ORIGINAL ARTICLE

Comparative study on the post-operative pain and outcomes of mesh fixation with non-absorbable sutures versus absorbable sutures in Lichtenstein inguinal hernia repair

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Abstract

Introduction: Chronic groin pain is the most common and irritating post-operative complication after Lichtenstein mesh hernioplasty for inguinal hernia surgery. The occurrence and handling of chronic groin pain has posed a significant challenge to surgeons around the globe. An effort to reduce chronic groin pain we designed this study to compare the possible influence of delayed absorbable suture used for mesh fixation in tension free inguinal hernia repair on the rate of chronic groin pain.

Material and Methods: Prospective study conducted in Surgical Unit-III, Abbasi Shaheed Hospital, Karachi. It includes all the male patients ages 18 years and above admitted for elective inguinal hernia mesh repair. Half of the patients (Group A) mesh fixation was done with polypropyelene non-absorbable monofilament sutures and in other half (Group B) polyglactin delayed absorbable braided sutures are used. Post-operative chronic pain was assessed using Visual Analogue Scale (VAS) at the time of discharge, post-operative day 07, 1 month and 3 months follow up.

Results: There were 156 patients admitted in the Surgical Unit-III for elective surgery of inguinal Lichtenstien hernioplasty from July 2018 to June 2021 which were included in this study. Majority of our patients were of old age, with mean age was 49.1 years (range 18 - 74 years). 93(60%) patients are between 40 and 60 years of age. 87(56%) patients had Right, 55(35%) of patients had Left and 14(9%) patients had bilateral inguinal hernia. 06(4%) patients had recurrent inguinal hernias.

Chronic pain at 3-months follow up was present in 25 patients constituting 16% of all patients undergoing hernia repair. Patients were divided into groups of No (0), mild (1–3), moderate (4–6), and severe pain (>6) on basis of 10 point Visual Analogue Scale (VAS) score. It was found that majority, 14-patients had mild pain, 7-patients had moderate pain, and 4-patients had severe pain 3-months after hernioplasty. Chronic groin pain was occurred in 20.51% and 11.53% in Group-A and Group-B respectively.

Conclusion: In present study, we have found more incidence of post-operative pain in non-absorbable suture group as compared to absorbable suture group at different time intervals. A 3-months follow-up provided evidence that the use of absorbable sutures for mesh fixation decreases groin pain in patients after inguinal hernia repair with similar recurrence rate.

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Introduction:

Groin hernia is one of the most common condition for which primary care physicians refer patients for surgical management. 5% of the male population will develop a groin hernia in their lifetime,[1] making groin hernia repair one of the most common operations performed by general surgeons.[2] Inguinal hernia formation

depends on genetic, environmental, metabolic, and individual patient factors such as activity level, immune status, infections, medications, personal habits, chronic cough, chronic constipation, urine outflow obstruction and changes in body mass index.[3] Surgical repair should be considered in patients with symptomatic inguinal hernias.

Lichtenstein hernioplasty was first described in 1989.[4] Lichtenstein open tension-free repair using extraperitoneally placed polypropylene mesh is a simple technique, and can be carried out easily and at any time may be done under local anesthesia.[5] It is the preferred and widely accepted technique for primary inguinal hernia surgery due to its safety, efficacy, and low recurrence rates.[6,7] The recurrence rate in Lichtenstein hernioplasty is <1%.[8]

Chronic pain, after Lichtenstein inguinal hernia repair, remains a frequent and disabling complication of hernia repair which reduces the quality of life.[9] Chronic groin pain has a major impact on physical, emotional, and cognitive functions. Chronic pain can negatively affect patients' social life and their ability to work and secure an income. The occurrence and handling of Chronic Groin Pain (CGP) has posed a significant challenge to surgeons. The reported incidence of CGP varies from 0.7% 10 to 62.9%11 in the medical literature. Various causes for post-operative pain from Liechtenstein inguinal repair have been suggested, one of them being the use of non-absorbable sutures for fixing the mesh to the inguinal ligament and rectus sheath. Excessive collagenization and entrapment of the nerves during mesh fixation may result in chronic groin pain. Thus, an effort to reduce chronic pain was done in the form of using delayed absorbable sutures in mesh fixation. In our study we compare the post-operative outcomes of mesh fixation with non absorbable sutures versus delayed absorbable sutures in Lichtenstein open inguinal hernia repair.

Various causes for chronic groin pain (Inginodynia) from Liechtenstein inguinal repair have been suggested, such as neural tissue damage, nerve entrapment and the fibrosis induced by non absorbable mesh.[12]

The inguinal region has a rich neuronal in nervation, supplied by the ilioinguinal, iliohypogastric, genital branch of genitofemoral and lateral cutaneous branch of femoral nerve.[13] To avoid injury and post-operative complications it is vital to know the basic anatomy and course of these nerves.

The ilioinguinal nerve is located between the external and internal oblique layers covered and guarded by investing fascia of the internal oblique muscle. Passing suture through the internal oblique /conjoined tendon for mesh fixation has a potential risk of entrapping the nerve by the suture. The variability in the anatomical position and course of ilioinguinal nerve influence incidence of complications.[14]

The genital branch of the genitofemoral nerve is located under the cord, covered by the deep cremastericfascia. To prevent injury the nerve must be kept with the cord while the cord is separated gently from the inguinal floor to avoid damage to the cremasteric fascia. Lichtenstein and Amid recommended preservation of the ilioinguinal, iliohypogastric, and genitofemoral nerves.[4,15]

Material and Methods:

A single blinded prospective randomized comparative study included adults aged 18 and above years with inguinal hernia who underwent Lichtenstein's mesh hernioplasty in Surgical Unit-III Abbasi Shaheed Hospital a tertiary academic hospital. Prior approval of local ethical committee was obtained.

After obtaining an informed consent, a sealed envelope with suture type allocation was randomly selected by the patients undergoing tension free inguinal hernia repair. The envelope was opened in the operating room just before the mesh fixation stage of hernioplasty. Patients were allocated into two groups. The group-A

Table 1: Distribution of age

Age (years)	No of patients	% age of patients
18-29	28	18%
30-39	19	12%
40-49	37	24%
50-59	56	36%
60 & above	16	10%

included the patients in which mesh was fixed with monofilament non-absorbable Polypropyelene "0" suture and group-B included the patients in which mesh fixation was done with braided absorbable Glactin "0" sutures.

There were 156 patients included in the study who were admitted during a period from July 2018 to June 2021. Pre-operative evaluation of patients for any associated condition that leads to increased intra-abdominal pressure such as chronic cough, constipation, altered bowel habits or bladder outlet obstruction.

Most of the hernia repairs were done in spinal/epidural anesthesia by giving the injection of local anesthetic solution into the subarachnoid/epidural space at the level of the lumbar spine. All the patients received one dose of first-generation cephalosporin pre-operatively and two doses postoperatively after 6 and 12 hour of surgery.

In this procedure, the parainguinal incision was given, skin was incised and deepened to reach the external oblique aponeurosis. External oblique aponeurosis was opened along the direction of its fibers. A plane of cleavage is created between the external oblique aponeurosis and the conjoint tendon superiorly. The inguinal ligament was identified by dissecting the floor of inguinal canal. The cremasteric muscle with cord structures were hooked out. Ilioinguinal nerve is preserved to avoid entrapment and chronic pain in the pos-toperative period. For direct hernias, the sac is inverted using purse string suture and plication of the fascia transversalis was done. In the case of indirect inguinal hernia, the sac was opened at the fundus and the contents, if any must be reduced. Sac is transfixed at its neck and the excess sac was excised. Wide, deep ring is narrowed by suture ligation.

In Lichtenstein's repair[15] apiece of polypropyelene mesh measuring approximately 6cm by 11cm is used to reconstruct the inguinal floor. The mesh is fixed to the pubic tubercle, inguinal ligament laterally and to the transversalis fascia and conjoint tendon medially by interrupted sutures. The mesh is slit at the level of internal ring, and the two limbs which encircled around the spermatic cord and fixed with the inguinal ligament, creating a new internal ring. Hemostasis was achieved and wound was closed in layers. The external obliqueaponeurosis was closed over the cord structures with continuous 2-0 delayed absorbable sutures. The Scrapa's fascia and subcutaneous tissues were brought together and the skin was approximated with running subcuticular non-absorbable suture.

Post-operatively, the patients were treated with analgesics and were discharged as soon as they feel comfortable. Follow-up was scheduled at 1-week, 1-month, and 3-months after surgery. In the follow-up, all the patients were assessed for the development of any post-operative complication along with the hernia recurrence and results were tabulated. The statical analysis was done using the SPSS software and p value <0.05 was considered significant.

Patients with post-operative groin pain were assessed using 10 point Visual Analogue scale at the time of discharge, post-operative day-7, 1-month, and 3-months follow up. Chronic groin pain (can be mild, moderate or severe) is defined as the presence of pain, discomfort, or analgesic requirement. Pain existing for more than 3-months after the surgery is classified as chronic groin pain. The effect of physical activity and recurrence rates were also recorded.

Results:

There were 156 patients included in the study who were admitted in the Surgical Unit for elective surgery of inguinal Lichtenstien hernioplasty from July 2018 to June 2021.

Table 2: Types of hernias

Types of hernias	No of patients	% age of patients
Indirect hernias	95	61%
Direct hernias	52	33%
Combined	09	6%
Total	156	100%

Table 3: Types of Anesthesia

Types of Anesthesia	No of patients	% age of patients
Local	05	3.20%
Spinal	143	91.68%
General	08	5.12%

Table 4: Post-operative pain comparison between non-absorbable Monofilament (Polypropyelene) Sutures and absorbable Braided (Polyglactin) Sutures groups

Post-operative time	Pain score	polypropyelene	n%	Glactin	n%	Total
1 week	no pain	00	O%	02	1.2%	02
	mild	41	52.5%	40	51.2%	81
	moderate	26	33.3%	32	41.0%	58
	severe	11	14.1%	04	5.1%	15
1 month	no pain	27	34.6%	28	35.8%	55
	mild	37	47.4%	39	50%	76
	moderate	09	11.5%	08	10.2%	17
	severe	05	6.4%	03	3.8%	08
3 month	no pain	62	79.6%	69	88.4%	131
	mild	09	11.5%	05	6.4%%	14
	moderate	04	5.1%	03	3.8%	07
	severe	03	3.8%	01	1.2%	04
Chronic pain		16		9		25

6-patients lost to follow up after hernioplasty. 2-patients died with in 3-months of follow up. 1-patient who had hernioplasty using non absorbable suture for mesh fixation died 6 weeks after repair due to cerebrovascular event. One other patient who is a known case of ischemic heart disease died from acute myocardial infarction 12 weeks after hernioplasty with mesh fixation using absorbable sutures. Out of 164 patients 8 patients were excluded from the study.

Majority of our patients were of old age mean age 49.1 years (range 18 - 74 years). 93(60%) patients are between 40 and 60 years of age (Table 1). 87 (56%) patients had Right, 55(35%) of patients had Left and 14(9%) patients had bilateral inguinal hernia. 06(4%) patients had recurrent inguinal hernias 4-patients had right and 2-patients had left recurrent inguinal hernias. Majority of patients had Indirect inguinal hernias 61%.(Table 2)

52% of patients had defect <1.5 cm, 29% had defect 1.5 – 3cm and 19% had defect >3cm. Majority of cases were done in spinal anesthesia 91.68% (Table 3).

To grade the pain, we used the 4-point verbal-rank scale. No pain (0), mild (1-3), moderate (4-6) and severe (7-10) pain.

Patients were given analgesics Intramuscular and then oral Diclofenac sodium, for pain relief for one week not more than twice daily. All patients were ambulatory next day. 32-patients required further analgesics for one more week. 18-patients required analgesics for another two weeks while only 7-patients had analgesics for one more post-operative month. 4-patients require analgesics on strenuous work after 3-month of surgery.

All patients were advised not to do strenuous exercises or lifting heavy weights for six weeks post-operatively. The median absence from work after hernia repair was seven days and may be 14 days for those doing strenuous work.16% patients had occasional discomfort on strenuous activity for 3months after surgery.

Chronic pain at three-month follow up was present in 25 patients constituting 16% of all patients undergoing hernia repair. Patients were divided into four groups of No pain (0), mild (1–3), moderate (4–6), and severe pain (>6) on basis of VAS score, it was found that majority, 14 patients had mild pain, 7 patients had moderate pain, and 4 patients had severe pain at 3 month post-operatively.(Table 4)

Table 5: Post-operative complications

Post-operative complications	No of patients Poly-propylene sutures	No of patients Poly-glactin sutures
Seroma	06	06
Hematoma	03	04
Wound infection	02	01
Chronic groin pain	16	09
Recurrence	01	01
Foreign body fistulae formation	01	00
Urinary retension	07	08
skin anesthesia	03	02

There were 2-recurrences at the end of 3-months in each group. A 60-year old patient with chronic cough known case of chronic obstructive pulmonary disease had a recurrence of right inguinal hernia. 6-weeks after hernioplasty using absorbable sutures. The recurrence was on the medial end where the stitch had given away. The other patient 55 years old, with uncontrolled diabetes had wound infection post-operatively and had recurrence of hernia ten weeks after using non absorbable suture for mesh fixation.

Chronic groin pain is the most common post-operative complication after inguinal hernia repair with polypropyelenemesh (Table 5).

There was appearance of severe post-operative pain in 11 patients, 5 patients, and 3 patients after 07 days, after 1-month and after 3-months, respectively in non-absorbable suture group, while for absorbable suture group, severe post-operative pain appeared in 4-patients, 3-patients, and 1-patient after 07 days, after 1 month and after 3-months, respectively.

Moderate post-operative pain was observed in 26 patients, 9 patients, and 4 patients after 07 days, after 1 month and after 3 months, respectively in non-absorbable suture group, while for absorbable suture group, moderate post-operative pain appeared in 32-patients, 8-patients, and 3 patients after 07 days, after 1 month and after 3 months, respectively.

Mild post-operative pain occur in 41 patients, 37 patients, and 9 patients after 07 days, after 1 month and after 3 months, respectively innon absorbable suture group, while for absorbable suture group, mild post-operative pain appeared in 40-patients, 39-patients, and 5-patients after 07 days, after 1 month and after 3 months, respectively.

In our study the possible reason for less chronic groin pain at 3 months is that the polyglactin is an absorbable, synthetic, braided suture and is completely absorbed by hydrolysis within 60 days.

Discussion:

Chronic post-operative inguinal pain is one of the most common complication following inguinal hernia repair, occurring in nearly 20% of patients 9.[16] In another study 3% to 11% of patients with Lichtenstein hernioplasty suffer from severe debilitating post-operative pain.[17] The causal factors can include irritation of inguinal nerves by sutures or mesh.[18] an inflammatory reaction to the mesh and sutures[19] or simply hypertrophic tissue scaring.[20]

The definition of chronic pain was most frequently used, which states that chronic pain is any pain that persist beyond the normal tissue healing time usually taken to be 3 months.[21] David Bande et al reported that for the chronic post-operative pain, the following criteria should be satisfied: the pain developed after a surgical procedure, it persisted for at least 3 months, no other causes, such as cancer or chronic infection, could be found to explain the pain, and absence of the same pain (location or sensation) before surgery.[22] Yang Y defined chronic pain as 'pain that develops after a surgical procedure and lasts at least two months excluding non surgical causes for the pain.[23]

Pain assessment was commonly carried out by Visual Analog Scale (VAS) score with a score of 0 as No pain, 1-3 as mild, between 3-6 as moderate, and >6 as severe pain.[24]

Chronic pain can be classified into three grades. Mild= occasional discomfort or pain not interfering with daily activities. Moderate = discom-

fort or pain occasionally interfering with daily activities. Severe = discomfort or pain interfering with daily activities.[25,26]

The chronic groin pain (CGP) can be divided according to origin into neuropathic and non-neuropathic causes. Neuropathic causes of CGP include direct trauma to the nerves in the inguinal region during surgery, nerve entrapment during suture fixation of the mesh, mesh related fibrosis, post-operative fibrosis. Non-neuropathic causes of CGP include the periosteal reaction of suture fixation at the pubic tubercle, the displacement of the mesh, an inflammatory reaction to the mesh and potentially the use of micro porous heavy weight mesh for hernia repair.[27]

Iatrogenic injury to the ilio inguinal nerve during Lichtenstein repair is also associated with chronic groin pain.[28] The incidence of ilioinguinal nerve lying lateral or adherent to the spermatic cord was 15.5% and 21.6% respectively and increased the chances of iatrogenic nerve injury during mesh fixation. In 3.5% patients nerve is adherent to the conjoint tendon. In 35.5% patients ilio inguinal nerve was not seen in hernioplasty and increased risk of iatrogenic injury.[29]

It is important to make an attempt to identify and preserve the ilioinguinal nerve during hernioplasty. The nerve should not be dissected out from its sheath or exteriorized behind the external oblique aponeurosis because of the risk of exposing the nerve to fibrosis around the mesh that could result in neuropathic groin pain.

Non-absorbable suture use in inguinal hernia repair is associated with a higher rate of chronic pain and a longer time to pain disappearance as compared with absorbable sutures.[30] Chronic groin pain after surgery was higher in the non-absorbable monofilament suture group compared with the absorbable braided suture group (37 versus 26 patients.[31] In our study CGP was more in non-absorbable sutures group 16 versus 9 patients.

The polyglactin is a synthetic absorbable suture has a tensile strength 50% at 3 weeks and is completely absorbed in 60 days. In iatrogenic entrapment of nerve during hernioplasty, the patients may have pain during initial period after surgery but the pain usually subsides after 2 months due to complete hydrolysis /absorption of the polyglactin sutures.

The sutures interrupted or continuous used to fix the mesh affect the integrity of the inguinal ligament and strenuous movement of the leg causes chronic discomfort and pain. Different suture materials are used, but the influence of various sutures on post-operative pain has not been widely studied. Recently, a number of studies demonstrated that patients whose mesh was secured by glue had less pain than those with a suture-fixation technique.[32,33] We proposed that short-term absorbable sutures would be equivalent to glue because they dissolve and cause less nerve irritation and pain than non-absorbable sutures. Polyglactin is an absorbable, synthetic, braided suture and holds its tensile strength for approximately 3 to 4 weeks in tissue and is completely absorbed by hydrolysis within 60 days.[34]

Nienhuijs and colleagues[35] studied 334 patients after primary inguinal hernia repair and found an inverse correlation between the intensity of chronic pain and age. We found similar results in our study, suggesting that younger age contributes to the presence and intensity of pain after inguinal hernia repair. A more vigorous and contractile wound-healing process and a more active lifestyle, which can be attributed to younger men, serve as a possible explanation for our findings. The chronic groin pain is also more common in patients who underwent recurrent inguinal hernia repair.[36]

In patients who have genetic and familial tendency of increased collagen synthesis and to form hypertrophied and keloid scar may have increased incidence of chronic groin pain.

The incidence of groin pain decreases with post-operative time. Incidence of chronic pain after lichtenstine repair at 2 months was 6% and af-

ter 12 months decrease to 3%.[37] In our study 14 and 11 patients had moderate to severe pain at one month in non-absorbable and absorbable sutures fixation respectively. The moderate to severe pain decreased to 7 and 4 respectively at 3 months follow up.

Conclusion:
It is safe to use delayed absorbable sutures material for mesh fixation in Lichtenstein tension free open inguinal hernia repair. A 3-months follow-up provided evidence that the use of absorbable sutures for mesh fixation decreases groin pain in patients after inguinal hernia repair with similar recurrence rate.

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Role and contribution of authors:
Azfaruddin Qureshi, collected the data, references and did the initial writeup.

Aisha Tasneem, helped in collecting the data and also helped in introduction writing.

Mehmood Ahmed Khan, helped in collecting the references and also helped in abstract writing.

Shameen Shoaib, helped in collecting the data and also helped in discussion writing.

S Ashraf Hassan, critically review the article and made final changes.

Dr Mohammad Aurangzaib, collected the references and also helped in material and methods writing.

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