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A longitudinal study of the prevalence of post-surgical inguinodynia and the factors responsible for the development of chronic pain among the patients undergoing open hernioplasty at a tertiary care center

Prabhu T[1], Aakash Kumar Indransh[2], Laishram Sanjana[3]

[1]Assistant Professor, Department of General Surgery, [3]Assistant Professor, Department of Community Medicine, Arunai Medical College and Hospital, Tiruvannamalai, Tamil Nadu, [2]Assistant Professor, Department of General Surgery, MVJ Medical College and Hospital, Bengaluru, Karnataka, India

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ABSTRACT

Background: Chronic groin pain (Inguinodynia) is a potential complication following inguinal hernia mesh repair and has a significant impact on the quality of life. The incidence varies among studies ranging between 0% and 62.9%. **Aims and Objectives:** The present study was conducted with the objectives of estimating the prevalence of post-surgical inguinodynia among the patients undergoing open hernioplasty. The secondary objective was to assess the factors associated with the development of post-surgical inguinodynia. **Materials and Methods:** A longitudinal study was carried out in a tertiary care center in Bangalore, Karnataka among the hernia patients attending the outpatient department of General Surgery department. A pro forma prepared with expert validation was used to collect details regarding pre-operative characteristics, type of anesthesia, intraoperative findings, and post-operative complications. The pain was assessed by the visual analog scale. Descriptive statistics and Chi-square test were used to identify the risk factors. **Results:** A total of 112 patients underwent hernioplasty. Out of this, 108 were males and 4 were females. The mean age of the patients was 48 ± 10.8 years. Majority of them (84, 77.7%) presented with indirect inguinal hernia. The prevalence of inguinodynia at 3-month post-hernia surgery was 21.4% (n = 24). Patients with significant pre-operative pain had higher chances of developing chronic pain (P = 0.000). It was found that post-operative surgical site infection was associated with increased chances of development of chronic pain (P = 0.000). **Conclusion:** Our study found that around one-fifth of the hernia patients had developed chronic post-surgical inguinal pain following open hernioplasty. There was no significant relationship between patients' characteristics and development of chronic post-operative pain. The presence of pre-operative pain and post-operative infection in the patients was significantly associated with the development of chronic pain. Intraoperative nerve identification and chronic post-operative pain did not have a significant relationship in our study. Most of the patients who developed chronic pain had experienced only mild pain and none of them had severe inguinal pain. From the findings of our study, we would like to recommend that all measures must be taken to prevent and treat post-operative surgical site infection which leads to the development of chronic pain in patients.

Key words: Inguinodynia inguinal hernia; Hernioplasty; Visual analog scale

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Address for Correspondence:
Dr. Laishram Sanjana, Assistant Professor, Arunai Medical College and Hospital, Department of Community Medicine, Tiruvannamalai, Tamil Nadu, India. **Mobile:** +91-9562685065. **E-mail:** drsanjlaishram143@gmail.com

INTRODUCTION

Hernia by definition is a protrusion of a viscous or a part of viscous through an abnormal opening in the walls of its containing cavity. There are many classifications for hernias, but the Nyhus classification is accepted worldwide. Inguinal hernia is the most common abdominal wall hernia and accounts for 80% of the total hernias in adults. Around 90% of all groin hernias are inguinal hernias, which affect 25% of adult males in their lifetime. An indirect inguinal hernia is the most common hernia, regardless of gender.[1] Chronic Groin Pain (Inguinodynia) is a potential complication following inguinal hernia mesh repair and has a significant impact on the quality of life. The incidence varies among studies, ranging between 0% and 62.9%, with 10% of patients fitting in the moderate-to-severe pain group.[2] The definition of pain devised by the International Association for the Study of Pain (IASP) is as follows: Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage. Chronic pain is any pain which persists beyond the normal healing period of 12 weeks. Post-herniorrhaphy groin pain is defined as pain lasting >3 months after surgery, which is one of the most important complications occurring after inguinal hernia repair, and occurs with greater frequency than previously thought.[3] Mild pain lasting for a few days is common following mesh inguinal hernia repair. However, moderate-to-severe pain persisting more than 3 months after inguinal herniorrhaphy should be considered as pathological. The major reasons for chronic groin pain have been identified as neuropathic causes due to inguinal nerve(s) damage or non-neuropathic causes due to mesh or other related factors.[4] Recurrence rate in mesh inguinal hernia repair is less than in non-mesh inguinal hernia repair.[5] Various types of meshes have been discovered to combat with chronic groin pain-related problems. The use of polypropylene mesh (heavy weight) leads to formation of rigid scar plates, and stiffness of abdominal wall, leading to physical discomfort limiting the daily activities of the individuals. To overcome, this problem lightweight meshes with large pore size were introduced with less foreign body reaction and pain.[6] Intraoperative preservation of all three nerves (ilioinguinal nerve, iliohypogastric, and genitofemoral nerve), along with the use of lightweight mess has been shown to reduce chronic groin pain.

Both medical and surgical options have been tried for chronic groin pain but resulted in occurrence of post-operative consequences such as recurrent pain, recurrent hernia, and significant sensory loss. By far the best treatment for chronic groin pain is careful intraoperative handling of inguinal structures and better patient counseling pre- and post-hernioplasty. With this background, the study was conducted with the aim to estimate the prevalence of inguinodynia in patients undergoing open hernioplasty in a tertiary healthcare center in Bangalore, India. The secondary objective was to assess the factors associated with the development of chronic pain following inguinoplasty.

Aims and objectives

The present study was conducted with the objectives of estimating the prevalence of post-surgical inguinodynia among patients undergoing open hernioplasty in a tertiary care center in India. The secondary objective was to assess the factors associated with the development of post-surgical inguinodynia.

MATERIALS AND METHODS

Study design and study setting

A prospective cohort study was conducted among the patients with reducible hernia admitted in the surgical ward of MVJ Medical College and Research Hospital, Bangalore. The study was conducted for a period of 1 year (March 2022–February 2023).

Study population

Patients presenting with hernia at the Surgery outpatient department and admitted at the surgical ward were included in our study.

Inclusion criteria

The patients diagnosed with reducible hernia and age above 18 years were included in the study.

Exclusion criteria

Patients presenting with irreducible hernia, obstructed/strangulated inguinal hernia and those not consenting to participate were excluded from the study.

Sample size and sampling method

According to a study by Kudva et al., post-surgical inguinodynia was seen in 16.7% of the population in the study group.[7] Using this incidence and assuming an allowable absolute error of 7%, the sample size obtained was 113. In our study, a total of 112 patients undergoing elective hernioplasty during the study period satisfied the inclusion criteria and were available for follow-up at end of 3 months. A convenience sampling method was used to select the patients for inclusion in the study.

Study tools and data collection

A pro forma prepared with expert validation was used to collect details regarding pre-operative characteristics, type of anesthesia, intraoperative findings, and post-operative complication. A written informed consent was obtained from the study participants. Different studies have quoted

various time scales for chronic groin pain. These range from the first post-operative day to any empirical period after surgery. However, the IASP described chronic groin pain as "groin pain reported by the patient at or beyond 3 months following inguinal hernia repair."[8] Major consensus currently has been to take 3 months as a cutoff point to differentiate between patients with post-operative pain and chronic groin pain due to various causes.[9] Taking these references the assessment of inguinodynia in the operated patients was done by following them at 3 months post-surgery. All patients underwent Lichtenstein procedure with non-absorbable polypropylene mesh of lightweight with a large pore size having a dimension 7 cm × 15 cm. The mesh was fixed with polypropylene sutures and wound closed in layers. Important nerves (ilioinguinal nerve, iliohypogastric and genitofemoral nerve) were identified and preserved intraoperatively. The pain was assessed by the visual analog scale (VAS).[10] preoperatively and on days 1, 7, and at the end of 3 months by a questionnaire/telephonic conversation. Pain score was classified as mild VAS score 1–3, moderate VAS score 4–7, and severe VAS score >7.

Ethical consideration

Ethical clearance was obtained from the Institutional Ethics Committee (MVJMC&RH/78/2022-23). Data were collected after explaining the purpose of the study and taking informed consent from the patients willing to participate in the study.

Statistical analysis

Data were entered in Microsoft Excel and analyzed using IBM SPSS version 21.0. Descriptive statistics were analyzed in the form of proportions, means, and standard deviation. Chi-square test was used to analyze the factors associated with the development of chronic inguinodynia after hernioplasty. P<0.05 was considered to be statistically significant.

RESULTS

A total of 112 patients underwent hernioplasty in our study. Out of this, 108 were males and four were females. The mean age of the patients was 48±10.8 years. Majority of them (84, 77.7%) presented with indirect inguinal hernia. The prevalence of inguinodynia at 3 months post-hernia surgery was 21.4% (n=24) as shown in Figure 1. The patient characteristics are summarized at Table 1. Table 2 shows the VAS scores of patients at the end of 3 months following surgery. It was found that 24 patients had chronic pain after hernia surgery. Table 3 shows the classification of chronic pain. When the patients were divided into groups of mild (1–3), moderate (4–7), and severe pain (>7) on the basis of VAS score, it was found that majority, 66.6% (n=16) had mild pain, 33.4% (n=8) had moderate pain, and none had severe pain.

Table 1: Patient characteristics (n=112)

Characteristic	Number	Percentage
Sex		
Male	108	96.4
Female	4	3.6
Age (in years)		
25–35	13	11.6
35–45	20	17.9
45–55	57	50.9
>55	22	19.6
Type of hernia		
Indirect hernia	87	77.7
Direct hernia	25	22.3
Site		
Right	34	30.4
Left	61	54.5
Bilateral	17	15.1
Pre-operative pain		
Present	23	20.5
Absent	89	79.5
Post-operative complication (hematoma/seroma/wound infection)		
Present	19	17.0
Absent	93	83.0
Type of anesthesia		
Spinal	96	85.7
Epidural	16	14.3

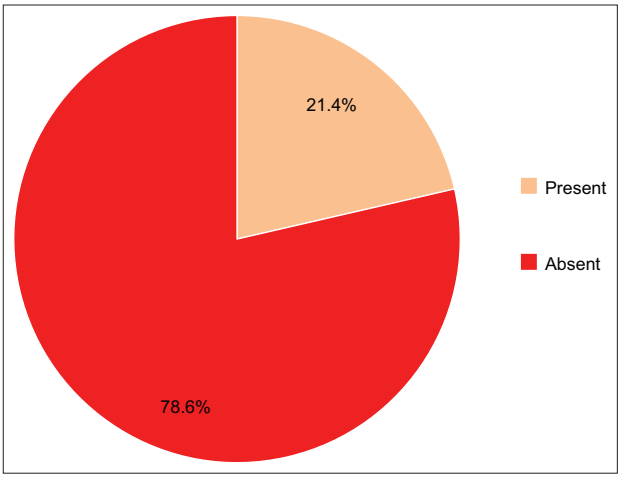

Figure 1: Prevalence of inguinodynia (n=112)

The factors associated with chronic inguinodynia are shown in Table 4. It was seen that 13.5% of the patients without pre-operative pain developed chronic pain whereas 52.2% of patients with pre-operative pain developed chronic pain. Patients with significant pre-operative pain had higher chances of developing chronic pain (P=0.000). It was found that post-operative surgical site infection was associated with increased chances of development of chronic pain (P=0.000). Majority (85.7%) of patients underwent hernia surgery under spinal anesthesia and 14.3% underwent under epidural anesthesia. This type of anesthesia had a higher effect on the development of chronic pain. No significant relation was found between nerve identification and the development of chronic pain

Table 2: VAS score at the end of 3 months (n=112)

VAS score	Number	Percentage
0	89	79.5
1	8	7.1
2	2	1.8
3	5	4.5
4	1	0.9
5	2	1.8
6	5	4.5
7	0	0

VAS: Visual analog scale

Table 3: Chronic pain at 3 months (n=24)

Chronic pain (VAS score)	Number	Percentage
Mild (1–3)	16	66.6
Moderate (4–6)	8	33.4
Severe (>6)	0	0

VAS: Visual analog scale

Table 4: Factors associated with chronic pain post-hernia surgery (n=112)

Factors	Chronic pain		P-value
	Present (%)	Absent (%)	
Age			
25–35 years	4, 30.8	9, 69.2	0.141
36–45 years	4, 20	16, 80	
46–55 years	8, 14	49, 86	
>55 years	8, 36.4	14, 63.6	
Type of anesthesia			
Spinal	21, 21.9	75, 78.1	0.778
Epidural	3, 18.8	13, 81.3	
Pre-operative pain			
Present	12, 52.2	11, 47.8	0.000
Absent	12, 13.5	77, 86.5	
Site of hernia			
Left	14, 23	47, 77	0.440
Right	5, 14.7	29, 85.3	
Bilateral	5, 29.4	12, 70.6	
Post-operative infection			
Present	12, 63.2	7, 36.8	0.000
Absent	12, 12.9	81, 87.1	
Nerve identified			
One	4, 13.8	25, 86.2	0.372
Two	16, 26.2	45, 73.8	
Three	4, 18.2	18, 81.8	

following surgery. Seventeen patients had bilateral hernia and chronic pain was higher compared to those with unilateral hernia.

DISCUSSION

Hernioplasty is considered as the "gold standard" for the treatment of inguinal hernia as the risk of recurrence is comparatively lesser than herniorrhaphy. Therefore, the attention has gradually shifted toward the study of the development of chronic pain following the inguinal mesh repair. In our study, 112 patients underwent open hernioplasty. The prevalence of chronic post-operative inguinal pain among the patients who underwent inguinal hernia repair in our study was 21.4%. Among them, majority of the patients had a mild pain (VAS Score: 1–3). Patients presenting with pre-operative pain had higher chances of developing chronic pain after hernia surgery. Those who developed post-operative surgical site infection had more chances of developing post-surgical chronic pain after 3 months as compared to those who did not develop any post-operative infections. Patients who underwent spinal anesthesia developed post-surgical chronic more than those who underwent epidural anesthesia. Yet, there was no statistically significant difference in the development of chronic pain and type of anesthesia. Similarly, patients presenting with bilateral hernia had more chances of developing chronic post-surgical pain than those who presented with unilateral hernia but no significant difference could be seen in our study. No statistically significant relationship was found between the chronic post-operative inguinal pain and the patient characteristics.

A study conducted in Bangalore has showed that chronic pain at 6-month follow-up was present in 89 patients constituting 39.4% of all patients undergoing hernia repair. It was seen that 26.9% of patients without pre-operative pain developed chronic pain whereas 76.7% of patients with pre-operative pain developed chronic pain. This finding was similar to the findings in our study. Pre-emptive analgesia failed to show statistical significance in the development of chronic pain (P=0.079). It was found that nerve injury significantly affected the development of chronic pain (P=0.001). The development of chronic pain following hernia surgery was dependent on factors such as pre-operative pain, type of anesthesia, nerve injury, post-operative local infiltration, post-operative complication, and most importantly the early post-operative pain.[3] In a study by Prasad and Patel, the authors concluded that the overall incidence of inguinodynia was 22.17%, and the incidence of inguinodynia was higher in open hernia repair in comparison to laparoscopic hernia repair (24.83% versus 16.67%). The incidence of mild inguinodynia was approximately 8 times more common than severe inguinodynia.[4] Our study also shown that among the patients who developed chronic post-operative pain, most of them had mild pain. Similarly, in a study done in Uganda, the prevalence of chronic post-operative inguinal pain amongst patients who underwent mesh inguinal hernia repair was 24.4%. This finding is almost similar to our study. Chronic post-operative pain among patients who underwent hernioplasty was higher than those who underwent non-mesh inguinal hernia repair. There were no statistically significant relationships between the chronic post-operative inguinal pain and

patient characteristics in the patients who underwent mesh hernioplasty (all P>0.05).[5] In our study also, there was no significant relationship between the patient's characteristics and chronic post-operative inguinal pain. In a randomized controlled study, the incidence of chronic inguinodynia among the population of the study group was found to be 16.7% at the end of 6 months. Out of this, 14.4% of the patients had mild-intensity pain and 2.3% of the patients had moderate-intensity pain.[7] Our study also had similar findings where most of the patients developed mild chronic pain. Another study in Kenya had 30.2% of the patients reported chronic post-surgical pain in the groin at the follow-up period.[11] The occurrence of inguinodynia following open hernioplasty in these studies is similar to the findings in our study. A comparative study between prophylactic Ilioinguinal neurectomy and nerve preservation in open inguinal hernia repair suggested that prophylactic ilioinguinal neurectomy during open hernia surgery significantly reduces the incidence of chronic groin pain without any morbidity.[12] In a prospective study, the authors found that 21% of the patients developed inguinodynia at 2 weeks associated with the inflammatory response of the tissues and the presence of a foreign body (mesh). Out of this, 77% of the patients had persistence mild pain at 3-month post-surgery, 21% had moderate pain and only 2% of the patients reported severe pain which limited physical activity and effort.[13] Majority of the patients experienced mild chronic pain which was consistent with the findings in our study. In another comparative study the authors compared the grading of pain of inguinodynia, post-operative pain duration, the analgesia dosage, duration of hospital-stay, and various complications and came to a conclusion that inguinodynia is significantly lesser in laparoscopy (Trans Abdominal Pre-peritoneal) when compared to open (Lichtenstein) hernioplasty.[14] In a study by Sharif et al., it was found that prophylactic ilioinguinal neurectomy significantly reduces groin pain at 6 months as compared to nerve preservation group following Lichenstein hernioplasty.[15] In a comparative study done in India, it was concluded that pain after inguinal mesh hernioplasty was a cause of morbidity, pain was experienced by a significantly larger number of non-neurectomised patients at 6 months of follow-up, prophylactic ilioinguinal neurectomy was associated with reduced chronic groin pain and disability caused by pain after inguinal hernioplasty was significantly reduced by ilioinguinal neurectomy as compared with the control group.[16] In a randomized controlled study conducted in Pakistan, the authors concluded that excision of ilioinguinal and iliohypogastric nerve in inguinal mesh hernioplasty reduces the frequency of chronic inguinodynia.[17] However, in our study, we could not find any significant relationship between the nerve identification and chronic post-operative inguinal pain.

Limitations of the study

To mention the limitation of our study, the sample size and the follow-up period in the current study are relatively short. A larger study sample and longer follow-up may be needed before any further conclusion can be made.

CONCLUSION

Our study found that around one-fifth of the hernia patients had developed chronic post-surgical inguinal pain following open hernioplasty. In the present study, there were no significant relationship between patient's characteristics and the development of chronic post-operative pain. The presence of pre-operative pain and post-operative infection in the patients was significantly associated with the development of chronic pain. Intraoperative nerve identification and chronic post-operative pain did not have a significant relationship in our study. Most of the patients who developed chronic pain had experienced only mild pain and none of them had severe inguinal pain. From the findings of our study, we would like to recommend that all measures must be taken to prevent and treat post-operative surgical site infection which leads to the development of chronic pain in patients.

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Authors Contribution:
PT- Definition of intellectual content, literature survey, prepared first draft of manuscript, clinical protocol, data analysis and manuscript preparation; **AKI-** Design of study, implementation of study protocol, data collection, data analysis, statistical analysis and interpretation editing and manuscript revision; **SL**- Concept, design of study, implementation of study protocol, data analysis, statistical analysis, manuscript revision, editing and submission of article.

Work attributed to:
MVJ Medical College and Hospital, Department of General Surgery, Bengaluru, Karnataka, India.

Orcid ID:
Prabhu T - https://orcid.org/0000-0002-3511-5516
Aakash Kumar Indransh - http://orcid.org/0009-0002-1197-4970
Laishram Sanjana - https://orcid.org/0009-0001-8804-9698

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