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# ILIOINGUINAL NERVE DIVISION VERSUS PRESERVATION IN LICHTENSTEIN REPAIR: IMPACT ON CHRONIC POSTOPERATIVE PAIN AND HYPOESTHESIA

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## ABSTRACT

**Introduction**: Hernia surgery remains a common procedure with evolving techniques, presenting challenges such as chronic groin pain. Ilioinguinal nerve division and preservation during hernia repair influence pain and hypoesthesia outcomes, sparking interest in optimizing patient outcomes.

**Methods**: This prospective observational study included 80 cases conducted in a tertiary care teaching hospital in South India. Patients aged 18 and above with direct or indirect inguinal hernias were assigned to two groups: ilioinguinal nerve preservation (Group A) and division (Group B). Pain and hypoesthesia were assessed at one, three, and six months post-surgery using validated questionnaires and sensory testing.

**Results**: Both groups (A and B) had comparable age and gender distributions. Pain at rest was significantly higher in the preserved group (Group A) compared to the divided group (Group B) at all time intervals. Pain during regular activities showed no significant difference at one month, but the preserved group (Group A) reported higher pain at the third and sixth months. Hypoesthesia was consistently higher in the divided group (Group B) compared to the preserved group (Group A) across all time points. Pain reduction was significant over time in the divided group (Group B), particularly among complete hernia patients. Diabetes mellitus did not significantly influence pain or hypoesthesia.

**Conclusion**: This study demonstrates substantial differences in pain and hypoesthesia outcomes based on ilioinguinal nerve division or preservation during hernia repair. While preserved group experienced greater pain at rest and during regular activities at later time points, the divided group consistently exhibited increased hypoesthesia. These findings underline the complexity of balancing pain reduction and sensory outcomes in hernia surgery.

***Keywords***: *Ilioinguinal nerve, Lichtenstein repair, Chronic postoperative pain, Inguinodynia, Hypoesthesia*

## INTRODUCTION

Hernias are characterized by the abnormal protrusion of a part of an organ through an opening in the surrounding cavity walls.[1] Advances in surgical techniques, prosthetic materials, and laparoscopic approaches have made hernia surgery a fascinating field, requiring dedication and adaptation.[2] Among the oldest human afflictions, hernias, especially inguinal ones, remain prevalent and represent a common surgical procedure today.[3] Despite frequent occurrence, the techniques for hernia repair continue to evolve, with various procedures having their pros and cons, including early and late complications.

However, the primary post-repair concern has shifted from recurrence to chronic groin pain, a condition lasting over 3 months, after open inguinal hernia repair.

Chronic groin pain, also termed inguinodynia, has become a significant complication following open mesh inguinal hernia repair,[4] with reported rates ranging from 29% to 76%.[5,6] However, only a small percentage of patients, around 2%-4%, are substantially affected in their daily lives.[7] This persistent pain can substantially impact a patient's quality of life and is a common problem post-surgery.[8,9] Although the exact cause of this pain remains unclear, efforts have been made to categorize it as either neuropathic or nociceptive.[10] Inguinal postoperative chronic pain can be secondary to entrapment or stretching of nerves, inflammation, fibrotic reactions, or formation of neuromas, and it may require several interventions, including oral analgesics, local anesthesia, physiotherapy, or further surgery. [11]

Addressing chronic groin pain poses challenges for healthcare professionals and has broader implications for healthcare systems and economies. One proposed approach has been routine neurectomy, a practice not unique to inguinal hernia repairs, as seen in procedures like axillary and neck dissections.[12] Some advocate routine ilioinguinal nerve excision as a way to prevent long-term post-herniorrhaphy neuralgia, by eliminating the potential sources of pain like inflammation, entrapment, neuroma, and fibrotic reactions. However, controversies persist, and the procedure's widespread adoption is limited. Different experts have tried establishing management algorithms or preventive methods for this chronic pain syndrome.[13,14]

This study endeavours to compare the effects of ilioinguinal nerve division versus nerve preservation during Lichtenstein's inguinal hernia repair over three, six, and twelve months. The goal is to assess the development of inguinodynia and hypoesthesia, ultimately determining the most effective treatment modality based on a comprehensive evaluation of morbidity and patient satisfaction.

## MATERIALS AND METHODS

The present study was conducted at tertiary care teaching hospital in South India employed a prospective observational design. The study spanned included a sample of 80 cases. The study was granted ethical approval by the Institutional Ethics Committee. The study aimed to investigate the outcomes of elective Lichtenstein hernia repair in patients with direct and indirect inguinal hernias, aged 18 and above, at the aforementioned institution. Patients with recurrent hernias or those with complicated hernias such as strangulated, obstructed, irreducible, and incarcerated cases were excluded from the study. The enrolled patients were assigned two groups: Group A, which involved patients undergoing ilioinguinal nerve preservation, and Group B, encompassing patients with ilioinguinal nerve division by simple random sampling through envelope method. Informed consent was obtained from all participants prior to their involvement in the study. Post-surgery, patients were closely monitored for pain and hypoesthesia at the end of the first, third, and sixth months using a predesigned, pretested questionnaire. Pain intensity was evaluated using a four-point verbal scale validated by Hwang et al,[15](Table 1) while hypoesthesia was assessed using the Monofilament test and compared with the opposite side., we used Semmes-Weinstein monofilament[16] with a reproducible buckling stress 10 grams. Monofilament testing was in the inner thigh of the participants by the first author, who had received the necessary training on the use of monofilament. The monofilament was placed on palm of the patient's hand while his/her eyes were closed and each participant was asked if they were able to feel the sensation of monofilament on the palm, if so in which part of the body. After it was ensured that the patient understood how to cooperate and how to answer questions, the monofilament was placed on the examination portion of the patient's skin and was pressed as far as the monofilament could be bent. The patient was asked whether he/she felt something on the site and on which side. In each point, the test was repeated for three times. If the patient answered incorrectly two or more times in that position, it was recorded as a positive symptom of neuropathy. The duration of conducting the test on both feet was for 5 to 10 minutes. If there was no sensation measured on any one site of the affected side, the patient was considered to have hypoesthesia. The results were entered in Microsoft excel and was analysed using SPSS 27. The Descriptive data was expressed as Frequency/Percentage and Mean/SD. Chi-square was used to measure the association between age, sex, pain and hypoesthesia between the groups. $P<0.05$ was considered as statistically significant

**Table 1: Classification of pain**

| PAIN SCORE | DEGREE OF PAIN | RESPONSE |
|---|---|---|
| 0 | None | Negative response to questioning |
| 1 | Mild | Pain reported in response to questioning only without any behavioral signs |
| 2 | Moderate | Pain reported in response to questioning and accompanied by a behavioral sign or pain reported spontaneously without questioning |
| 3 | Severe | Strong verbal response or response accompanied by facial grimacing, arm withdrawal or tears |

## RESULTS

The study participants were between age of 21 to 87 years and were equally distributed between both the groups. There was no significant difference between both groups with respect to age (CSV-2.681, P=0.611). Female population in Nerve division group was 5% compared to 2.5% in nerve preservation group. There was no statistical difference between both the groups with respect to gender (CSV-0.346, P=0.55). Both the groups were similar with respect to distribution of type of hernia. (Table 2)

**TABLE 2: Type of inguinal hernia comparison**

| Type of inguinal hernia | Nerve division | | Nerve preservation | | CSV | sig |
|---|---|---|---|---|---|---|
| | N | % | N | % | | |
| Right Direct | 09 | 22.5 | 10 | 25 | 9.865 | 0.08 |
| Left Direct | 05 | 12.5 | 07 | 17.5 | | |
| Right Indirect | 15 | 37.5 | 06 | 15 | | |
| Left Indirect | 09 | 22.5 | 07 | 17.5 | | |
| Bilateral Direct | 01 | 2.5 | 04 | 10 | | |
| Bilateral Indirect | 01 | 2.5 | 06 | 15 | | |

The post operative pain at rest for the preserved group at first month, third month and sixth month was 40%, 22.5%, 17.5% respectively compared to 22.5%, 0%, 0% respectively at the same time interval for the nerve division group. The results were statistically significant. (Table 3)

**TABLE 3: Comparison of pain at rest among both groups**

| Pain at rest (POD) | | Ilioinguinal nerve | | | | χ 2 - value | p- value |
|---|---|---|---|---|---|---|---|
| | | Divided | % | Preserved | % | | |
| 1st month | No pain | 31 | 77.5 | 24 | 60.0 | | |
| | Mild | 6 | 15.0 | 16 | 40.0 | | |
| | Moderate | 3 | 7.5 | 0 | 0.0 | 8.436 | 0.015 * |
| 3rd month | No pain | 40 | 100.0 | 31 | 77.5 | | |
| | Mild | 0 | 0.0 | 9 | 22.5 | 10.141 | 0.002 |
| 6th month | No pain | 40 | 100.0 | 33 | 82.5 | | |
| | Mild | 0 | 0.0 | 7 | 17.5 | 7.671 | 0.012 * |

The post operative pain during regular activities for the preserved group at first month, third month and sixth month was 32.5%, 32.5%, 22.5% respectively compared to 22.5%, 12.5%, 0% respectively at the same time interval for the nerve division group. The results were statistically significant for third and sixth month. (Table 4)

**TABLE 4: Comparison of pain during walking/ daily activities among both groups**

| Pain during walking/ daily | | Ilioinguinal nerve | | | | χ 2 - value | p- value |
|---|---|---|---|---|---|---|---|
| | | Divided | % | Preserved | % | | |
| 1st month | No pain | 31 | 77.2 | 27 | 67.5 | | |
| | Mild | 7 | 17.5 | 13 | 32.5 | | |
| | Moderate | 2 | 5.0 | 0 | 0.0 | 4.076 | 0.130 # |
| 3rd month | No pain | 35 | 87.5 | 27 | 67.5 | | |
| | Mild | 5 | 12.5 | 13 | 32.5 | 4.588 | 0.032 * |
| 6th month | No pain | 40 | 100.0 | 31 | 77.5 | | |
| | Mild | 0 | 0.0 | 9 | 22.5 | 10.141 | 0.002 |

The post operative hypoesthesia for the preserved group at first month, third month and sixth month was 2.5%, 0%, 0% respectively compared to 25%, 17.5%, 15% respectively at the same time interval for the nerve division group. The results were always statistically significant (Table 5)

**TABLE 5 Comparison of hypoesthesia between both groups**

| Hypoesthesia | | Ilioinguinal nerve | | | | χ2 - value | p- value |
|---|---|---|---|---|---|---|---|
| | | Divided | | Preserved | | | |
| 1st month | Absent | 30 | 75.0 | 39 | 97.5 | | |
| | Mild | 10 | 25.0 | 1 | 2.5 | 8.538 | 0.007 |
| 3rd month | Absent | 33 | 82.5 | 40 | 100.0 | | |
| | Mild | 7 | 17.5 | 0 | 0.0 | 7.671 | 0.012 * |
| 6th month | Absent | 34 | 85.0 | 40 | 100.0 | | |
| | Mild | 6 | 15.0 | 0 | 0.0 | 6.486 | 0.026 * |

Pain reduced within group significantly as the time increases in Divided group while in the preserved group there is no significance. On further analysis it was found that pain was perceived high among complete hernia patients compared to other types. Also, there was no significant association between pain inguinodynia and diabetes mellitus

**DISCUSSION**

This study was done to compare the development of inguinodynia and hypoesthesia of ilioinguinal nerve division versus nerve preservation during Lichtenstein's inguinal hernia repair over three, six, and twelve months.

Both the groups were similar with respect to age, sex and type of hernia. The mean age of our study population was comparable with that of the studies done by Picchio et al.[17] and Karakayali et al.[18] Similar sex distribution was found in the study done by Malekpour et al. [19] and Chaudhary et al.[20]

Pain at rest was significantly higher in the preserved group compared to the Divided group at all the times. When compared for pain at regular activities, there was no significant difference between the groups at first month. At third and sixth month, the pain in the preserved group was higher compared to the divided group. Hypoesthesia was significantly higher in the Divided group compared to the Preserved group at all the times. Similar results were obtained by many studies done. [11,17,22]

Dividing the ilioinguinal nerve during hernia surgery can sometimes lead to a reduction in pain, particularly chronic groin pain or inguinodynia. This may seem counterintuitive, but there are several reasons why this division of the nerve might result in pain reduction:

1. **Nerve Irritation**: In some cases, the ilioinguinal nerve might be compressed, entrapped, or irritated by scar tissue or the mesh used in the hernia repair. Dividing the nerve can relieve this compression, potentially leading to a decrease in pain.
2. **Neuroma Formation**: After surgical trauma or injury, nerves can sometimes develop abnormal growths called neuromas. Neuromas are bundles of disorganized nerve fibers that can be a source of chronic pain. By dividing the ilioinguinal nerve, the potential for neuroma formation might be reduced or eliminated.
3. **Nociceptive Pathways**: Pain perception involves complex pathways that transmit signals from the site of injury to the brain. Dividing the ilioinguinal nerve can interrupt these nociceptive pathways, thereby reducing the transmission of pain signals.[22,23,24]

The way the ilioinguinal nerve is divided and managed during surgery can influence the outcome. Properly managing the nerve during surgery might prevent further nerve irritation or damage, leading to pain reduction.

Dividing the ilioinguinal nerve during hernia surgery can lead to an increase in hypoesthesia (reduced sensation) in the surgical area due to the interruption of sensory nerve fibers. This outcome might seem contradictory, but it is a well-documented phenomenon in nerve surgery. Here's why dividing the ilioinguinal nerve can result in increased hypoesthesia:

1. **Nerve Disruption**: When the ilioinguinal nerve is divided, the nerve fibers responsible for carrying sensory information from the surgical area to the brain are interrupted. This disruption leads to a lack of sensory input, resulting in a decrease or loss of sensation in the distribution area of the nerve.
2. **Peripheral Nerve Regeneration**: After nerve division, there is a potential for nerve regeneration to occur. However, during the regeneration process, the reconnected nerve fibers might not function optimally or might form abnormal connections. This can result in altered sensory perception, including increased hypoesthesia.
3. **Neuroma Formation**: Neuromas might be associated with altered sensation, including increased hypoesthesia.
4. **Surgical Trauma**: The surgical manipulation and division of the nerve can cause trauma to the nerve fibers. This trauma can lead to scar tissue formation or changes in nerve function, contributing to altered sensation.
5. **Nerve Regeneration and Remodeling**: Nerves have the ability to regenerate and remodel over time. During this process, nerve fibers might not align perfectly, leading to altered transmission of sensory signals. This can result in changes in sensation, including hypoesthesia.[24,25,26]

**CONCLUSION**:

This study demonstrates that ilioinguinal nerve division during Lichtenstein repair significantly reduces chronic groin pain—both at rest and during routine activities—compared with nerve preservation. However, nerve division is consistently associated with a higher incidence of hypoesthesia. These findings emphasise the need to balance pain relief with sensory outcomes when choosing the operative technique. Prophylactic ilioinguinal nerve division may be considered in patients who prioritise postoperative pain reduction, provided they are adequately counselled about the possibility of reduced sensation in the inner thigh or scrotal region.

**Limitations:** The study relied on patient-reported data, which might be subject to recall bias or individual variations in pain perception. Variations in surgical techniques among different surgeons could have influenced the outcomes and introduced confounding variables.

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