numbness, and hypoesthesia were evaluated on postoperative day (POD) 1, POD 7, and at 1, 3, and 6 months.

Results: No significant difference in pain scores was observed on POD 1 ($p=0.956$). However, statistically significant differences favoring the neurectomy group emerged at POD 7 ($p=0.032$), 1 month ($p=0.00004$), 3 months ($p<0.00001$), and 6 months ($p=0.000001$). At 6 months, 81.3% of neurectomy patients reported mild pain versus 46.7% in the preservation group. Numbness and hypoesthesia were significantly more common in the neurectomy group during early follow-up but resolved substantially by 6 months, with only 6.7% reporting mild residual numbness ($p=0.023$) and 4% reporting mild hypoesthesia ($p=0.080$, non-significant).

Conclusion: Elective ilioinguinal neurectomy during Lichtenstein hernioplasty significantly reduces chronic postoperative pain without causing disabling long-term sensory disturbances. This approach is recommended as a safe and effective strategy to prevent chronic inguinodynia.

Keywords: Ilioinguinal Nerve, Neurectomy, Inguinal Hernia, Lichtenstein Repair, Chronic Groin Pain, Inguinodynia.

INTRODUCTION

Inguinal hernia repair is one of the most frequently performed surgical procedures worldwide, with the Lichtenstein tension-free mesh technique remaining the gold standard for open repair due to its simplicity, reproducibility, and low recurrence rates [1].

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Despite these advantages, chronic postoperative groin pain—defined as pain persisting beyond three months—has emerged as a significant long-term complication, affecting 10-30% of patients and severely impacting quality of life in 1-5% [2,3].

The ilioinguinal nerve (IIN), which provides sensory innervation to the groin, medial thigh, and genital region, is particularly vulnerable during inguinal dissection due to its anatomical course through the inguinal canal [4]. Traditional surgical teaching advocates for nerve preservation to avoid postoperative sensory deficits. However, emerging evidence suggests that even meticulous preservation may not prevent chronic pain, as the nerve can become entrapped in suture material, mesh, or scar tissue [5].

Several randomized controlled trials have yielded conflicting results regarding the benefit of prophylactic ilioinguinal neurectomy. While some

studies report significant reduction in chronic pain with neurectomy [6,7], others demonstrate no long-term advantage and increased early sensory disturbances [8,9]. These inconsistencies have prevented the establishment of clear evidence-based guidelines.

The present study was designed to evaluate the impact of elective ilioinguinal neurectomy versus nerve preservation on postoperative pain and sensory outcomes following Lichtenstein hernioplasty in a rural tertiary care setting, with the hypothesis that prophylactic neurectomy would reduce chronic pain without causing significant functional disability.

MATERIALS AND METHODS

Study Design and Setting

This prospective randomized study was conducted at the Department of General Surgery, Dr Ulhas Patil Medical College & Hospital, Jalgaon, Maharashtra, India. Ethical approval was obtained from the Institutional Ethics Committee, and the study was registered prospectively. Written informed consent was obtained from all participants in their preferred language (Hindi, Marathi, or English).

Participants

A total of 150 male patients aged 18-60 years with unilateral uncomplicated inguinal hernia (direct or indirect) were enrolled consecutively. Exclusion criteria included: complicated hernias (strangulated, obstructed, incarcerated), recurrent hernias, previous inguinal region surgery, mesh allergy, diabetes mellitus, and patients with preoperative pain in the inguinal region.

Randomization and Blinding

Patients were randomized into two groups based on the last digit of their inpatient department number (odd = neurectomy, even = preservation), resulting in 75 patients per group. The operating surgeon could not be blinded due to the nature of the intervention. However, postoperative outcome assessments were performed by an independent observer blinded to group allocation. Patients were also unaware of whether their nerve was preserved or excised.

Surgical Technique

All patients underwent standardized Lichtenstein tension-free mesh hernioplasty under spinal or general anesthesia. The ilioinguinal nerve was identified in all cases. In Group A (preservation), the nerve was carefully dissected and preserved. In Group B (neurectomy), the ilioinguinal nerve was identified and electively divided, with proximal ligation to prevent neuroma formation. A standard polypropylene mesh was placed and secured with non-absorbable sutures. The iliohypogastric nerve and genital branch of the genitofemoral nerve were preserved in all patients.

Outcome Measures

The primary outcome was postoperative pain intensity assessed using the Numerical Rating Scale (NRS; 0 = no pain, 1-3 = mild, 4-6 = moderate, 7-10 = severe) at rest and during minor exercise. Secondary outcomes included:

- Numbness (non-painful ongoing sensation)
- Hypoesthesia (reduced response to non-painful stimuli assessed by cotton swab)

Assessments were conducted on postoperative day (POD) 1, POD 7, and at 1, 3, and 6 months.

Sample Size Calculation

Sample size was calculated based on the expected difference in chronic groin pain incidence at 1 year from Mishra et al. [7] (6.67% in neurectomy group vs. 23.33% in preservation group). Using a two-proportion formula with α=0.05 and 80% power, the calculated sample size was 68 per group. To account for dropouts, 75 patients were enrolled per group (total N=150).

Statistical Analysis

Data were analyzed using SPSS version 25.0. Categorical variables were compared using the Chi-square test or Fisher's exact test, as appropriate. Continuous variables were analyzed using the independent t-test or Mann-Whitney U test. A p-value <0.05 was considered statistically significant.

RESULTS

Baseline Characteristics

All 150 patients (75 per group) completed the 6-month follow-up. The two groups were comparable with respect to age, hernia type (direct vs. indirect), side, and type of anesthesia ($p>0.05$ for all comparisons). The mean age was 48.6±11.2 years in the preservation group and 49.2±10.8 years in the neurectomy group.

Postoperative Pain Outcomes

Postoperative Day 1: No statistically significant difference in pain scores was observed between groups (χ^2=0.32, p=0.956). Mild pain was reported by 25 patients (33.3%) in the preservation group and 28 (37.3%) in the neurectomy group; moderate pain by 32 (42.7%) vs. 31 (41.3%); severe pain by 18 (24.0%) vs. 16 (21.3%).

Postoperative Day 7: A significant difference emerged (χ^2=8.83, p=0.032). The neurectomy group showed higher rates of mild pain (61/75, 81.3% vs. 47/75, 62.7%) and lower rates of moderate (11/75, 14.7% vs. 20/75, 26.7%) and severe pain (3/75, 4.0% vs. 8/75, 10.7%).

At 1 Month: The difference was highly significant (χ^2=20.31, p=0.00004). Mild pain was reported by 49 patients (65.3%) in the neurectomy group vs. 22 (29.3%) in the preservation group.

At 3 Months: Highly significant difference persisted (χ^2=22.96, p<0.00001). Mild pain: 56 patients (74.7%) in neurectomy vs. 30 (40.0%) in preservation.

At 6 Months: The difference remained highly significant (χ^2=27.84, p=0.000001). Mild pain: 61 patients (81.3%) in neurectomy vs. 35 (46.7%) in preservation.

Numbness Outcomes

POD 1: Numbness was significantly more common in the neurectomy group (24/75, 32.0% vs. 7/75, 9.3%; χ^2=10.56, p=0.0051).

POD 7: Neurectomy group continued to show higher numbness rates (19/75, 25.3% vs. 5/75, 6.7%; χ^2=11.68, p=0.0029).

At 1 Month: Numbness decreased in both groups but remained higher in neurectomy (14/75, 18.6% vs. 3/75, 4.0%; χ^2=9.39, p=0.0091).

At 3 Months: Minimal residual numbness (9/75, 12.0% in neurectomy vs. 1/75, 1.3% in preservation; χ^2=7.32, p=0.0258).

At 6 Months: Only 5 patients (6.7%) in the neurectomy group reported mild numbness vs. none in the preservation group (χ^2=5.17, p=0.023).

Hypoesthesia Outcomes

POD 1:** Significantly higher in neurectomy group (21/75, 28.0% vs. 4/75, 5.3%; χ^2=14.31, p=0.00077).

POD 7: Neurectomy group: 17/75 (22.7%) vs. 2/75 (2.7%); χ^2=13.24, p=0.0013.

At 1 Month: Neurectomy group: 9/75 (12.0%) vs. 1/75 (1.3%); χ^2=7.78, p=0.0204.

At 3 Months: Neurectomy group: 6/75 (8.0%) vs. 0/75; χ^2=6.35, p=0.0117.

At 6 Months: Neurectomy group: 3/75 (4.0%) vs. 0/75; χ^2=3.06, p=0.080 (non-significant).

DISCUSSION

This prospective randomized study demonstrates that elective ilioinguinal neurectomy during Lichtenstein hernioplasty significantly reduces chronic postoperative pain compared to nerve preservation, with transient and clinically acceptable sensory disturbances that largely resolve by six months.

Pain Outcomes

The absence of significant pain difference on POD 1 (p=0.956) is consistent with the understanding that acute postoperative pain is primarily nociceptive—arising from surgical incision, tissue dissection, and inflammation—rather than neuropathic [10]. Both groups experienced similar acute pain profiles, confirming that neurectomy does not exacerbate early postoperative discomfort.

From POD 7 onward, the neurectomy group consistently demonstrated superior pain outcomes. This temporal pattern suggests that as nociceptive pain subsides, neuropathic mechanisms—including nerve entrapment, tension, and neuroma formation—become increasingly significant contributors to the pain experience. By prophylactically excising the ilioinguinal nerve, these neuropathic pathways are interrupted before they can become established.

Our findings align with several previous studies. Wantz [11] reported that none of 546 patients undergoing neurectomy experienced significant chronic pain. Mui et al. [12] demonstrated that elective neurectomy reduced exertional chronic pain and improved patient satisfaction. Mishra et al. [7] found chronic groin pain rates of 6.67% in neurectomy vs. 23.33% in preservation at 1 year (p<0.05). Similarly, Malekpour et al. [6] reported significant reduction in chronic inguinodynia (6% vs. 21%, p=0.033).

Conversely, some studies have reported no long-term advantage of neurectomy. Picchio et al. [9] found no difference in chronic pain between groups at 1, 6, or 12 months, while Ravichandran et al. [13] reported no statistically significant difference in pain but increased early sensory loss in the neurectomy group. These discrepant findings may reflect differences in surgical technique, patient selection, follow-up duration, or sample size. The present study's large sample size (150 patients) and complete 6-month follow-up strengthen the validity of our conclusions.

Sensory Disturbances

As expected, neurectomy was associated with significantly higher rates of numbness and hypoesthesia during early follow-up. At POD 1, 32% of neurectomy patients reported numbness compared to 9.3% in the preservation group. However, these sensory disturbances showed progressive resolution over time—by 6 months, only 6.7% of neurectomy patients reported mild numbness, and 4% reported mild hypoesthesia (the latter not statistically significant).

This resolution pattern is consistent with neurophysiological adaptation, including nerve stump retraction, central sensory compensation, and possible collateral innervation from adjacent nerves (iliohypogastric and genitofemoral) [14,15]. Importantly, no patient in either group reported moderate or severe numbness or hypoesthesia at 6 months, confirming that even when persistent, sensory deficits are mild and non-disabling.

These findings echo those of Koch et al. [16] and Loos et al. [17], who reported that sensory symptoms following neurectomy diminish substantially within 3-6 months and rarely affect quality of life. The transient nature of these disturbances—coupled with the significant pain reduction—supports a favorable risk-benefit profile for prophylactic neurectomy.

Clinical Implications

Chronic postoperative pain following inguinal hernia repair is a leading cause of patient dissatisfaction and reduced quality of life [3]. Our findings suggest that routine identification and elective division of the ilioinguinal nerve during Lichtenstein hernioplasty can significantly reduce this risk. The procedure adds minimal operative time, requires no special equipment, and does not increase complication rates. The predictable and transient sensory changes are well-tolerated by patients, particularly when weighed against the potential for debilitating chronic pain.

We propose that prophylactic ilioinguinal neurectomy be considered a standard component of open inguinal hernia repair, especially in patients at higher risk for chronic pain (e.g., young, active individuals, those with pre-existing pain sensitivity, or undergoing repair of large or recurrent hernias). This approach is consistent with the pragmatic, case-by-case strategy recommended by the European Hernia Society [18], which advocates nerve division when the nerve appears at risk for entrapment.

Study Limitations

Several limitations warrant acknowledgment. First, blinding of the operating surgeon was not possible due to the nature of the intervention. Second, the study included only male patients, limiting generalizability to females. Third, follow-up was limited to 6 months; longer-term outcomes (1-5 years) would provide additional insight into the durability of pain reduction and the possibility of late neuroma formation. Fourth, the study was conducted at a single center, and results may not be universally applicable. Finally, while the NRS is a validated pain assessment tool, it is inherently subjective.

Strengths

The study's strengths include its prospective randomized design, adequate sample size based on power calculation, complete follow-up (100% at 6 months), blinded outcome assessment, and standardized surgical technique. The use of multiple assessment time points allowed characterization of the temporal evolution of both pain and sensory outcomes.

CONCLUSION

Elective ilioinguinal neurectomy during Lichtenstein tension-free mesh hernioplasty significantly reduces chronic postoperative groin pain compared to nerve preservation. Although associated with higher rates of transient numbness and hypoesthesia in the early postoperative period, these sensory disturbances are mild and largely resolve by six months without functional impairment. Prophylactic neurectomy is a safe, simple, and effective strategy to prevent chronic inguinodynia and should be considered a routine component of open inguinal hernia repair, particularly in patients at increased risk for chronic postoperative pain.

Table 1: Baseline Characteristics of Study Participants

Characteristic	Nerve Preservation (N=75)	Neurectomy (N=75)	P-Value
Mean Age (Years)	48.6 ± 11.2	49.2 ± 10.8	0.742
Hernia Type: Direct	42 (56.0%)	39 (52.0%)	0.621
Indirect	33 (44.0%)	36 (48.0%)	
Right-Sided Hernia	68 (90.7%)	65 (86.7%)	0.438
Spinal Anesthesia	71 (94.7%)	73 (97.3%)	0.682

Table 2: Postoperative Pain Distribution (NRS Scores)

Time Point	Pain Category	Nerve Preservation (N=75)	Neurectomy (N=75)	X^2	P-Value
Pod 1	Mild (0-3)	25 (33.3%)	28 (37.3%)	0.32	0.956
	Moderate (4-6)	32 (42.7%)	31 (41.3%)		
	Severe (7-10)	18 (24.0%)	16 (21.3%)		
Pod 7	Mild	47 (62.7%)	61 (81.3%)	8.83	0.032
	Moderate	20 (26.7%)	11 (14.7%)		
	Severe	8 (10.7%)	3 (4.0%)		
1 Month	Mild	22 (29.3%)	49 (65.3%)	20.31	0.00004
	Moderate	38 (50.7%)	21 (28.0%)		
	Severe	15 (20.0%)	5 (6.7%)		
3 Months	Mild	30 (40.0%)	56 (74.7%)	22.96	<0.00001
	Moderate	33 (44.0%)	16 (21.3%)		
	Severe	12 (16.0%)	3 (4.0%)		
6 Months	Mild	35 (46.7%)	61 (81.3%)	27.84	0.000001
	Moderate	30 (40.0%)	12 (16.0%)		
	Severe	10 (13.3%)	2 (2.7%)		

Table 3: Postoperative Numbers

Time Point	Numbness	Nerve Preservation (N=75)	Neurectomy (N=75)	X^2	P-Value
Pod 1	Absent	68 (90.7%)	51 (68.0%)	10.56	0.0051
	Present	7 (9.3%)	24 (32.0%)		
Pod 7	Absent	70 (93.3%)	56 (74.7%)	11.68	0.0029
	Present	5 (6.7%)	19 (25.3%)		
1 Month	Absent	72 (96.0%)	61 (81.3%)	9.39	0.0091
	Present	3 (4.0%)	14 (18.7%)		
3 Months	Absent	74 (98.7%)	66 (88.0%)	7.32	0.0258
	Present	1 (1.3%)	9 (12.0%)		
6 Months	Absent	75 (100%)	70 (93.3%)	5.17	0.023
	Present	0 (0%)	5 (6.7%)		

Table 4: Postoperative Hypoesthesia

Time Point	Hypoesthesia	Nerve Preservation (N=75)	Neurectomy (N=75)	X^2	P-Value
Pod 1	Absent	71 (94.7%)	54 (72.0%)	14.31	0.00077
	Present	4 (5.3%)	21 (28.0%)		
Pod 7	Absent	73 (97.3%)	58 (77.3%)	13.24	0.0013
	Present	2 (2.7%)	17 (22.7%)		
1 Month	Absent	74 (98.7%)	66 (88.0%)	7.78	0.0204
	Present	1 (1.3%)	9 (12.0%)		
3 Months	Absent	75 (100%)	69 (92.0%)	6.35	0.0117
	Present	0 (0%)	6 (8.0%)		
6 Months	Absent	75 (100%)	72 (96.0%)	3.06	0.080
	Present	0 (0%)	3 (4.0%)		

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