SCIENTIFIC ARTICLE

Exploring the impact of prophylactic ilioinguinal neurectomy on neurosensory outcomes in Lichtenstein repair for inguinal hernia: A prospective investigation.

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Abstract

Introduction: Prolonged inguinodynia is a significant issue that arises following mesh hernioplasty. It appears that scar tissue, adhesion to the implanted mesh covering, or damage from sutures are the mechanisms at work. During a Lichtenstein hernioplasty, ileo-inguinal neurectomy may provide prophylaxis against such excruciating pain. The aim of current study is to assess how the implementation of prophylactic ilioinguinal neurectomy influences both the occurrence and intensity of chronic groin pain following a Lichtenstein tension-free repair. Material & methods: The prospective study was undertaken on 50 patients (two groups of 25 each) with inguinal hernia, admitted to the Department of Surgery, Punjab Institute of Medical Sciences, Jalandhar, Punjab. All routine investigations were done. Statistical analysis was done using SPSS software package 25.0 keeping level of significance at $p<0.05$. Results: 36% patients were below 40 years of age while 64% were above 40 years of age. Right sided hernia was more common with R:L ratio of 26:24. 34 cases had indirect and 16 had direct hernia. At baseline and one month follow up none of results were statistically significant while at 6 month follow up results were found significant with respect to development of chronic pain ($p=0.007$), pain after walking 3 flights of stairs ($p=0.02$) and pain after cycling for 10 minutes ($p=0.021$). Conclusion: Following Lichtenstein hernia surgery, preventive ilioinguinal neurectomy dramatically reduces the incidence of chronic groin discomfort without causing new morbidities. It ought to be viewed as a standard surgical procedure carried out during the procedure.

Introduction

Groin hernia repair is one of the most frequently performed surgeries by general surgeons. Several methods have been developed over the years to improve the traditional methods, with the most important innovation being the tension-free mesh repair methods. Relatively few complications are observed with this technique, including local wound complications, recurrent hernias, testicular atrophy, andinguinal neuralgia [1,2]. Until the introduction of mesh-based repairs, the primary concern was preventing recurrences. Since Lichtenstein published one of his first articles on his repair technique, the use of mesh in primary inguinal hernia repair has become popular [3]. This has resulted in an evidence-based reduction in hernia recurrence, with some centers reporting recurrence rates dropping below 1%. With recurrence rates decreased to very low levels, the focus has shifted from preventing recurrence to preventing other complications, such as chronic groin pain [4]. Chronic groin pain emerges as a significant complication post inguinal hernia repair, manifesting with greater frequency than initially anticipated. Several studies, in the last decade, have documented chronic pain incidences ranging from 19% to 62.9% [5]. Diagnosis and definitive treatment constitute a challenging issue for both the surgeon and the patient. Moreover, litigation may occur, especially if the patient is not well informed. Acute pain, effectively addressed with analgesics, typically resolves within a timeframe of 15 to 30 days [6]. Chronic pain seen 3 months after surgery may become a therapeutic challenge. Management may involve analgesia, blocks with local anesthetic drugs, steroids, radiofrequency ablation, or surgery in the form of inguinal neurectomy. Tensionfree mesh repairs are reported to have a lower likelihood of inducing chronic groin pain compared to nonmesh repairs, with no distinguishable distinction between open mesh and laparoscopic mesh repair. Other potential causes contributing to chronic pain after hernia repair include partial division, neuroma formation, injury, or entrapment of the inguinal nerve [7].

The ilioinguinal nerve is highly susceptible to entrapment due to its location beneath the divided external oblique aponeurosis. It can be inadvertently included in the sutures employed for hernia repair or during the reapproximation of the external oblique aponeurosis. The mesh placed atop the

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internal oblique muscle or conjoint tendon can adhere to the ilioinguinal nerve during healing. Nerve excision eliminates post-surgical pain caused by entrapment, inflammation, or fibrotic reaction around the nerve, and there seems to be some theoretical benefit to this practice [8].

Ilioinguinal neurectomy has been extensively documented as an effective intervention for alleviating chronic groin pain post open hernia repair. Numerous studies have discussed the positive outcomes associated with the routine implementation of ilioinguinal neurectomy, highlighting its effectiveness in diminishing chronic pain. A pioneer in this domain, Ravichandran et al. [9], conducted a pilot study in 2000 involving 20 patients with bilateral inguinal hernia. In this study, surgery was performed with the preservation of the ilioinguinal nerve on one side and its division on the other. Additionally, a double-blind randomized clinical trial conducted by Malekpour et al [10], also demonstrated that neurectomy leads to a reduction in chronic post-surgical pain following elective inguinal hernia repair.

The present study was conducted to evaluate the effect of prophylactic ilioinguinal neurectomy on the incidence and severity of chronic groin pain after Lichtenstein tension-free repair. The effects on the incidence of groin numbness and postoperative sensory loss or changes in the groin region were also evaluated..

Methods

The study was conducted on 50 patients diagnosed with inguinal hernia and admitted to the Department of Surgery at Punjab Institute of Medical Sciences, Jalandhar, Punjab. This was a prospective study aimed at investigating the short to midterm neurosensory effects of prophylactic ilioinguinal neurectomy during Lichtenstein repair of inguinal hernia.

A detailed history was obtained, and a thorough clinical examination was performed. Informed consent for the study was obtained. All routine investigations, ECG, and chest X-rays were conducted. Patients were divided into two groups: the study group and the control group, each consisting of 25 cases. All patients underwent standard tension-free mesh repair under spinal anesthesia. Ilioinguinal neurectomy was performed in the study group only. Patients were selected based on the following inclusion and exclusion criteria.

Inclusion criteria

The inclusion criteria for this study encompass individuals aged between 18 and 80 years who have been specifically chosen for elective hernia repair.

Exclusion criteria

The exclusion criteria for this study involve individuals who meet the following conditions: those with bilateral hernia, those experiencing recurrent hernia, those presenting with irreducible hernia, those diagnosed with peripheral neuropathy, and female patients.

Intervention

Study Group: Ilioinguinal nerve was cut sharply with a blade 12 cm lateral to the internal inguinal ring, and 3 to 4 cm of the nerve was excised. After the transection of the nerve, its proximal end was implanted into the internal oblique muscle . Neither electrocautery nor suture material was used in cutting the nerve. To control of bleeding, direct pressure was used when needed. Consent was taen from all patients and t eave informed about irreversible nature.

Control Group: The ilioinguinal nerve was carefully preserved throughout the operation. Extreme care was taken during surgery to avoid the inclusion of nerve tissue during suturing and mesh placement. All patients were followed up on outpatient basis. They were advised to visit at 1 month, 3 months, and 6 months postoperatively, or at any time if they experienced pain.

Statistical analysis

Statistical analysis was based on an intention-to-treat analysis and was performed using statistical software, Statistical Package for Social Science (version 25.0 for Windows). Comparisons were carried out using the Pearson chi-square test or Fisher exact test where appropriate for categorical data and the Student t-test for parametric data. A two-sided P-value of less than 0.05 was considered significant.

Results

A total of 50 patients were enrolled in the study. All patients were male, as per the exclusion criteria. 36% of patients were below 40 years of age, while 64% were above 40 years of age. Right-sided hernia was more common, with an R:L ratio of 26:24. 34 cases had indirect hernias, and 16 had direct hernias, as shown in Table 1.

Table 1 : Baseline characteristics of all patients

Variable		Frequency (percentage)
Age	Below 40 years	18 (36)
	Above 40 years	32 (64)
Side of hernia	Right	26 (52)
	Left	24 (48)
Type of hernia	Indirect	34 (68)
	Direct	16 (32)

The two groups were studied regarding various pain parameters at the baseline, and the results indicated that none of them showed statistical significance, as illustrated in Table 2.

Table 2: Showing comparison of two groups at baseline

Variable	Study group N (%)	Control group N (%)	P value
Pain at rest	2 (8)	1 (4)	0.53
Pain after coughing for 10 times	5 (20)	7 (28)	0.64
Pain after walking 3 flights of stairs	5 (20)	4 (16)	0.48
Pain after cycling for 10 min	5 (20)	6 (24)	0.82
Patients with groin numbness	1(10)	1(4)	0.43
Complications			
Wound infection	I (4)	0 (0)	1.0
Hematoma	2 (8)	3 (12)	1.0
Retention of urine	4 (16)	3 (12)	1.0
Others	I (4)	0 (0)	1.0

A comparison of the two groups was conducted at the one-month follow-up, and it was found that none of the results showed statistical significance, as illustrated in Table 3.

Table 3: Showing comparison of two groups at one month follow up

Variable	Study group	Control group	P value
Patients developed chronic pain at 6 months	2(8)	7 (28)	0.007*
Pain experienced during normal daily activities	0 (0)	1 (4)	0.23
Pain at rest	0 (0)	2 (8)	0.057
Pain after coughing for 10times	1 (4)	5 (10.2)	0.25
Pain after walking 3 flights of stairs	1 (4)	3 (12)	0.02 *
Pain after cycling for 10 min	1 (4)	4 (16)	0.021 *
Patients with groin numbness	7 (28)	5 (20)	0.363
Patient developed sensation change or loss	11 (44)	11 (44)	0.930

At 6 months follows-up, chronic pain (p=0.007), pain afterwalking 3 flights of stairs (p=0.02 and pain after cycling (P=0.021) was significantly higher in the control group (table 4).

Table 4: Showing comparison of two groups at six months follow up.

Variable	Study group	Control group	P value
Pain experienced during normal daily activities	16 (64)	15 (60)	0.35
Pain experienced at rest	4 (16)	4 (16)	1.0
Pain experienced after coughing for 10 times	4 (16)	4 (16)	1.0
Pain experienced after walking 3 flights of stairs	2 (8)	5 (20)	0.11
Pain experienced after cycling for 10 min	1 (4)	4 (16)	0.12
Patients with groin numbness	5 (20)	16 (64)	0.13
Patients developed chronic pain at 1 month	19 (76)	19 (76)	1.0
Patients developed sensation changes or loss	13 (52)	14 (56)	0.36

Discussion

Chronic groin discomfort following inguinal hernia surgery is a debilitating complication, with a significant impact on a patient's well-being and quality of life following the procedure [1,2]. Because of the mesh's close proximity to the ilioinguinal nerve, there is a suggestion that inflammation and fibrosis may contribute to the development of chronic groin discomfort after surgery [11]. Additionally, the occurrence may be attributed to inadvertent injury or entrapment of the ilioinguinal nerve during suturing. Accumulating evidence suggests that prophylactic ilioinguinal nerve excision during open hernia repair seems to be linked with minor complications and has the potential to reduce the incidence of chronic groin discomfort after surgery [12-14].

Due to the underpowered nature of the initial randomized study conducted by Ravichandran et al. to address this issue, no definitive conclusions could be reached. Subsequent investigations into chronic groin pain after elective neurectomy have produced conflicting results. Surprisingly, in a retrospective analysis encompassing 191 patients who underwent elective ilioinguinal nerve excision following open hernia repair, none of the individuals reported enduring groin pain, at the 12-month postoperative assessment [9]. Dittrick et al conducted a retrospective analysis and discovered that patients who had elective neurectomy following open inguinal hernia repair experienced a significantly lower incidence of chronic groin discomfort [12]. A recent randomized controlled trial by Picchio et al [15] reported a simillar incidence of chronic groin pain in the

the ilioinguinal nerve excision group and the control group, contradicting these findings.

In this study, 36% of patients were below 40 years of age, while 64% were above 40 years of age. The mean age of patients within the prophylactic neurectomy group, as observed in the study conducted by Mui et al., was recorded at 65.1 years [16]. Likewise, in the study by Ravichandran et al. the mean age of participants was slightly higher at 65.2 years [9]. A prevalence of right-sided hernias was noted, with a ratio of 26:24 for right-to-left occurrences. Among the cases examined, 34 were identified as indirect hernias, while 16 presented with direct hernias. In study conducted by Picchio et al, the majority of patients, accounting for 67%, exhibited indirect inguinal hernias, while 30% had direct hernias, and 3.5% displayed a mixed type of inguinal hernia [15]. In study conducted by Malekpour et al, the distribution of hernia types revealed that 84% of patients had indirect inguinal hernias, 9% had direct inguinal hernias, and 7% presented with a mixed type [10].

In line with the findings of Picchio et al, the current studyl found that the incidence of chronic groin pain during regular daily activities was comparable in the two groups [15]. The current study also discovered that a notably lower proportion of patients in the neurectomy group experienced persistent groin pain after exertion (going up three flights of stairs and cycling for ten minutes). The morbidity linked to sensory loss over the groin area is another possible drawback of ilioinguinal neurectomy. Patients who underwent nerve excision during open hernia surgery had a higher rate of sensory loss to pain and touch in the groin area, according to a prior study by Picchio et al [15].

The present investigation, however, conclusively demonstrated that, at the 6-month follow-up, elective ilioinguinal nerve excision was not associated with any additional morbidities in terms of neurosensory issues, groin numbness, or quality of life. We hypothesized that cross-innervations from contralateral cutaneous nerves could compensate for the sensory loss resulting from neurectomy.

This study is subject to several limitations. The inability to discern significant variations between the two groups concerning the incidence or intensity of persistent groin pain after surgery, during routine daily activities, or subsequent to coughing raises concerns about potential errors or limitations within the study. Another notable limitation is the lack of exploration into the long-term effects of ileoinguinal neurectomy. It is conceivable that, with an extended follow-up period, disparities in the incidence of chronic pain between the groups and assessments of quality of life might undergo alterations. To comprehensively investigate the enduring impact of prophylactic neurectomy in patients undergoing Lichtenstein repair, larger-scale clinical trials with an expanded patient cohort and prolonged follow-up periods are imperative. Lastly, even if the study successfully demonstrates that preventative neurosurgery diminishes the prevalence of chronic pain, the precise causative factors behind this phenomenon remain unknown. Further investigations, such as histology or nerve conduction studies, are necessary to elucidate the exact processes involved.

Conclusions

The current study concluded that the incidence of exertional chronic groin pain following surgery is reduced when the ilioinguinal nerve is excised prophylactically during Lichtenstein inguinal hernia repair. Additionally, there are no extra morbidities related to local cutaneous neurosensory abnormalities following the treatment. An ileoinguinal neurectomy could be regarded as a standard surgical procedure when repairing an open mesh hernia.

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