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KEY WORDS: Inguinal hernia; Groin; Lichtenstein; Polypropylene mesh; Herniorrhaphy; Ilioinguinal; Neurectomy; Mesh repair.

COMPARATIVE STUDY OF PRESERVATION VERSUS DIVISION OF ILIOINGUINAL NERVE DURING LICHTENSTEIN MESH HERNIOPLASTY IN SOUTHERN ODISHA.

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ABSTRACT

Background: 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.[1] Despite the high incidence, the technical aspects of hernia repair continue to evolve. Chronic pain is defined as "pain lasting for more than 3 months" as per the International Association for the Study of Pain.[2]*Chronic post herniorrhaphy groin pain is defined as pain lasting for more than 3 months after surgery. It is one of the most important complications occurring after inguinal hernia repair and it occurs with greater frequency than previously thought. Majority of chronic pain has been attributed to Ilioinguinal nerve entrapment. Routine excision of the ilioinguinal nerve is an attempt to decrease the incidence of chronic groin pain caused by nerve entrapment, inflammation and fibrotic reactions around the nerve.*

AIMS AND OBJECTIVES: *The purpose of the current study is to evaluate the effect of routine ilioinguinal nerve excision compared to nerve preservation on chronic groin pain, paraesthesia and also on the quality of life when performing Lichtenstein tension free inguinal hernia repair.*

Method: *A total of 100 patients admitted for inguinal hernia at M.K.C.G. Medical College & Hospital Berhampur who met with the inclusion criteria underwent open mesh repair of inguinal hernia over the study period from August 2016 to August 2018.The ilioinguinal nerve was identified and preserved in 50 patients(group A) and elective division of the ilioinguinal nerve was done in 50 patients(group-B).* The primary outcome was the incidence of chronic groin pain at the end of 1 month, 3 months and 6 months following the procedure. Secondary outcomes included incidence of postoperative sensory loss or sensory change at the groin region and quality of life measurement assessed by modified SF-36 questionnaire at the end of 6 months.

Results: About 93 out of 100 patients completed the study protocol fully. The incidence of post-operative groin pain at rest in this study compared ilioinguinal nerve preservation versus routine excision of ilioinguinal nerve showing was 8% versus 6% at 1 month, 8.33% versus 2.05% at 3 months, and 8.52% versus 2.18% at 6 months. The incidence of post-operative groin pain during Normal Daily Activities in this study compared ilioinguinal nerve preservation versus routine excision of ilioinguinal nerve showing was 10% versus 8% at 1 month, 8.33% versus 2.05% at 3 months, and 8.52% versus 2.18% at 6 months. The incidence of post-operative groin pain after Moderate Activities in this study compared ilioinguinal nerve preservation versus routine excision of ilioinguinal nerve showing was 14% versus 12% at 1 month, 8.33% versus 2.05% at 3 months, and 8.52% versus 2.18% at 6 months. The incidence of post-operative groin pain after Vigorous Activity in this study compared ilioinguinal nerve preservation versus routine excision of ilioinguinal nerve showing was 58% versus 48% at 1 month, 50% versus 12.25% at 3 months, and 51.07% versus 10.87% at 6 months. The incidence of post-operative groin pain on Walking in this study compared ilioinguinal nerve preservation versus routine excision of ilioinguinal nerve showing was 30% versus 18% at 1 month, 27.09% versus 2.05% at 3 months, and 21.28% versus 2.18% at 6 months. The incidence of Post Operative hypoaesthesia in this study compared ilioinguinal nerve preservation versus routine excision of ilioinguinal nerve showing was 10% versus 20% at 1 month, and 4.2% versus 18.4% at 3 months , 4.3% versus 13.05% at 6 months. The incidence of post-operative Hyperesthesia compared ilioinguinal nerve preservation versus nerve excision results showed 26% versus 20% at 1 month, 4.17% versus 8.2% at 3 months and 4.26 versus 0% at 6 months.

Conclusion: *The prophylactic excision of the ilioinguinal nerve during Lichtenstein mesh hernia repair decreases the incidence of chronic groin pain after surgery. Furthermore the procedure is not significantly associated with additional morbidities in terms of local cutaneous neurosensory disturbances. So when performing Lichtenstein inguinal hernia repair, routine ilioinguinal neurectomy is a reasonable option.*

INTRODUCTION

The latin word hernia means a rupture or tear.3 A hernia is defined as an abnormal protrusion of an organ or tissue through a defect in its surrounding walls.[4]

Chronic post herniorrhaphy groin pain is defined as pain lasting for more than 3 months after surgery. It is one of the most important complications occurring after Lichtenstein mesh inguinal hernia repair.

Inguinodynia is the recommended generic term for chronic groin pain after hernia repair and should replace "neuralgia or mesh inguinodynia" to promote uniformity and avoid confusion in the literature. Routine ilioinguinal nerve excisions has been proposed as a means to avoid the troubling complication of long term postherniorrhaphy neuralgia. Theoretically excision of ilioinguinal nerve would eliminate the possibility of inflammation neuralgia arising from entrapment, neuroma, fibrotic reactions yet controversies persists and the procedure is not widely accepted. Many investigators and pioneers started to establish algorithm for management of these chronic pain syndrome; others tried to define a method to prevent this complications rather than treat it.

A proposed mechanism for the development of post-operative chronic groin pain is inflammation and fibrosis induced by the mesh, which is in close proximity to the ilioinguinal nerve.5 The purpose of this study was to evaluate the effect of routine ilioinguinal nerve excision compared to nerve preservation on chronic groin pain and other sensory symptoms when performing Lichtenstein inguinal hernia repair.

AIMS AND OBJECTIVES

1. To compare and correlate the therapeutic effectiveness of routine ilioinguinal neurectomy versus nerve preservation with respect to-

a. Post operative groin pain during rest and various activities.
b. Post operative paraesthesia.
c. Post operative patient satisfaction and wellbeing.

2. To arrive at a consensus concerning management of the ilioinguinal nerve during hernia repair and try to provide uniform terminology to be used in this context.

MATERIALS AND METHODS

This is a prospective comparative study conducted in the Department of Surgery, M.K.C.G. Medical College Hospital over a period of 24 months from August 2016 to August 2018. In this study, the clinical material consists of patients admitted with uncomplicated inguinal hernia (both males and females), 50 cases with ilioinguinal nerve preservation (Group A), and 50 cases with elective division of the nerve (Group B).

INCLUSION CRITERIA

1. All patients between the age of 18 and 80 years.
2. All patients with unilateral inguinal hernias either direct inguinal hernia or indirect inguinal hernias.
3. All patients who is fit to undergo elective surgery with good perfomance status.
4. All patients with uncomplicated unilateral hernias.
5. All patients were planned for elective hernia repair.

After explaining the procedure and proposed outcomes to the patients were divided in to two groups group a- undergoing ilioinguinal neurectomy with lichenstein's mesh repair and the second group b-preserving the ilioinguinal nerve in lichenstein's mesh repair.

EXCLUSION CRITERIA:

1. Patients with bilateral inguinal hernias
2. All patients aged below 18 years and above 80 years.
3. All patients with complicated inguinal hernias like obstructed or strangulated inguinal hernias requiring emergency management.
4. Those with recurrent hernias.
5. Those with h/o peripheral neuropathy.
6. Those with impaired cognitive function.
7. Patients with poor performance status.

OBSERVATION AND RESULTS

A total of 100 patients were eligible for the study during the 24 months study period. These patients were randomized with 50 patients each in neurectomy and nerve preservation group.

Seven patients were not followed up regularly after discharge out of which 4 patients belonged to neurectomy group and 3 patients belonged to nerve preservation group, and therefore, only one month data were available for them. These patients were not considered in the results of the study. Rest of the patients were followed for a period of 6 months.

Table 1: Mean Age and Standard Deviation

Group	N	Mean	Std. Deviation	Minimum	Maximum
Neurectomy	50	51.56	15.15	18.00	80.00
Nerve Preservation	50	44.70	14.06	18.00	72.00
Total	100	48.13	14.94	18.00	80.00

In our study, the minimum age of the patient presenting with inguinal hernia was 18 yrs in the neurectomy group and 18 yrs in the nerve preservation group, while the oldest being 80 yrs in the neurectomy group and 72 yrs in the nerve preservation group.

Table 2: Sex Incidence

Sex	Surgery n(%)	
	Neurectomy	Nerve preservation
Male	48 (96.0)	49 (98.0)
Female	02 (4.0)	01(2.0)
Total	50 (100)	50 (100)

P=0.557
In our study, 2 female patients were present in Neurectomy group and 1 female patient was present in Nerve preservation group.

Table 3: Diagnosis - Type of Inguinal Hernia

Inguinal hernia	Surgery n(%)	
	Neurectomy	Nerve preservation
Right Direct	10 (20.0)	13 (26.0)
Left Direct	09 (18.0)	05 (10.0)
Right Indirect	20 (40.0)	22 (44.0)
Left Indirect	11 (22.0)	10 (20.0)
Total	50 (100)	50 (100)

P= 0.642
In our study, the incidence of right indirect hernia was the highest, being 40% in neurectomy group and 44% in nerve preservation group. The least was of left direct hernia.

Table 4: Pre-operative Pain

Pre-operative Pain	Surgery n(%)	
	Neurectomy	Nerve preservation
Absent	22 (44.0)	27 (54.0)
Present	28 (56.0)	23 (46.0)
Total	50 (100)	50 (100)

P= 0.317
Pre-operative pain was present in 56.0% of the patients in the neurectomy group and 46.0% of the patients in the nerve preservation group.

Table 5: Pre-operative Paraesthesia

Pre-operative Paraesthesia	Surgery n(%)	
	Neurectomy	Nerve preservation
Absent	42 (84.0)	47 (94.0)
Present	08 (16.0)	03 (6.0)
Total	50 (100)	50 (100)

P = 0.110
Pre-operative paraesthesia was present in 16.0% patients in the neurectomy group and in 6.0% patients in the nerve preservation group.

Table 6: Pain at Rest

Pain at Rest		Follow up n (%)		
		1 month	3 months	6 months
Neurectomy	Absent	47(94.0)	48(97.95)	45(97.82))
	Present	03(6.0)	1(2.05)	1(2.18)
	Total	50(100)	49(100)	46(100)

Nerve preservation	Absent	46(92.0)	44(91.67)	43(91.48))
	Present	04(8.0)	04(8.33)	04(8.52)
	Total	50(100)	48(100)	47(100)

P= 0.595

Pain at rest was present in 8.5% of the patients in nerve preservation group after 6 months while there is only 2.18% of the of the patients in Neurectomy group. The difference is not significant.

Table 7: Pain experienced during Normal Daily Activities

Pain during Normal Daily Activities		Follow up n (%)		
		1 month	3 months	6 months
Neurectomy	Absent	46(92.0)	48(97.95)	45(97.82)
	Present	04(8.0)	01(2.05)	01(2.18)
	Total	50(100)	49(100)	46(100)
Nerve preservation	Absent	45(90.0)	44(91.67)	43(91.8)
	Present	05(10)	04(8.33)	04(8.52)
	Total	50(100)	48(100)	47(100)

P=0.519

Pain during normal daily activities was present in 8.52% of the patients in Nerve preservation group after 6 months while there is only 2.18% of the of the patients in Neurectomy group. The difference is not significant.

Table 8: Pain after Moderate Activity

Pain after Moderate Activity		Follow up n (%)		
		1 month	3 months	6 months
Neurectomy	Absent	44(88.0)	48(97.95)	45(97.82)
	Present	06(12.0)	1(2.05)	1(2.18)
	Total	50(100)	49(100)	46(100)
Nerve preservation	Absent	43(86.0)	44(91.67)	43(91.48)
	Present	07(14.0)	04(8.33)	04(8.52)
	Total	50(100)	48(100)	47(100)

P=0.426

Pain after moderate activity occurred in 8.52% patients in the Nerve preservation group at 6 months follow up while there is only 2.18% of the of the patients in Neurectomy group. The difference is not significant.

Table 9: Pain after Vigorous Activity

Pain after Vigorous Activity		Follow up n (%)		
		1 month	3 months	6 months
Neurectomy	Absent	26(50.0)	43(87.75)	41(81.93)
	Present	24(48.0)	6(12.25)	5(10.87)
	Total	50(100)	49(100)	46(100)
Nerve preservation	Absent	21(42.0)	24(50.0)	23(48.93)
	Present	29(58.0)	24(50.0)	24(51.07)
	Total	50(100)	48(100)	47(100)

P=0.0096

Incidence of pain after vigorous activity was found to be present in 58% of patients in Nerve preservation group while 48% in Neurectomy group at 1 month follow up. But it is around 51% in Nerve preservation group while it reduced to only around 11% in Neurectomy groupat the end of 6 months follow up which is found statistically significant with P value 0.0096.

Table 10: Pain on Walking

Pain on Walking		Follow up n (%)		
		1 month	3 months	6 months
Neurectomy	Absent	41(82.0)	48(97.95)	45(97.82)
	Present	9(18)	01(2.05)	01(2.18)
	Total	50(100)	49(100)	46(100)
Nerve	Absent	35(70.0)	35(72.91)	37(78.72)
	Present	15(30.0)	13(27.09)	10(21.28)
	Total	50(100)	48(100)	47(100)

P=0.0465

Incidence of pain on walking was 2.18% in the neurectomy group and 21.28% in the nerve preservation group. The difference in the incidence was found to be significant.

Table 11: Post Operative Hypoaesthesia

Post Operative Hypoaesthesia		Follow up n (%)		
		1 month	3 months	6 months
Neurectomy	Absent	40(80.0)	40(81.6)	40(86.95)
	Present	10(20.0)	09(18.4)	06(13.05)
	Total	50(100)	49(100)	46(100)
Nerve preservation	Absent	45(90.0)	46(95.8)	45(95.7)
	Present	05(10.0)	02(4.2)	02(4.3)
	Total	50(100)	48(100)	47(100)

P=0.996

Incidence of hypoesthesia was 13.05% in the neurectomy group whereas it was only 4.3% in the nerve preservation group at the 6 months follow up but the difference was not found to be significant.

Table 12: Post Operative Hyperesthesia

Post Operative Hyperesthesia		Follow up n (%)		
		1 month	3 months	6 months
Neurectomy	Absent	40(80.0)	45(91.8)	46(100)
	Present	10(20.0)	04(08.2)	0
	Total	50(100)	49(100)	46(100)
Nerve	Absent	19(63.3)	29(96.7)	45(95.74)
	Present	13(26.0)	02(4.17)	02(4.26)
	Total	50(100)	48(100)	47(100)

P=0.949

Incidence of hyperesthesia was comparable in both the study groups an 1 month follow up. At 6 months follow up, only 2 patients in the Nerve preservation group was found to have persistent hyperesthesia at the operated site where as it is completely subsided in Neurectomy group.

DISCUSSION

Post operative complications

1. Post operative pain :

Direct meaning comparison of pain between our study and other studies is not possible because of the different available methods used to determine the severity of pain like the Visual Analogue Scale (VAS), Verbal Rating Scale (VRS), 10 point Likert scale, Mc Gill pain questionnaire etc.

In the present study, a validated questionnaire was used to evaluate the pain severity. In this, the patients were asked about the presence or absence of pain in the groin, at rest, pain experienced during normal daily activities, pain after moderate activities, pain after vigorous activities and pain experienced on walking. The questionnaire was updated at every follow up, which was at 1, 3 and 6 months.

Pain at rest:

In the neurectomy study group, pain at rest was present in 6% patients at 1 month which reduced toonly 2.18% at 6 months, whereas in the nerve preservation study group, it was present in 8% patients at 1 month and in 8.52% patients at 6 months post operatively. In the study by Picchio et al6, 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 = 0.595) which compliment the findings of Mui et al7 (P = 0.056) and Picchio et al6 (P = 0.56).

Pain experienced during normal daily activities:
In our study, at the end of 1 month, pain was present in 8% of patients in the neurectomy study group and 10% of patients in the nerve preservation study group. After 6 months, incidence of pain reduced to 2.18% in the first group and 8.52% in the second group. Mui et al7 found a high incidence of pain at the end of the first month, in both the 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 al7 (P= 0.24) and were found to be insignificant between both the study groups (P=0.519).

Pain experienced during moderate activities:
In our study, at the end of 1 month pain was present in 12% of patients of Neurectomy group and 14% of patients in Nerve preservation group where as this pain incidence reduced to 2.18%bin neurectomy group and to 8.52% of patients in nerve preservation group.

Pain after vigorous activity and on walking:
Significant differences were found in the incidence of pain after vigorous activity, between the neurectomy group and the nerve preservation group (10.87% v/s 51.07%; P=0.0096), as well as in the incidence of pain on walking (2.18% v/s 21.28%; P=0.0465) with a noticeable decrease in the incidence of pain in the neurectomy group over the 6 month follow up period.

These findings are consistent with those of Dittrick et al8 (3% v/s25%; P=0.003) and Malekpour et al9 (6% v/s 21%; P=0.033), however, Picchio et al6 reported an almost equal incidence of pain after one year (18% v/s 21%).

Ravichandran et al10, in a pilot study in the year 2000, compared 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.

2.Post operative paraesthesia:
In our study, at the end of the first month of follow up, incidence of hypoesthesia was higher in the neurectomy group (20% v/s 10%) as compared to hyperesthesia which was higher in the nerve preservation group (20% v/s 26%).

At 6 months of follow up, overall incidence of paraesthesia decreased but hypoesthesia persisted in 13.05% patients of the neurectomy group as opposed to 4.3% patients of the nerve preservation group.

These results are comparable with those of Mui et al7 (26% v/s 18.4%) and G.W.Dittrick et al8 (13% v/s 5%).

This finding is complimented by the study of Abdullah et al11, 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 post operative numbness. The explanation being 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.

3. Quality of life:
In our study, there was no significant difference in the health related quality of life between the two study groups. These compliment the findings of Mui et al7. However in a historical cohort survey by Poobalan et al12, patients with chronic pain after hernia repair reported significantly worse scores on three dimensions of the SF- 36: social functioning (P<0.046), mental health (P<0.018) and bodily pain (P<0.001). This difference between patients in our study, suffering from chronic pain, and those of Poobalan et al12 can be explained by the lower mean IQ of our patients, the lower socio economic status of our patients, which makes them more resistant to the emotional and functional aspects of chronic pain and the relative indifference to chronic pain owing to their daily lifestyle and habits.

CONCLUSION
The results of this comparative study demonstrate that prophylactic excision of ilioinguinal nerve during Lichtenstein inguinal hernia repair decreases the incidence of exceptional chronic groin pain after surgery. Furthermore, as the procedure is not associated with additional morbidities in terms of local cutaneous neurosensory disturbances or deterioration in quality of life. Ilioinguinal neurectomy should be considered as a routine surgical step during open mesh hernia repair.

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