SHAREme.

Scientific Hub of Applied Research in Emerging Medical science & technology

Published: 27.03.2026

check for updates

Research Article

A Prospective Study on Measurement of Chronic Pain and Quality of Life in Inguinal Hernia Patients: An Effective Utilization of Assessment Scales

Bethapudi Ravallika[1*], Konda Akshita[2], Dangeti Pallavi[3], Teljeru Preetham[4], Dr. PDSS Prakash[5] , Dr. K. Varun Deep[6]

[1,2,3,4]Pharm D, Department of Pharmacy Practice, Malla Reddy College of Pharmacy, Hyderabad, Telangana, India

[5]Doctor of Pharmacy, Assistant professor, Department of Pharmacy Practice, Malla Reddy College of Pharmacy, Hyderabad, Telangana, India

[6]M.B.B.S., M.S. (General Surgery), F.MAS, D.MAS, Associate Professor, Department of General Surgery, MRIMS, Suraram, Hyderabad, India

*Author for Correspondence: Bethapudi Ravallika
Email ID: ravallikabethapudi28@gmail.com

Abstract

Background: Inguinal hernia is one of the most common surgical conditions encountered in clinical practice and accounts for nearly 75% of all abdominal wall hernias worldwide. It occurs due to the protrusion of abdominal contents through a weakened area in the inguinal region. Surgical repair, particularly mesh hernioplasty, is considered the definitive treatment and has significantly reduced recurrence rates compared to traditional tissue repair techniques. However, chronic postoperative pain and mesh-related discomfort remain important concerns that may negatively affect patients' functional status and quality of life. Therefore, systematic evaluation of postoperative pain and patient-reported outcomes using validated assessment tools is essential to assess surgical success and improve patient care.

Objective: To evaluate chronic postoperative pain and quality of life among patients undergoing inguinal hernia repair using the Visual Analog Scale (VAS) and the Carolina Comfort Scale (CCS).

Methods: A prospective observational study was conducted among 100 patients who underwent inguinal hernioplasty in the Department of General Surgery at a tertiary care hospital. Patient demographic details, diagnosis, and postoperative information were collected from medical records. Postoperative pain intensity was assessed using the Visual Analog Scale (VAS), while postoperative comfort, mesh sensation, and functional limitations were evaluated using the Carolina Comfort Scale (CCS). Patients were followed up at three postoperative intervals: Day 5, Day 15, and Day 45. Data were analyzed using descriptive statistics, and correlation analysis was performed to determine the relationship between VAS and CCS scores.

Results: A total of 100 patients were included in the study, with a mean age of 46.61 years. The majority of patients were male (69%), reflecting the higher prevalence of inguinal hernia among men. Right indirect inguinal hernia was the most frequently

observed diagnosis. Postoperative pain assessment showed a progressive reduction in VAS scores over time, with the mean score decreasing from 3.95 on postoperative Day 5 to 1.24 on Day 15 and reaching 0 by Day 45. Similarly, CCS scores demonstrated significant improvement, declining from 1.46 on Day 5 to 0.18 by Day 45, indicating reduced discomfort and improved functional ability. A strong positive correlation ($r = 0.789$, $p < 0.001$) was observed between VAS and CCS scores, suggesting that pain intensity significantly influences postoperative quality of life.

Conclusion: Mesh hernioplasty is an effective surgical treatment for inguinal hernia and is associated with significant reduction in postoperative pain and improvement in patients' quality of life. The combined use of VAS and CCS provides a comprehensive and reliable method for evaluating postoperative outcomes and monitoring recovery in patients undergoing inguinal hernia repair.

Keywords: Inguinal hernia, postoperative pain, quality of life, Visual Analog Scale, Carolina Comfort Scale, hernioplasty

Introduction

Inguinal hernia is one of the most common surgical disorders encountered worldwide and represents approximately 75% of all abdominal wall hernias. It occurs when abdominal contents such as intestine or preperitoneal fat protrude through a weakened area of the abdominal wall in the inguinal region. Globally, millions of hernia repair surgeries are performed every year, making it one of the most frequently performed procedures in general surgery (1). The lifetime risk of developing an inguinal hernia is estimated to be approximately 27% in men and about 3% in women, which reflects the significant male predominance of this condition due to anatomical differences in the inguinal canal and the presence of the spermatic cord in males (2,3). The incidence of inguinal hernia increases with age and is particularly common in individuals above 40 years of age (4).

Clinically, inguinal hernias commonly present with symptoms such as a visible or palpable swelling in the groin region, discomfort, or pain that worsens during activities such as coughing, lifting heavy objects, or prolonged standing. Although many hernias remain reducible during the early stages, untreated cases may lead to complications such as incarceration and strangulation, which can compromise the blood supply to the herniated tissue and lead to bowel obstruction or ischemia. Such complications require urgent surgical intervention and may increase morbidity and mortality (5).

Surgical repair remains the definitive treatment for inguinal hernia. Over the years, several surgical techniques have been developed to improve patient outcomes and reduce recurrence rates. Among these, mesh-based tension-free hernioplasty has become the most widely accepted surgical technique due to its lower recurrence rates when compared with traditional tissue repair methods such as the Bassini or Shouldice procedures (6). In addition, minimally invasive approaches such as laparoscopic transabdominal preperitoneal (TAPP) repair and totally extraperitoneal (TEP) repair have further improved surgical outcomes by reducing postoperative pain, shortening hospital stay, and promoting faster recovery (7,8).

Despite the advancements in surgical techniques and materials, chronic postoperative pain remains a significant complication following inguinal hernia repair. Studies have reported that approximately 10–15% of patients experience persistent groin pain after surgery, which may negatively affect daily activities, physical functioning, and overall quality of life (9,10). Chronic postoperative pain may occur due to several factors including nerve injury or entrapment, mesh-related inflammatory reactions, fibrosis, or surgical trauma during the repair procedure (11). In some cases, persistent pain may lead to functional limitations, decreased productivity, and psychological distress, thereby affecting patient satisfaction even when the surgical repair is technically successful (12).

With increasing recognition of chronic postoperative pain as an important postoperative complication, evaluation of patient-reported

outcomes has become essential in surgical research. Traditional measures of surgical success such as recurrence rates and complication rates do not fully capture the patient's postoperative experience. Therefore, validated assessment tools are required to measure pain intensity, functional limitations, and overall quality of life following surgery (13).

The Visual Analog Scale (VAS) is one of the most widely used tools for assessing pain intensity in both clinical practice and research settings. It is a simple and reliable method that enables patients to quantify their pain on a scale ranging from "no pain" to "worst imaginable pain," and it is frequently used in postoperative pain assessment (14).

In addition to pain assessment, evaluating postoperative comfort and activity limitation is particularly important in patients undergoing mesh-based hernia repair. The Carolina Comfort Scale (CCS) is a validated disease-specific questionnaire developed to assess mesh-related discomfort, pain, and movement limitations during various physical activities following hernia repair. The CCS provides a comprehensive evaluation of postoperative quality of life and has been widely used in studies assessing outcomes after hernia surgery (15).

The use of standardized assessment tools such as VAS and CCS allows clinicians to better understand patient-reported symptoms, monitor postoperative recovery, and evaluate the effectiveness of surgical interventions. These tools also provide valuable data that can help improve postoperative pain management and enhance patient-centered care. Therefore, the present study was conducted to assess chronic pain and evaluate the quality of life in postoperative inguinal hernia patients using the Visual Analog Scale (VAS) and the Carolina Comfort Scale (CCS).

Materials and Methods

This study was designed as a prospective observational study conducted in the Department of General Surgery at Tertiary Care Hospital in Hyderabad, India. The study was carried out over a period of six months. A total of 100 patients diagnosed with inguinal hernia and undergoing surgical repair (hernioplasty) were included in the study.

Patients were selected based on predefined inclusion and exclusion criteria. The inclusion criteria comprised patients diagnosed with inguinal hernia who were scheduled to undergo hernioplasty surgery and were willing to participate in the study. Patients with complicated hernias, those with severe comorbid conditions, and individuals unwilling to provide informed consent were excluded from the study.

Prior to participation, the study procedure was explained to the patients, and informed consent was obtained. Patient demographic details such as age, gender, diagnosis, and postoperative clinical information were collected from patient case records and documented in a structured data collection form. All patient information was handled with strict confidentiality throughout the study period.

Postoperative pain intensity was assessed using the Visual Analog Scale (VAS), which is a validated tool used for measuring subjective pain. The VAS consists of a numerical scale ranging from 0 to 10, where 0 indicates no pain and 10 represents the worst imaginable pain. Patients were asked to rate their pain based on this scale during the postoperative follow-up period.

In addition to pain assessment, postoperative quality of life and mesh-related discomfort were evaluated using the Carolina Comfort Scale (CCS). The CCS is a disease-specific questionnaire designed to assess symptoms associated with mesh hernia repair. It evaluates three major domains: pain, mesh sensation, and movement limitation during daily activities such as bending, walking, climbing stairs, and performing routine physical tasks.

Patients were followed up at three different postoperative intervals to evaluate recovery and symptom progression. Assessments were conducted on postoperative Day 5, Day 15, and Day 45. During each follow-up visit, both VAS and CCS scores were recorded to monitor changes in pain levels and quality of life over time.

The collected data were entered into Microsoft Excel spreadsheets for analysis. Descriptive statistical methods were used to summarize demographic and clinical characteristics of the study population. In addition, correlation analysis was performed to

determine the relationship between VAS scores and CCS scores in order to evaluate the association between pain intensity and postoperative quality of life.

Results

A total of **100 patients undergoing inguinal hernia repair** were included in the present study. The demographic characteristics of the study population showed that the **mean age of the patients was 46.61 years**, with the majority of patients belonging to the **40–70 years age group**. The distribution of patients according to age groups is presented in **Table 1**.

Gender distribution analysis revealed that **male patients constituted the majority of the study population (69%)**, while **female patients accounted for 31%**. This finding is consistent with the higher prevalence of inguinal hernia among males due to anatomical and physiological factors. The gender distribution of the study participants is shown in **Table 2**.

With respect to the type of diagnosis, **right indirect inguinal hernia was the most frequently observed condition**, accounting for **25% of the cases**, followed by other types such as left indirect inguinal hernia, direct inguinal hernia, and bilateral hernia. The distribution of different types of inguinal hernia among the study population is summarized in **Table 3**.

Postoperative pain was assessed using the **Visual Analog Scale (VAS)** at different follow-up intervals. The mean VAS score on **postoperative Day 5 was 3.95**, indicating mild to moderate pain among most patients. A significant reduction in pain intensity was observed during subsequent follow-up visits. The mean VAS score decreased to **1.24 on Day 15**, reflecting mild pain levels. By **postoperative Day 45**, the VAS score reached **0**, indicating complete resolution of pain in most patients. These findings demonstrate a progressive decline in postoperative pain following hernioplasty. The VAS score distribution at different follow-up intervals is presented in **Table 4**, and the trend of pain reduction over time is illustrated in **Figure 1**.

Postoperative quality of life and mesh-related discomfort were evaluated using the **Carolina Comfort Scale (CCS)**. The mean CCS score recorded on **postoperative Day 5 was 1.46**, indicating mild discomfort during the early

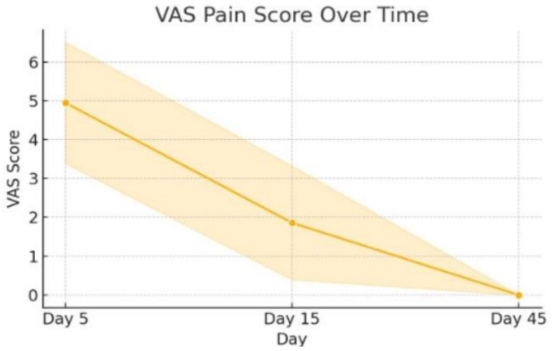

Fig 1: Trend of postoperative pain scores measured using the Visual Analog Scale (VAS) over the follow-up period.

postoperative period. As the recovery progressed, the CCS score gradually improved, showing a reduction in discomfort and improved functional ability. By **postoperative Day 45**, the mean CCS score had decreased to **0.18**, indicating minimal discomfort and improved quality of life among most patients. The changes in CCS scores across the follow-up period are summarized in **Table 5**, and the improvement in CCS scores over time is shown in **Figure 2**.

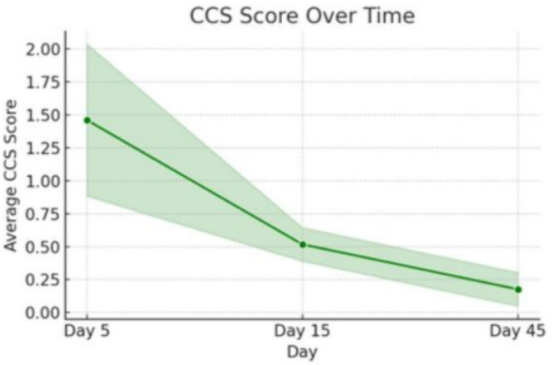

Fig 2: Improvement in postoperative quality of life measured using the Carolina Comfort Scale (CCS) during follow-up.

Further analysis was performed to determine the relationship between post-operative pain and quality of life. A **correlation analysis between VAS and CCS scores revealed a strong positive correlation ($r = 0.789$, $p < 0.001$)**. This indicates that higher pain scores were associated with poorer quality of life and increased discomfort during daily activities. Conversely, as pain levels decreased over time, the quality of life of the patients improved significantly. The correlation between VAS and CCS scores is shown in **Table 6**, and the relationship between the two variables is illustrated in **Figure 3**.

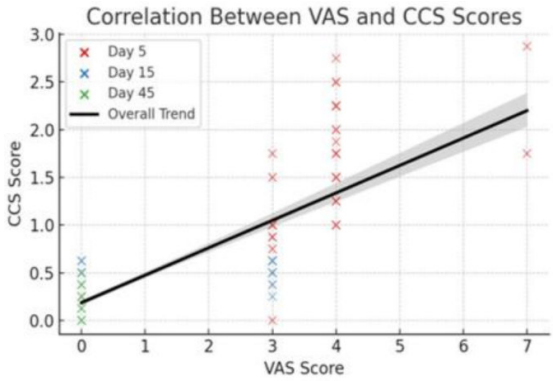

Fig 3: Correlation between VAS pain scores and CCS scores showing the relationship between postoperative pain and quality of life.

Overall, the findings of the study demonstrate that postoperative pain and discomfort significantly decreased over time following inguinal hernia repair, resulting in improved patient comfort and quality of life during the follow-up period.

Table 1: Age Distribution of Study Participants

Age Group (Years)	Number of Patients	Percentage (%)
20–30	12	12%
31–40	18	18%
41–50	30	30%
51–60	22	22%
>60	18	18%
Total	100	100%

Table 2: Gender Distribution of Patients

Gender	Number of Patients	Percentage (%)
Male	69	69%
Female	31	31%
Total	100	100%

Table 3: Diagnosis Distribution

Type of Hernia	Number of Patients	Percentage (%)
Right Indirect Inguinal Hernia	25	25%
Left Indirect Inguinal Hernia	20	20%
Right Direct Inguinal Hernia	18	18%
Left Direct Inguinal Hernia	15	15%
Bilateral Hernia	22	22%
Total	100	100%

Table 4: VAS Scores at Different Follow-up Intervals

Follow-up Day	Mean VAS Score	Pain Category
Day 5	3.95	Mild–Moderate
Day 15	1.24	Mild
Day 45	0	No Pain

Table 5: CCS Scores at Different Follow-up Intervals

Follow-up Day	Mean CCS Score	Interpretation
Day 5	1.46	Mild discomfort
Day 15	0.82	Reduced discomfort
Day 45	0.18	Minimal discomfort

Table 6: Correlation Between VAS and CCS Scores

Variables	Correlation Coefficient (r)	p-value	Interpretation
VAS vs CCS	0.789	<0.001	Strong positive correlation

Discussion

The present study evaluated postoperative pain and quality of life among patients undergoing inguinal hernia repair using validated assessment tools, namely the Visual Analog Scale (VAS) and the Carolina Comfort Scale (CCS). The findings demonstrate that mesh hernioplasty is associated with favorable postoperative outcomes, including a significant reduction in pain intensity and improvement in patients' quality of life during the follow-up period.

In the present study, the majority of patients were male (69%), while female patients accounted for 31% of the study population. This observation is consistent with previous epidemiological studies reporting a higher prevalence of inguinal hernia among males. The higher incidence in men is primarily attributed to anatomical differences in the inguinal canal and the presence of the spermatic cord, which increases the likelihood of abdominal wall weakness and hernia formation. The age distribution in the present study also showed that most patients were within the middle-aged and elderly population, which is consistent with previous reports indicating that the incidence of inguinal hernia increases with age due to weakening of abdominal wall tissues.

Postoperative pain assessment using the Visual Analog Scale demonstrated a progressive reduction in pain intensity during the follow-up period. The mean VAS score decreased from 3.95 on postoperative Day 5 to 1.24 on Day 15 and eventually reached 0 by Day 45. These findings indicate effective postoperative recovery and pain control following hernioplasty. Similar observations have been reported in previous studies, where postoperative pain gradually decreases as tissue healing occurs and postoperative inflammation subsides. Effective surgical techniques and improved postoperative care strategies may contribute to faster recovery and reduced pain levels.

Quality of life and postoperative comfort were evaluated using the Carolina Comfort Scale. The CCS score decreased from 1.46 on Day 5 to 0.82 on Day 15 and further declined to 0.18 by Day 45, indicating a substantial improvement in patient comfort and functional ability. The gradual decline in CCS scores suggests that most patients experienced minimal mesh-related discomfort during later follow-up periods and were able to resume their normal daily activities. These findings highlight the importance of evaluating patient-reported outcomes following hernia repair surgery, as they provide valuable insights into patient recovery and satisfaction.

The correlation analysis performed in this study revealed a strong positive relationship between VAS and CCS scores ($r = 0.789$, $p < 0.001$). This indicates that higher pain levels were associated with poorer postoperative quality of life and increased discomfort during daily activities. Conversely, as postoperative pain decreased over time, patients experienced improved comfort and enhanced functional recovery. This relationship emphasizes the importance of effective pain management strategies in improving overall patient outcomes following hernia repair surgery.

Overall, the results of this study support the effectiveness of mesh hernioplasty as a safe and reliable surgical intervention for the treatment of inguinal hernia. The progressive reduction in postoperative pain and improvement in quality of life observed in this study highlight the benefits of modern surgical techniques and postoperative care practices. The use of validated assessment tools such as VAS and CCS provides a comprehensive evaluation of

patient-reported outcomes and can help clinicians monitor recovery and optimize postoperative management strategies.

Strengths and Limitations of the Study

The present study has several strengths. It was conducted as a prospective observational study, which allowed systematic collection of data during the postoperative follow-up period. The study also utilized validated assessment tools, namely the Visual Analog Scale (VAS) and the Carolina Comfort Scale (CCS), to evaluate postoperative pain and quality of life. These tools provide reliable and standardized measurement of patient-reported outcomes. Additionally, the study assessed patients at multiple follow-up intervals (Day 5, Day 15, and Day 45), which enabled monitoring of the progression of postoperative recovery and symptom improvement over time.

However, certain limitations should also be considered while interpreting the findings. The study was conducted at a single tertiary care center, which may limit the generalizability of the results to a wider population. The sample size was limited to 100 patients, which may not fully represent the diversity of patients with inguinal hernia. Furthermore, the follow-up period was relatively short, and long-term outcomes such as persistent chronic pain beyond the study duration were not evaluated. Future studies with larger sample sizes, multicenter participation, and longer follow-up periods are recommended to provide more comprehensive evidence regarding postoperative outcomes after inguinal hernia repair.

Clinical Implications

The findings of this study have important clinical implications for the management of patients undergoing inguinal hernia repair. The results demonstrate that mesh hernioplasty is associated with favorable postoperative outcomes, including reduction in pain and improvement in quality of life. The use of validated assessment tools such as the Visual Analog Scale (VAS) and the Carolina Comfort Scale (CCS) enables clinicians to systematically evaluate postoperative pain, mesh-related discomfort, and functional limitations experienced by patients. Incorporating these assessment tools into routine postoperative follow-up can help healthcare professionals monitor patient recovery more effectively and identify individuals who may require additional pain management or supportive care. Ultimately, improved monitoring and evaluation of postoperative outcomes may contribute to enhanced patient satisfaction and better overall surgical outcomes.

Conclusion

The findings of the present study demonstrate that mesh hernioplasty is an effective surgical treatment for inguinal hernia, providing favorable postoperative outcomes. A significant reduction in postoperative pain was observed during the follow-up period, along with a marked improvement in patients' quality of life. The progressive decline in pain scores and improvement in comfort levels indicate successful postoperative recovery and effective surgical management.

The combined use of the Visual Analog Scale (VAS) and the Carolina Comfort Scale (CCS) proved to be valuable in assessing postoperative pain, mesh-related discomfort, and functional limitations in patients undergoing hernia repair. These assessment tools provide a comprehensive evaluation of patient-reported outcomes and enable clinicians to monitor recovery more effectively.

Overall, the use of standardized pain and quality-of-life assessment tools such as VAS and CCS can contribute to improved postoperative monitoring, better patient care, and enhanced clinical decision-making following inguinal hernia surgery.

Conflict of Interest

The authors declare no conflict of interest.

Funding

No external funding was received.

Ethical Approval

The study was approved by the Institutional Ethics Committee.

Informed Consent

Written informed consent was obtained from all participants.

References

1. Kingsnorth A, LeBlanc K. Hernias: inguinal and incisional. Lancet. 2003;362(9395):1561–1571.

2. Primatesta P, Goldacre MJ. Inguinal hernia repair: incidence of elective and emergency surgery. International Journal of Epidemiology. 1996;25(4):835–839.
3. Burcharth J. The epidemiology and risk factors for recurrence after inguinal hernia surgery. Hernia. 2014;18(2):157–166.
4. Jenkins JT, O'Dwyer PJ. Inguinal hernias. BMJ. 2008;336(7638):269–272.
5. Fitzgibbons RJ, Forse RA. Groin hernias in adults. New England Journal of Medicine. 2015;372(8):756–763.
6. Lichtenstein IL, Shulman AG, Amid PK, Montllor MM. The tension-free hernioplasty. American Journal of Surgery. 1989;157(2):188–193.
7. McCormack K, Scott NW, Go PMNYH, Ross S, Grant AM. Laparoscopic techniques versus open techniques for inguinal hernia repair. Cochrane Database of Systematic Reviews. 2003;CD001785.
8. Bittner R, Schwarz J. Inguinal hernia repair: current surgical techniques. Langenbeck's Archives of Surgery. 2012;397(2):271–282.
9. Poobalan AS, Bruce J, Smith WC, King PM, Krukowski ZH, Chambers WA. Chronic pain after inguinal hernia repair. British Journal of Surgery. 2001;88(10):1310–1315.
10. Kehlet H, Jensen TS, Woolf CJ. Persistent postsurgical pain: risk factors and prevention. Lancet. 2006;367(9522):1618–1625.
11. Aasvang EK, Kehlet H. Chronic postoperative pain after inguinal hernia repair. British Journal of Anaesthesia. 2005;95(1):69–76.
12. Bay-Nielsen M, Perkins FM, Kehlet H. Pain and functional impairment after inguinal herniorrhaphy. Annals of Surgery. 2001;233(1):1–7.
13. Alfieri S, Amid PK, Campanelli G, et al. International guidelines for prevention and management of post-operative chronic pain following inguinal hernia surgery. Hernia. 2011;15(3):239–249.
14. Hawker GA, Mian S, Kendzerska T, French M. Measures of adult pain: Visual Analog Scale for pain (VAS). Arthritis Care & Research. 2011;63(S11):S240–S252.
15. Heniford BT, Walters AL, Lincourt AE, Novitsky YW, Hope WW, Kercher KW. Comparison of generic versus specific quality-of-life scales for mesh hernia repairs. Journal of the American College of Surgeons. 2008;206(4):638–644.