



Routine Ilioinguinal and Iliohypogastric Nerve Excision in Lichenstein Hernia Repair - A Prospective Study of 50 Cases

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Abstract

Chronic inguinal neuralgia is one of the most significant complications following inguinal hernia repair. Subsequent patient disability can be severe & may often require numerous interventions for treatment. The purpose of the study is to evaluate long term outcomes following nerve excision to nerve preservation when performing lichenstein inguinal hernia repairs.

A prospective study of cases with excision of ilioinguinal & iliohypogastric nerve excision during lichenstein hernia repair with post operative groin repair at 6 month & 1 yrs from May 2015-17 was carried out in the Deptt. of General Surgery, VSSIMSAR, Burla.

Introduction

No disease of human body, belongs to the province of the surgeon, requires its treatment, a better combination of accurate anatomical knowledge with surgical skill than hernia in all its variety. This statement made by SIR Astley Cooper, 1804 & really a true aphorism to all hernia surgeons.

In most of the surgical OPDs, Inguinal hernia is a common entity. Indirect Inguinal Hernia or Oblique inguinal hernia is the most common of all forms of hernia.

In adult males, 65 % of inguinal hernias are indirect & 55% are right sided. The hernia is bilateral in 12% of cases.

Chronic inguinal neuralgia is one of the most significant complications following hernia repair. Incidence of long term (≥ 1 year) postoperative

neuralgia reported for Lichtenstein repair of inguinal hernias range from 6% to 29%. The probable cause of chronic inguiniodynia after hernioplasty due to entrapment, inflammation, ligation, neuroma or fibrotic reactions involving ilioinguinal, iliohypogastric & genital branch of genito-femoral nerve. Routine ilioinguinal nerve & iliohypogastric nerve excision has been proposed as a means to avoid the troubling complication of long term postherniorrhaphy neuralgia. This excision would eliminate the above mentioned possibilities.

Insult to the nerves may occur in form of Primary

- Partial / complete division
- Stretching
- Crushing
- Electrical damage

Secondary

- Entrapment
- Irritation by an adjacent inflammatory reaction.
- Adherence & Cicatricial compression with mesh
- Neuroma formation.

Usually the primary injury is not

Appreciated at operation, nor is the etiologic lesion, identifiable with certainty after the neuralgia begins. Residual neuralgia deserves attention because they may result in severe morbidity and may become difficult to manage.

Study Group

During this period 50 patient were eligible for the study. All were admitted to this hospital for inguinal hernia repair (herniorrhaphy or hernioplasty)

Inclusion Criteria

1. Age 20-80 years.
2. Males

Exclusion Criteria

- I. Recurrent hernia
- II. Irreducible/ Strangulated hernia
- III. Patients with
 - Previous h/o stroke
 - Peripheral neuropathy
 - Neuromuscular diseases.
 - Diabetes mellitus

As from such patients no definite conclusion about pain or paresthesia can be made.

- IV. Patients having Pre-operative inguinal neuralgia.

All the patients were divided in to 2 groups based on routine excision of ilioinguinal nerve & iliohypogastic (Group – A) & preservation of ilioinguinal & iliohypogastic.

Principles Followed During the study

1. All patients received the standard technique of hernia repair i.e. Lichtenstein's tension free hernioplasty using polypropylene mesh.

2. All repair had been performed by one surgeon & team.
3. Iliioypogastric & illioinguinal were: identified & excised during operation.

Post operative Assessment:-

- Through personal interview & clinical examination at 1 month routine post-operative check-up at our surgery OPD.
- Through telephone at 6 month and at 1 year Post-Operatively.

Out Comes evaluated are

1. Chronic Post herniorrhaphy groin pain

a. Mild Pain

- Occasional pain or discomfort
- Does not limit activity
- Return to pre hernia life style

b. Moderate Pain

- Prevents return to normal preoperative activities such as sports & lifting
- Analgesics rarely being needed

c. Severe Pain

- Incapacitating
- Interferes with activity of daily living
- Frequent need of analgesics

2. Paresthesia (Numness) as told by the patients.

In this present study patients Were not aware of excision of ilioinguinal nerve & iliohypogastric nerve.

Evolution of Hernia Surgery

The earlier record of inguinal hernia dates back to approximately 1500 BC. The ancient Greeks were well aware of inguinal hernias & the term derives from the Greek word, meaning an offshoot a building or bulge.

The Latin word 'hernia' means a rupture or tear. In the earlier part of first century AD, Celus described the operation in vogue at that time in the Greco-Roman area.

Little information was added to the literature until the beginning of 18th century. From this time until the 19th century anatomy of inguinal region was described & accurately defined.

Irving Lichtenstein (Born 1920)

Lichtenstein received his medical education & surgical training at Hahnemann Medical School. He is a Diploma of the American Board of Surgery (1950) & became a fellow of the American College of Surgeons in 1952. Lichtenstein is the founder & director of the **Lichtenstein Hernia Institute in Los Angeles.**

Lichtenstein Tension- free Hernioplasty

Since the first true herniorrhaphy was performed by Bassini over 100 year ago, all modifications & surgical techniques have shared a common disadvantages: suture line tension. The anatomic, physiologic & pathologic characteristics of hernia recurrence are examined. The prime etiologic factor behind most herniography failure is the suturing together, under tension of structure that is not normally in opposition.

With the use of modern mesh prosthetics, it is now possible to repair all hernia without distortion of the normal and with no suture line tension. The technique is simple, rapid, less painful and effective. Allowing prompt resumption of unrestricted physical activity with the prosthesis for the repair of inguinal hernia in mind and focusing on the principal of “no tension” (considered one of the great principals of surgery by Halsted), the Lichtenstein group popularized routine use of mesh in 1984 and coined the term “tension – free hernioplasty”.

Main Principles in Lichtenstein Repair

- In the tension free hernioplasty instead of suturing anatomic structures that are not in apposition (conjoint tendon & inguinal ligament), the entire inguinal floor is reinforced by insertion of a sheet of mesh.
- The prosthesis, which is placed between the transversalis fascia & the external oblique aponeurosis extend well beyond the Hesselbach’s triangle to provide sufficient mesh/issue interface.
- On increased intra abdominal pressure the external oblique aponeurosis applies counter pressure on the mesh thus using the intra abdominal pressure as a positive factor.

Technique of the Operation

1. Exploration of Inguinal Canal
2. Indirect Hernia Sac– separated from the cord up to neck and inverted into the abdomen without excision, suture or ligature.
3. Direct Hernia Sac – if large inverted by means of a single absorbable invaginating suture.
4. Monofilament Polypropelene Mesh is Used:-
 - Size 8 x 16 cm/5 x 10 cm
 - Surface texture promotes fibroplasias
 - Monofilament structure does not perpetuate or harbor infection.
 - Elicit little tissue reaction.
 - They are not rejected even in the presence of infection.

Fixation of Mesh

- Medical end of mesh made rounded to the shape of medical corner of inguinal Canal.
- **First Stitch** – Rounded corner is sutured with polypropelene (1-0) to the aponeurotic tissue over the pubic bone (periosteum of the bone is avoided). The mesh should overlap the bone by 1 to 1.5 cm because failure to cover this bone can result in recurrence.
- **The Lower Edge** is tacked in place by a continuous suture to the inguinal ligament up to a point just lateral to the internal ring. Suturing the mesh beyond this is unnecessary and could injure the femoral nerve.
- A slit is made at the lateral end of mesh creating two tails, a wide one (2/3) above and narrower (1/3) below. The cord is placed between two tails near internal ring.
- The superior edge of the mesh is loosely secured by similar continuous suture (interrupted in our Institution) to the rectus sheath & conjoined muscle & tendon above.
- The wider upper tail is crossed & placed over the narrower one. A single polypropelene suture approximates the tail of mesh to inguinal ligament lateral to the internal rings.

This creates a new internal ring made of mesh.

Outcomes of the Operation

1. Post-operative pain: less than other procedure.
2. Chronic groin pain: 6 % to 29% according to different studies.
3. Return to work :
 - 2 – 14 days post-operatively, depending upon patient's occupation.
 - 2 days longer in bilateral inguinal hernias.
4. Recurrence Rate:
 - Uniform results from different studies in different institution < 1%
 - Some hernia recurred at pubic tubercle because of failure to overlap the bone with mesh.
5. Infection, hematoma & Seroma: Seen approximately < 1% of cases.

Results of different studies

1. Can safely be performed under local anesthesia
2. Immediate mobilization of patients.
3. Early return to work.
4. Minimal patient's discomfort.
5. Uniformly low recurrence rate <1%
6. **Gaining increasing acceptance with surgeons around the globe.**
7. 70% British surgeons are now using the Lichtenstein tension free method of hernia repair.

Anatomy of Inguinal Canal

It is a musculo-aponeurotic tunnel about 3.75 cm long and extends from the deep inguinal ring to the superficial inguinal ring. The canal is directed downwards, forwards & medially above and parallel with the medial half of the inguinal ligament.

Boundaries of Inguinal Canal

The canal presents anterior & posterior walls, roof, floor, inlet & outlet.

Anterior Wall

1. External oblique muscle
2. Internal oblique muscle

Posterior Wall

1. Aponeurosis of transverses abdominis muscle
2. Fascia transversalis
3. Conjoint tendon (formed by aponeurotic fibers of internal oblique & transversus abdominis) in front of fascia transversalis.

Roof

1. Lower edge of the internal oblique muscle
2. The transversus abdominis muscle & aponeurosis.

Floor

Grooved upper surface of inguinal ligament (poupart's)

Upper surface of the lacunar ligament (Gimbernats)

Inlet of the Canal i.e. Deep inguinal ring:

It is a normal defect in the transversalis fascia. It is an oval gap in fascia transversalis about 1.25 cm above the mid-inguinal point (mid-point between anterior superior iliac spine and the symphysis pubis).

Structure Passing Through Superficial Ring:

Ilio-inguinal nerve.

Contents of spermatic cord:

1. **Vas deferens**- Most important structure & passes along posterior part of cord.
2. **Arteries**
 - a. Testicular artery from abdominal aorta
 - b. Cremasteric artery from inferior epigastric
 - c. Artery to vas deferens from superior or inferior vesical artery.

Sensory Nerves of Groin

1. Iliohypogastric
2. Ilioinguinal
3. Genital branch of genitor-femoral

Iliohypogastric Nerve (L1)

This emerges from the upper lateral border of psoas major, crosses, obliquely behind lower renal pole and in front of quadratus lumborum (here the nerve intervenes between the subcostal vessels & nerve above and the ilioinguinal nerve below)

↓
At the lateral border of quadratus lumborum the nerve pierces the aponeurotic origin of transversus abdominis

↓
Runs between internal oblique and transversus abdominis & supplies both the muscles

↓
Close to iliac crest it divides into

↙
Lateral cutaneous branch

↓
Pierces the internal & external oblique muscle

↓
Crosses behind the tubercle of iliac crest

↓
Supplies posterolateral gluteal skin

↓
Anterior cutaneous branch

↓
Passes forward & medially

↓
Pierces fleshy part of internal anterior superior iliac spine.

↓
Then finally becomes cutaneous by piercing the external oblique aponeurosis

↓
Supplies suprapubic skin

- Iliohypogastric nerve connects with subcostal and ilio-inguinal nerves.
- Occasionally branches of the iliohypogastric are seen passing anterior to

the inguinal canal and crossing the ilioinguinal nerve as they descend to thigh.

Ilioinguinal Nerve (L1)

It is smaller than iliohypogastric nerve & arises with it from the first lumbar ventral ramus.

Course

Emerges from lateral border of psoas major, caudal to iliohypogastric

↓
Passes obliquely across the quadratus lumborum & the upper part of iliacus.

↓
At the anterior end of iliac crest perforates the transversus abdominis, sometimes connecting with iliohypogastric nerve

↓
About 2.5 cm medial to anterior superior iliac spine pierces internal oblique, supplying it and enters inguinal canal.

↓
Traverses the inguinal canal below the spermatic cord or round ligament of uterus.

↓
Leaves the inguinal canal through superficial inguinal ring with spermatic cord/round ligament of uterus.

Supplies

- Upper & medial part of thigh
- Root of the penis
- Upper part of scrotum
- Skin covering mons pubic & labium majus in female.
- It is encountered in its usual position only in 60% of the patients.
- When aberrant, the course and position of the ilioinguinal nerve are.
 - (a) Behind the cord
 - (b) Within the cremaster muscle.
- Ilioinguinal nerve may sometimes do not exist and cannot be found.
- Sometimes exists as very small fibers.
- Occasionally branches and inhibit of the nerve fan out over the spermatic cord and in an anterior groin hernioplasty.

It is usual to preserve this nerve, but it can interfere with the placement of the mesh and may be traumatized inadvertently during operation. Nerve entrapment is a cause of chronic pain following hernia surgery and division of the nerve may be required for relief.

Genito-femoral Nerve (L1 L2)

Origin: it is formed by the ventral rami of the first and second lumbar nerves (L1, L2)

Femoral Branch:

Descends lateral to the external iliac artery

Crosses the deep circumflex iliac artery



Passes behind the inguinal ligament.



Enters the femoral sheath lateral to femoral artery



Pieces the anterior layer of femoral sheath & fascia late.



Supplies the skin over the upper part of front of thigh

Diagnostic Consideration of Chronic Residual Neuralgia

Following Open Tension-Free Inguinal Hernia Repair

- Character of chronic residual of neuralgia.
 - Invariably out proportion to the apparent pathology
 - Profound change in mood and behavior and a depressive effect predominates.
 - Interpersonal relationships are disturbed and patients are unable to return to work.
- Divided into 2 types on the basis of pathogenesis
 1. Nociceptive (somatic) chronic pain
 2. Differentiation (central) chronic pain

1. Nociceptive (somatic) chronic pain

Cause

- Repeated activation of pain fibers by the proliferation of nerve fibers outside the

neurilemma of a partially or completely divided nerve (neuroma formation)

- Compression of nerve by scar or suture.

Character

- More or less permanent, varying degree often burning and without spontaneous paroxysms.
- Body movements aggravates the pain while some body position alleviate the discomfort.
- Percussion of neuroma causes a severe lancinating pain.
- Hyperesthesia occur in areas innervated by the nerve.
- Potentially treatable by surgical neurectomy or excision of the offending lesion.

2. Differentiation (central) chronic pain

Cause

- Interruption of afferent pathways of the peripheral sensory nerves.
- Lesions in peripherals nerve & involvement of CNS.

Character

- Burning type and permanent with spontaneous paroxysmal exacerbations.
- Onset of pain is delayed
- Initially the area of skin involved is anesthetic, but this is soon replaced by variety of unpleasant sensations like hyperesthesia, hyperalgesia, hyperpathia & allodynia.

Identification of sensory nerve involved

- Identifying the nerve by clinical distribution of pain is often inaccurate because the 3 sensory nerves in groin intermingle.
- By local anesthesia nerve blocks-
 - Iliohypogastric & ilioinguinal nerves can be blocked in the groin
 - Neuralgia from genitofemoral nerve can be identified by blocking L1 & L2 paravertebrally.

Chronic Post-Herniorrhaphy Groin pain

Lichtenstein et al (1988) described the cause of severe and persistent pain after hernia surgery is due to sensory nerve crushing. They have described an operative technique that prevents inadvertent crushing or division of sensory nerves to groin with persistent postoperative pain, the offending nerve is usually difficult to identify. They first differentiate whether the pain is due to ilioinguinal or genitocrural causalgia. When the particular nerve is incriminated, its division will ordinarily cure the problem.

Charles P. Heise et al (1998) reported 117 inguinal reexplorations performed for inguinodynia and 20 of these patients has primary mesh herniorrhaphy (3 patients had their initial repair performed Laparoscopically)

Chronic groin pain persisted for 12. $\pm$ 1.7 months before reexplorations 4 patients underwent plus inguinal reexploration & mesh neurectomy. After remedial surgery, patients were followed up for 15.9 $\pm$ 3.1 months. The 10 of 16 patients who had mesh removal plus neurectomy reported good to excellent results (62 %) compared with 2 of 4 reporting the same with mesh removal only (50%).

Lastly they concluded that Mesh inguinodynia i.e. (Mesh herniorrhaphy with chronic groin pain) is a definite symptom for patients. Remedial inguinal surgery with mesh removal and neurectomy will cure this problem.

George. E. Wantz (1993), performed about 1882 anterior hernioplasties since 1970, the ilioinguinal nerve was intentionally divided in 546 patients. Chronic groin pain was not seen in neurectomy group, but was seen in whom nerve had been carefully preserved. So according to some surgeons routine excision of ilioinguinal nerve prevent the development of inguinal neuralgia.

Poobalan et al (2001), reported the frequency and characteristics of chronic pain following open inguinal hernia repair and identified certain risk factors for its development. In this study 351 patients underwent surgery for inguinal hernia by open methods. Out of these 226 patients (64%)

completed the questionnaire. 30 % of subjects reported chronic pain and reported pain was predominantly neuropathic in character. Patients at increased risk of chronic pain were under 40 years old, had day-case surgery, had subsequent surgery on the same side and recalled pain operation.

Effect of ilioinguinal neurectomy on chronic post-herniorrhaphy groin pain.

Ravichandran et al (2000) studied 20 patients with primary bilateral hernia. Both sides were repaired by a single surgeon under GA using Lichtenstein tension free hernioplasty. In one side ilioinguinal nerve was divided cleanly lateral to the deep ring where it would not interfere or come into contact with the mesh and in other side the nerve preserved. Patients were assessed for pain & numbness at 1 day, 1 month and 6 month post-operatively.

There is no evidence that elective division of ilioinguinal nerve is associated with any significant improvement in post-operative symptoms, but the limited sample size precludes any firm conclusions.

George W. Dittrick et al (2004) published the incidence of postoperative neuralgia was significantly lower in ilioinguinal Neurectomy group versus the nerve preservation group at 1 month 5% Vs 21 % at 6 months: 3 % Vs 25%. There was no significant difference in the incidence of postoperative neuralgia at 3 years i.e. 6% Vs 8%.

Observations

Patient Profile

1	Total no. of patients	50
2	Sex (all males)	50
3	Age	20-80 Years
4	Number of patients available At 1 month follow up	25 (group A), 25 (group B)
5	Number of patients available At 6 month follow up	24 (group A), 22 (group B)
6	Number of patients available At 1 year follow up	24 (group A), 22 (group B)

At. 1 year Post-operative follows up

S. No.	Authors	Postoperative groin pain		Post-operative Paresthesia	
		Gr. A	Gr. B	Gr. A	Gr. B
1	George. W. Dittrick et al (20014)	3%	25%	13%	5%
2	Tsakayanis et al (2004)	0%	-	6.28%	-
3	Marcello Picchio et al (2004)	24%	27%	6%	4%

Incidence of Post-herniorrhaphy groin pain and numbness in our present study:

Overall incidence of chronic groin pain in our prospective study.

Follow up period	Nerve excision gr. A	Nerve preservation gr. B
6 month	12.4%	22.7%
1 year	4.16%	22.7%

Incidence of postoperative paresthesia (numbness) over groin

Follow up period	Gr. A nerve excision		Gr. B Nerve Preservation	
At. 6 month	4/24	16.64%	2/22	9.08%
At 1 year	3/24	12.48%	2/22	9.08%

Incidence of post-operative groin at 1 year

Pain	Gr. A,n=24 nerve excision grp		Gr. B,n=22 Nerve Preservation	
Presence of pain	1	4.16%	5	22.7%
Mild pain	1	4.16 %	4	18.16%
Moderate pain	0	0%	1	4.54%
Severe pain	0	0%	0	0%

Results

- A total of 50 patients were admitted for primary inguinal hernia repair (unilateral or bilateral), satisfying all the inclusion criteria in the study.
- All were evaluated properly with preoperative minimum routine investigations.
- All patients were polypropylene mesh, by a single surgeon (operated with), with the

standard technique every time. All repairs were done under spinal anesthesia.

- In one group of 25 patients i.e. (Gr – A) ilioinguinal nerve iliohypogastric was identified and excised.
- In another group of 25 patients i.e. (Gr – B) ilioinguinal nerve iliohypogastric & preserved. In 4 patients the nerve could not be identified & were included in nerve preservation group.
- In all cases, early post-operative period was uneventful, during the hospital stay. In few patients urinary retention was a problem on 1st day of operation and was managed by bladder catheterization.
- During hospital stay they were administered.
 - Injectable antibiotics for first 2 days & injectable analgesic on 1st day.
 - Then the patients were switched over to oral antibiotics.
- Stiches were removed on 7th post operative day and were discharged with a scrotal support.
 - In all cases wounds were healthily
 - No residual scrotal edema in any cases.

The present study has several limitations

1. Unable to perform clinical neurological examination at 6 month & 1 year for loss of pain & touch sensation.
2. Long term effort of ilioinguinal neurectomy was not followed up.
3. Able to show that prophylactic neurectomy decreases the incidence of chronic groin pain, the exact reasoning behind this phenomenon remains unknown.

Conclusion

This present study was conducted to evaluate the effect of excision of ilioinguinal nerve and iliohypogastric nerve tension free hernioplasty on postoperative chronic groin pain and paresthesia in the department of General Surgery, VSS IMSAR, Burla during the period from May 2015 to 2017. A total of 50 patients were admitted for primary inguinal hernia repair (unilateral or bilateral)

satisfying all the inclusion criteria in the study. All patients were treated with Lichtenstein tension free hernioplasty with polypropylene mesh by a single surgeon with the standard technique every time.

In 4 patients the nerve could not be identified & were included in nerve preservation group. In all cases early post-operative period was uneventful, during the hospital stay.

Post operative assessment for chronic groin pain and numbness was carried out at 6 month and 1 year. At the end of the study both the group of patients i.e. nerve excision group (Grp – A) and nerve preservation group pain (Grp – B) were compared for (i) incidence of post herniorrhaphy groin pain (ii) incidence of post herniorrhaphy groin numbness.

This prospective study showed a satisfactory significant decrease in the incidence of post operative groin pain at 6 months and 1 year for patients in the ilioinguinal nerve & iliohypogastric excision group versus nerve preservation group. This study also clearly demonstrated that elective excision of ilioinguinal nerve and iliohypogastric nerve were not accompanied by a significant increase in post-operative groin numbness.

Furthermore, there was a consistence decrease in incidence of post – operative numbness with increasing time period in nerve excision group.

The result of this prospective trial demonstrate that prophylactic excision of iliohypogastric nerve ilioinguinal nerve during Lichtenstein tension free hernioplasty:

1. Significantly decrease the incidence of chronic groin pain after surgery.
2. Not associated with additional morbidities in term of local cutaneous neurosensory disturbances.
3. Safe to perform
4. Well tolerated by the patients
5. High patient satisfaction in terms of no recurrence & no pain.

So ilioinguinal and iliohypogastric neurectomy should be considered as a routine surgical step during open mesh hernia repairs.

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