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A randomised control study on neurosensory outcomes of ilioingunal neurectomy in Lichtenstein's hernia repair

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ABSTRACT

Background: Chronic groin pain is a major cause of post-operative morbidity in open inguinal mesh hernia repair. Neurectomy is a well-established treatment modality. This study was performed to evaluate the neurosensory outcomes of prophylactic neurectomy in open mesh hernia repair.

Aim: To assess the incidence of inguinodynia in patients undergoing open mesh hernia repair And to study, the neurosensory outcomes of sacrificing the ilioinguinal nerve in comparison to the group in which a nerve is identified and preserved.

Materials and methods: A prospective double-blinded study was performed at Kasturba Medical College, Manipal from September 2008 to December 2009. The ilioinguinal nerve was either preserved or sacrificed according to the surgeon's choosing. Pain and hyposthesia were studied at defined timed intervals by a single observer.

Results: 105 inguinal hernia mesh repairs were enrolled into the study. Nerve excision was done in 44 patients and preserved in 61 patients. Ninety patients were followed till six months. At post-operative day 1, all patients in both the groups had pain and 15.2% had numbness. Chronic post surgical inguinodynia was seen in 16.7% of the population in the study group and numbness in 5.6% of the study population at six months.

Conclusion: The severity of pain in the neurectomy group was less than the control group. There were no significant differences in the neurosensory outcomes of prophylactic ilioinguinal neurectomies in open mesh hernia repair compared to nerve preservation and hence prophylactic neurectomy is presently the choice of most surgeons.

Key words: *Neurectomy, inguinodynia*

Introduction

Chronic groin pain can be a debilitating complication significantly affecting the quality of life following open mesh hernia repair. The overall incidence of inguinodynia is estimated to be around 25% [1] with a spectrum of severity intensity. Ten percent of these patients are estimated to fit the definition of severe pain [1]. Multiple treatment modalities have been suggested in the treatment of inguinodynia, starting from NSAIDs to acupuncture. Surgical resection of the involved nerve has been a common approach in the treatment of this debilitating pain. This has prompted many surgeons to perform prophylactic neurectomy of the inguinal nerves, either singly or in combination with the ilioinguinal nerve, iliohypogastric nerve and genitofemoral nerve. The theoretical benefit behind this

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could be the elimination of nerve injury during hernia repair and nerve entrapment by the fibrotic response during the wound healing process. If this is true, a second surgery would be rendered unnecessary and the financial burden for the patient reduced. The present work seeks to assess the incidence of chronic groin pain and the neurosensory effects following prophylactic ilioinguinal neurectomy in open mesh hernia repair compared to the nerve preserved group.

Materials and Methods

A prospective double-blinded study was conducted in Kasturba Hospital, Manipal between September 2007 and February 2009. Informed consents were obtained from all participants. Patients between the ages of 18 and 75 were included in the study. All received spinal anesthesia and open mesh repair was conducted in all patients. Patients with previous inguinal or ipsilateral scrotal surgeries, recurrent hernia, irreducible or strangulated hernia, laparoscopic hernia repair, female patients, femoral hernia, anatomical tension repairs and patients in whom the nerve was not identified were excluded.

Baseline measurements were completed preoperatively with a visual analogue scale (VAS score) for pain on a scale of 0 to 10 and a dichotomous scale for numbness (present/absent). To standardize the methods, a 24 G needle was used to check for pain sensation. The VAS score was then coded to a 4 point scale (none, mild, moderate and severe). These baseline measurements were taken as the control. This data was entered on a questionnaire. Patient was not revealed to which group they belonged to (neurectomy group/nerve preserved group), thus eliminating subjective bias. Nerve was either sacrificed or preserved as per surgeon's preference. The observer was not informed of the identity of the surgeon. At the end of the study period, the neurectomy status of the patient was revealed to the observer, thus eliminating observer bias (double-blinded). When the nerve was sacrificed, the cut ends were coagulated and buried. Standard Lichenstein mesh hernia repair was then performed on all the patients. In the patients where nerve was preserved, caution was taken not to include the nerve in suturing and mesh placement.

Patients were followed at post-operative day 1 and 30 and at 6 months post-operatively. At each visit, pain and numbness was assessed in the two groups. The mean age, frequencies of sex, laterality of the hernia, and the type of hernia was studied as secondary outcomes.

Statistical analysis was performed using Statistical Package for Social Science [SPSS] version 14 software for windows. Comparisons were carried out by the Z test for proportions with a confidence level of 95%. A Z–values of more than 0.05 were considered significant.

Results

A total of 204 patients underwent inguinal hernia repair during the study period at Kasturba Hospital, Manipal. After exclusions, 95 patients were enrolled in the study, out of which 10 patients had bilateral inguinal hernia. Therefore, a total of 105 inguinal mesh hernia repairs were enrolled in the study. In 44 hernias, neurectomy was performed and 61 hernia ilioinguinal nerves were identified and preserved (Figure 1).

In the excluded group, (Table 1) ilioinguinal nerves were not identified in 12 hernias and laparoscopic hernia repair was performed in 30 patients. Patients undergoing scrotal surgeries and with recurrent hernias were excluded as both caused a breach in nerve supply in the

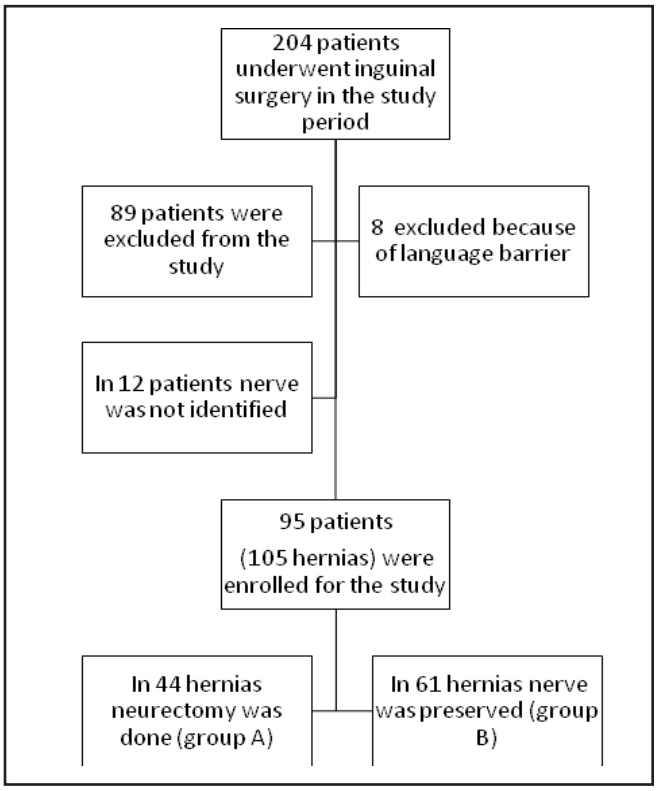

Figure 1. Flow chart of the double-blinded control study.

Table 1. Excluded cases from the study.

Scrotal surgeries	21
Recurrent hernias	11
Obstructed hernias	5
Femoral hernias	3
Bassini's repair	2
Laparoscopic hernia repair	30
Femoral hernia in obstruction	1
Illiterates	16
Nerve not identified	62
Language barrier	8

area supplied by the ilioinguinal nerve, and thus a probable inaccuracy in assessment. As much attention could not be paid to ilioinguinal nerve in emergency situations like obstructed hernias, such cases were excluded. Anatomical tension repairs were known to cause severe non-neuropathic groin pain, and thus excluded. In general, illiterates and a number of patients with whom proper communication was not possible because of the language barrier and were excluded to remove the subjective and observer bias.

The mean age of the patients in the study group was 57.5 years, with the youngest being 18 years and the maximum age was 78 years. 68 patients (64.8%) had indirect hernia, 31 had direct hernia (29.50%) and 6 had both indirect and direct components of a hernia (5.70%).

Pre-operatively, all patients were interviewed and baseline assessment of the neurosensory system completed with regard to pain and numbness (Table 2,3). 90.9% (40 of 44) of the patients in the neurectomy group and 83.6% (51 of 61) of the patients in the nerve preserved group did not complain of pain pre-operatively. 13.3% (14 of 105) of the patients in the study group complained of pain. 13.6% (6 of 44) in the neurectomy and 19.7% (12 of 61) in the nerve preserved group had numbness pre-operatively. The incidence of numbness in the distribution of ilioinguinal nerve pre-operatively was 17.1% (18 of 105) in the study group. Statistically, both groups were comparable. The baseline measurements of pain and numbness were taken as a control post-operatively. Six (42.90%) patients having pain and 8 (44.40%) having numbness had inguino-scrotal hernias which were long standing.

On post-operative day one, all patients had pain. 61.6% (61/99) of the patients had a mild intensity of pain - 67.5% (27/40) in the neurectomy group and 55.9% (33/59) in the nerve preserved group. 36.4% (36/99) of the patients had a moderate intensity of pain - 32.5% (13/40) in the neurectomy group and 39% (23/59) in nerve preserved group. Three (3% of the total patients) patients in the nerve preserved group (5.1% of group B) had severe intensity of pain. However, there was no statistically significant difference in the incidence of pain in either group. 27.50% (11/40) in the neurectomy group and 7.00% (4/59) of the patients in the nerve preserved group developed numbness post-operatively on day one. There was a statistically significant difference ($Z < 0.05$) in the incidence of numbness on post-operative day one.

Table 2. Pain assessment in the two groups at the predefined time intervals.

Pain assessment		Neurectomy performed	Nerve preserved	Total
Pre-operative pain	No pain	40	51	91
		90.90%	83.60%	86.70%
	Mild	4	10	14
		9.10%	16.40%	13.30%
	Total	44	61	105
Pain on post-operative day one	No pain	0	0	0
		0%	0%	0%
	Mild	27	33	60
		67.50%	55.90%	60.60%
	Moderate	13	23	36
		32.50%	39.00%	36.40%
	Severe	0	3	3
		0%	5.10%	3.00%
	Total	40	59	99
Pain at 30th post-operative day	No pain	35	38	73
		87.50%	69.10%	76.80%
	Mild	5	15	20
		12.50%	27.30%	21.00%
	Moderate	0	2	2
		0%	3.60%	2.20%
	Total	40	55	95
Pain at 6 months post-operative	No pain	35	40	75
		92.10%	76.90%	83.30%
	Mild	3	10	13
		7.90%	19.30%	14.40%
	Moderate	0	2	2
		0	3.8%	2.30%
	Total	38	52	90

Table 3. Assessment of numbness in the two groups at predefined time intervals.

Assessment of numbness		Neurectomy performed	Nerve preserved	Total
Pre-operative numbness	Present	6	12	18
		13.60%	19.70%	17.10%
	Absent	38	49	87
		86.40%	80.30%	82.90%
	Total	44	61	105
Numbness on post-operative day one	Present	11	4	15
		27.50%	7.00%	15.20%
	Absent	29	55	84
		72.50%	93.00%	84.80%
	Total	40	59	99
Numbness at post-operative day 30	Present	9	2	11
		22.50%	3.60%	11.60%
	Absent	31	53	84
		77.50%	96.40%	88.40%
	Total	40	55	95
Numbness at 6 months post-operative	Present	4	1	5
		10.50%	1.90%	5.60%
	Absent	34	51	85
		89.50%	98.10%	94.40%
	Total	38	52	90

At the 30th post-operative day (short-term analysis), 21% (20/95) of the patients had a mild intensity of pain and 2.2% (2/95) of the patients had a moderate intensity of pain. In the neurectomy group, 12.50% (5/40) and 27.30% (17/55) in the nerve preserved group had a mild intensity of pain. None were receiving analgesics for pain. There was no significant difference in the incidence of pain between the two groups. The incidence of numbness on post-operative day 30 was 22.50% (9/40) in the neurectomy group and 3.60% (2/55) in the nerve preserved group. There was ($Z < 0.05$) statistical significance in the incidence of numbness at post-operative day 30.

Six months post-hernia repair (mid-term analysis), 16.70% (15/90) of the patients had pain. 7.90% (3/38) in the neurectomy group and 25.70% (12/52) in the nerve preserved group had pain. 14.40% (13) of the patients had mild intensity of pain and 2.30% (2) of the patients had moderate intensity of pain in the study group. In the 13 patients who experienced a mild intensity of pain, 3 (7.90%) belong to the neurectomy group and 10 (19.20%) belong to the nerve preserved group. Both the patients (2.30% = 2/90) with moderate intensity of pain at 6 months belong to the nerve preserved group i.e. 6.70% (2/52). The two patients who had moderate intensity of pain continued to have pain and were taking analgesics intermittently. There was no statistically significant difference in the incidence of pain at 6 months post-operatively. At 6 months post-operatively, 10.50% and 1.90% of the patients continued to have numbness in the neurectomy group and the nerve preservation group. Yet, there was no statistically significant difference in the incidence of numbness at 6 months post-intervention.

Discussion

Though it is difficult to differentiate between neuropathic and non-neuropathic pain, morbidity is caused to the patient along with legal issues as a result of the pain to the hernia surgeons, and is worth noting. The concept of neurectomy is not new. Lichenstein was one of the first to suggest prophylactic inguinal nerve excision as an option in avoiding post-hernia repair groin pain [2]. The theoretical benefit that this method would remove the potential cause for the chronic pain in post-hernia repair made many surgeons perform prophylactic neurectomies in open inguinal mesh repair. Several randomized control trials have been published to strengthen this view, though the controversies still persist. Mesh hernia repair, which is now performed in almost all cases of inguinal hernia repair, is now considered a significant etiological factor for increased incidence of neuropathic pain in post-hernia repair owing to the degree of fibrotic reaction induced by it. Ilioinguinal, iliohypogstric and the genitofemoral nerve are the three main nerves that traverse the surgical field and are prone to become entrapped in the fibrotic tissue and injured directly during hernia repair.

A retrospective review by Dittrick et al. found that ilioinguinal neurectomy during open, tension-free mesh repair resulted in significantly less pain after one year compared with routine nerve preservation, 3% and 25%, respectively [3]. A double-blinded, randomized controlled trial to investigate the effects of prophylactic ilioinguinal neurectomy following tension-free mesh repair of inguinal hernia was conducted by Mui et al., with 100 male patients randomized into two groups: prophylactic ilioinguinal neurectomy or ilioinguinal nerve preservation. The incidence of chronic groin pain

at 6 months was significantly lowered compared with the nerve preservation group (8% versus 28.6%, P = 0.0008) and there was no significant difference in the incidence of neurosensory complaints, including groin numbness and sensory loss [4]. However, Pappalardo et al. performed unilateral iliohypogastric neurectomy on 100 men requiring bilateral inguinal hernia repair, with each patient also serving as a control. They failed to demonstrate significant differences in the incidence of sensory abnormalities between the two sides and also in the intensity of pain after 7 days post-repair [5]. A double-blind study by Picchio et al. on 813 patients showed that, one year after surgery, pain was present in 23.5% of nerve preserved and 27% of nerve-transected patients with a 95% confidence interval, with severe pain being recorded in 2% and 3% respectively. They suggested that postsurgical pain after hernia repair was not affected by elective ilioinguinal nerve division, yet sensory disturbances in the area were significantly increased [6].

This study sought to investigate the incidence of inguinodynia and then compare the incidences of ilioinguinal neurectomy group and the nerve preserved group. The study was double-blinded to avoid subjective and objective bias. The pre-operative data collected was used as a control.

In the work presented here, it was that demonstrated that there was no significant difference in the incidence of pain at any time interval studied. However, variation in the intensity of pain was observed. At the end of 1 and 6 months, no patients in the neurectomy group had either moderate or severe intensity of pain. The incidence of chronic inguinodynia at the end of six months was 16.7%, with 13.3% of the patients belonging to the nerve preserved group and 3.4% of the patients belonging to the neurectomy group. None of the patients in the neurectomy group had any disabling pain. There was a significant difference in the incidence of numbness at the 1st and the 30th post-operative days. At the end of 6 months, there was no significant difference in the incidence of numbness between the two groups.

This study is the first of its kind from the Indian subcontinent, to the best of the authors' knowledge. Considering the ethnic, cultural, literacy and the pain tolerance differences versus the west, where the majority of studies have taken place regarding this issue, studies like the present one in which pain is the primary outcome are to an extent debatable and cannot be generalized. Pain is quite subjective, even with the use of well-established scoring systems such as the visual analogue score, and accuracy in assessing the intensity is questionable. As there is evidence that there will cross innervation between the nerves passing through the inguinal region, beneficial outcomes from ilioinguinal neurectomy alone are potentially doubtful. More studies with larger sample sizes and decreased dropouts in the follow up, multicenter-based including different ethnic and cultural groups and involving different combinations of nerves passing through the surgical field are needed. As of now, it is thought there was no reason why neurectomy should not be performed as there was an observed decrease in the intensity of pain despite there being no significant decrease in the incidence and morbidity of numbness.

Conclusion

Prophylactic inguinal neurectomy offers a permanent solution to chronic inguinodynia following inguinal hernia surgery and can be offered to selected patients after a careful discussion.

Conflict of interest statement

The authors have no conflicts of interest to declare.

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