

## Chapter 21

# Chronic Pain following Inguinal Hernia Repair: A Review

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## Abstract

Chronic pain represents a significant long-term complication following inguinal hernia repair and has increasingly been recognized as a major outcome measure alongside recurrence rates. It is typically defined as pain persisting for a minimum of three months post-surgery. The severity of chronic pain can vary from mild discomfort to severe, debilitating pain that negatively impacts quality of life, daily activities, and employment. The etiology is multifactorial, encompassing neuropathic injury to the ilioinguinal, iliohypogastric, and genital branches of the genitofemoral nerves, as well as mesh-related inflammation, fibrosis, mesh contraction, and periosteal injury. Identified risk factors include younger age, female sex, preoperative pain, severe early postoperative pain, recurrent hernia repair, and the use of open mesh techniques. Diagnosis necessitates a thorough clinical assessment to distinguish between neuropathic and non-neuropathic mechanisms. Management follows a stepwise approach, ranging from pharmacological therapy and nerve blocks to neurectomy and mesh removal in selected cases. This chapter provides a summary of the incidence, risk factors, prevention, and treatment of chronic pain following inguinal hernia repair in adults.

**Keywords:** Chronic Pain, Inguinodynia, CPIP, Risk Factors, Inguinal Hernia, Herniorrhaphy, Neurectomy.

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## Introduction

Chronic pain following inguinal hernia repair is defined as pain at the surgical site persisting for more than three months. The incidence of such chronic pain ranges from 6% to 51.6%. This pain can be categorized into neuropathic and non-neuropathic types. Risk factors include younger patients undergoing inguinal herniorrhaphy, preoperative pain, severe pain immediately postoperatively, and female gender (Nikkolo & Lepner, 2016). Open herniorrhaphy is frequently associated with a higher incidence of chronic pain compared to laparoscopic repairs.

Additionally, the type of mesh (heavyweight vs. lightweight) and the method of mesh fixation (sutures/tackers vs. glue) significantly affect outcomes. Management of chronic pain is categorized into medical management, which may include analgesics or referrals to pain specialists, and surgical management, which may involve neurectomy and mesh removal (Boaventura et al., 2022; Ferzli et al., 2007).

The European Hernia Society guidelines for adult inguinal hernia treatment advocate a multidisciplinary approach to managing chronic pain post-herniorrhaphy. The technique employed in inguinal hernia repair and the type of mesh utilized are critical determinants of chronic pain risk. Surgical interventions for chronic pain, such as neurectomy or the removal of mesh or staples, may be advantageous for selected patients (Simons et al., 2009). According to the HerniaSurge guidelines by the Australasian Hernia Society, chronic pain following herniorrhaphy is characterized as moderate pain impacting normal daily activities persisting for more than three months post-repair. Risk factors for chronic pain include younger age, preoperative pain, postoperative pain, recurrent hernia, and open hernia repair. Proper identification and preservation of nerves during hernia repair are crucial to minimizing the risk of chronic pain (Tran, 2018).

This chapter seeks to explore the definition of chronic pain subsequent to herniorrhaphy, focusing on the associated risk factors, diagnostic criteria, and treatment modalities. A thorough literature review was performed utilizing databases such as PubMed, Google Scholar, Semantic Scholar, and Cochrane to identify original research studies, observational studies, clinical trials, clinical reviews, review articles, systematic reviews, and meta-analyses published between 1990 and 2026. The search strategy incorporated keywords including “Chronic Pain,” “Inguinodynia,” “CPIP,” “Risk Factors,” “Inguinal hernia,” “Herniorrhaphy,” and “Neurectomy.” All selected articles were in English, with

additional relevant articles identified through manual cross-referencing. The chapter excluded case reports, commentaries, and editorials, while including all studies involving adult patients.

## Discussion

### Definition of Chronic pain following inguinal hernia repair

The International Association for the Study of Pain (IASP) defines chronic pain as pain persisting for more than three months after inguinal hernia repair. This chronic pain is specifically identified as neuropathic pain, which results from nerve injury or disease impacting the somatosensory system in patients who did not experience groin pain before undergoing inguinal hernia surgery (Alfieri et al., 2011; Schug et al., 2019). The term “inguinodynia” is also employed to describe chronic postoperative groin pain following inguinal hernia repair, which manifests three months post-surgery and may be classified as either neuropathic or nociceptive pain (Boaventura et al., 2022; Jacob et al., 2015).

### Incidence of Chronic Pain following Inguinal Hernia Surgery

Chu et al. conducted a systematic review and meta-analysis to assess the incidence of chronic pain following inguinal hernia surgery. This analysis included 18 studies encompassing 29,466 patients. The pooled incidence of chronic pain was found to be 17.01% (95% CI, 12.78-21.71). Region-specific incidences were reported as follows: Europe had an incidence of 18.65% (95% CI, 13.59-24.29), Asia reported 14.70% (95% CI, 7.87-23.17), and North America had an incidence of 6.04% (95% CI, 4.62-7.64). The study concluded that the incidence of chronic pain post-hernia repair is relatively high (Chu.Z, 2024). Kumar et al. performed a retrospective study examining chronic pain following laparoscopic versus open inguinal hernia repair. The study included 454 patients, with 240 undergoing laparoscopic repair and 214 undergoing open repair. Chronic pain was observed in 30% of the patients, with a higher incidence in those who underwent open hernia repair (Kumar et al., 2001). Similarly, Poobalan et al. conducted a retrospective study on the incidence of chronic pain post-inguinal hernia repair, reporting an incidence of 30% (Poobalan et al., 2000). Lundstrom et al. carried out a prospective cohort study on patient-reported rates of chronic pain following groin hernia surgery. This study included 22,917 patients and achieved a response rate of 75.5%. The incidence of chronic pain was 15.2%, with lower rates observed in patients who underwent laparoscopic inguinal hernia surgery compared to those who underwent open surgery (Lundström et al., 2018).

Nienhuijs et al. conducted a systematic review to evaluate chronic pain following mesh repair for inguinal hernia. This review encompassed 34 studies, revealing an incidence of chronic pain at 11%, with over 25% of these cases experiencing moderate to severe pain (Nienhuijs et al., 2007). Charalambous et al. performed a meta-analysis of randomized controlled trials to assess the incidence of chronic pain after open mesh inguinal hernia repair. This analysis included 9 studies with a total of 1510 patients, reporting a chronic pain incidence of 9.4% at 6 months and 4.8% at the 1-year follow-up (Charalambous & Charalambous, 2018). Bande et al. conducted a prospective multicenter study on the incidence of chronic pain following inguinal hernia repair. This study involved 1761 patients, with a chronic pain incidence of 38.6% in those undergoing mesh repair and 33.3% in those undergoing non-mesh repair (Bande et al., 2020). A prospective cross-sectional study assessed the incidence of chronic groin pain following laparoscopic versus open inguinal hernia repair. This study included 120 patients and found no significant differences in chronic pain incidence between the two surgical approaches at 6 months (Patil et al., 2026).

### Risk Factors for Chronic Pain following Inguinal Hernia Repair

A systematic review conducted by Reinpold examined the risk factors for chronic pain following inguinal hernia repair. This review included 113 studies and identified several risk factors with strong evidence for chronic pain: female gender, younger age, high-intensity preoperative pain, increased high-intensity postoperative pain, and the use of open hernia techniques (Reinpold, 2020). Kalliomäki et al. investigated the risk factors for long-term pain after inguinal hernia repair. Their study included 519 patients and concluded that young age, female sex, open hernia repair, and recurrent hernia are significant risk factors for chronic pain (Kalliomäki et al., 2008). Pierides et al. conducted a prospective study on the predictors of chronic pain following open inguinal hernia repair. This study involved 923 patients and found that the presence of pain, the use of heavy-weight mesh, and recurrence are associated with an increased risk of chronic pain after hernia repair (Pierides et al., 2016).

Forester et al. investigated the predictors of chronic pain following laparoscopic inguinal hernia repair. The study included 960 patients and identified several risk factors for chronic pain, including age over 45, female sex, preoperative pain, recurrent hernia, a high American Society of Anesthesiologists (ASA) score, and the intraoperative placement of a urinary catheter (Forester et al., 2021). Alaverdyan et al. conducted a systematic review and meta-analysis on perioperative risk factors for persistent postoperative pain following inguinal hernia repair. This review encompassed 140 studies and found that younger patients were at an increased risk of chronic pain (OR=1.80, 95% CI, 1.46-2.11). Additionally, female sex (OR=1.90, 95% CI, 1.23-2.94), preoperative pain (OR=1.71, 95% CI, 1.35-2.16), postoperative complications (OR=2.06, 95% CI, 1.76-2.41), and recurrent hernia (OR=1.90, 95% CI, 1.30-2.78) were identified as risk factors for chronic pain (Alaverdyan et al., 2024).

Van den Dop et al. conducted an observational cohort study to identify significant factors contributing to chronic postoperative pain following inguinal hernia repair. The study included 4016 patients and found that postoperative pain at one month posed a greater risk for chronic pain than preoperative pain, with incidences of 12.3% and 3.6%, respectively (Dop et al., 2022). Similarly, a retrospective study by Dennis et al. determined that severe pain at presentation prior to inguinal hernia repair, along with a history of chronic pain, were risk factors for chronic pain post-surgery (Dennis & O’Riordan, 2007).

## The type of Mesh and method of Fixation during inguinal hernia repair as factors for chronic pain

Rutegard et al. conducted a randomized clinical trial to investigate chronic pain following inguinal hernia repair using either heavyweight or lightweight mesh. The study randomized 412 patients, with 178 receiving heavyweight mesh and 185 receiving lightweight mesh. The results indicated no significant differences in the incidence of chronic pain between the two groups; however, lightweight mesh was associated with reduced groin discomfort (Rutegard et al., 2021). Melkemichel et al. conducted a prospective study comparing chronic pain outcomes following the use of lightweight versus heavyweight mesh in open inguinal hernia repair. This study included 23,249 patients and found no significant differences in chronic pain between the two mesh types (Melkemichel et al., 2020). Prakash et al. conducted a prospective randomized controlled trial to compare chronic pain outcomes in laparoscopic inguinal hernia repair using lightweight versus heavyweight mesh. In this trial, 140 patients were randomized, with 65 undergoing repairs with lightweight mesh and 66 with heavyweight mesh. The study found no differences in the rate of chronic pain between the two mesh types used for hernia repair (Prakash et al., 2016).

A randomized controlled trial conducted by Zwaans et al. compared the characteristics of groin pain following the use of self-gripping mesh versus sutured polypropylene mesh in open inguinal hernia repair. This study included 274 patients, and after a follow-up period of three years, the incidence of chronic groin pain was found to be similar between the two groups (Zwaans et al., 2018). Additionally, Van Steensel et al. performed a meta-analysis on chronic pain associated with sutured and non-sutured open mesh inguinal hernia repair. This analysis incorporated 23 studies with a total of 5190 patients, revealing that the incidence of chronic pain after 12 months of follow-up was comparable between the groups (OR=0.70, 95% CI, 0.30-1.66) (Steensel et al., 2019). Furthermore, Matikainen et al. investigated the influence of mesh type and fixation methods on chronic pain following Lichtenstein repair for inguinal hernia. The study involved 625 patients, with 216 undergoing glue fixation, 202 receiving self-gripping mesh, and 216 undergoing sutured fixation. Over a five-year follow-up period, no significant differences in chronic pain were observed among the different fixation methods (Matikainen et al., 2021).

## Chronic pain and the Type of inguinal hernia repair

Oberg et al. conducted a systematic review and meta-analysis of randomized controlled trials comparing chronic pain outcomes following mesh versus non-mesh inguinal hernia repair. This study included 23 trials with a total of 5444 patients, revealing no significant difference in the prevalence of chronic pain between the two repair methods, with median rates of 3.5% (ranging from 0 to 16.2%) for non-mesh and 2.9% (ranging from 0 to 27.6%) for mesh repair (Öberg et al., 2018). Sun et al. performed a Cochrane review examining mesh fixation using glue versus suture in the context of chronic pain and recurrence in Lichtenstein hernioplasty. This review encompassed 12 studies with 1932 patients, demonstrating that glue fixation was associated with a 32% reduction in chronic pain in the short term (OR=0.63, 95% CI, 0.44-0.91), suggesting potential benefits in pain reduction (Sun et al., 2017). Carvalho et al. conducted a systematic review and meta-analysis comparing chronic pain outcomes after Shouldice versus Lichtenstein repair for inguinal hernia. This analysis included 10 studies with 4122 patients, indicating that the Shouldice repair was associated with a 33% relative risk reduction in chronic pain compared to the Lichtenstein repair (RR=0.66, 95% CI, 0.56-0.78) (Silva Carvalho et al., 2026).

A meta-analysis conducted by van Steensel et al. examined postoperative pain associated with non-sutured versus sutured single-layer open mesh repair for inguinal hernia. This study incorporated 23 studies involving 5,190 patients and found no significant differences in chronic pain between the two mesh fixation methods at a 12-month follow-up (OR=0.70, 95% CI, 0.30-1.66). The conclusion drawn was that both methods of mesh fixation resulted in similar outcomes regarding chronic pain (Steensel et al., 2019). Additionally, a randomized trial by Königer et al. compared chronic pain outcomes following Shouldice, Lichtenstein, and transabdominal preperitoneal (TAPP) hernia repairs. The study involved 280 patients, with 93 undergoing Lichtenstein repair, 93 undergoing Shouldice repair, and 94 undergoing TAPP repair. Chronic pain was reported in 36% of patients following the Shouldice repair, 31% following the Lichtenstein repair, and 15% following the TAPP repair. The findings indicated that chronic pain was more prevalent after open inguinal hernia repairs (Königer et al., 2004).

Harpreet et al. conducted a systematic review and meta-analysis on chronic pain following inguinal hernia repair. This review included 22 studies encompassing 10,853 patients, with 5,171 patients undergoing laparoscopic repair and 5,682 patients undergoing open repair. At the two-year mark, no significant difference was observed in the risk of chronic pain between laparoscopic and open hernia repairs (RR=0.70, 95% CI, 0.47-1.03). However, at four years, the risk of chronic pain was reduced in patients who underwent laparoscopic hernia repair (RR=0.46, 95% CI, 0.31-0.68) (Sekhon Inderjit Singh et al., 2022).

**Table 1**

| Study                     | Study Type                        | N=Numbers | Operative method                               | Chronic Pain                                                                                                                                                                                                                                                  |
|---------------------------|-----------------------------------|-----------|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Oberg et al.,2018         | Systematic Review & Meta-analysis | 5444      | Open mesh and non-mesh repair                  | No difference in prevalence of chronic pain (3.7%vs 2.9%)                                                                                                                                                                                                     |
| Van Steensel et al., 2019 | Meta-analysis                     | 5190      | Sutured vs non-sutured open mesh hernia repair | No difference regarding chronic pain between the two procedures (OR=0.70, 95% CI, 0.30-1.66)                                                                                                                                                                  |
| Harpreet et al,2022       | Systematic review & Meta-analysis | 10853     | Laparoscopic and open inguinal hernia repair   | Chronic groin pain prevalence decreased over time, reaching 4.69% after laparoscopic repair and 6.91% after open repair beyond 5 years. TEP repair significantly reduced the risk of chronic pain compared with open mesh repair at most follow-up intervals. |
| Carvalho et al.,2026      | Systematic review & Meta-analysis | 4122      | Shouldice vs Lichtenstein hernia repair        | Shouldice repair was associated with a 33% risk reduction in chronic pain (RR=0.66, 95% CI, 0.56- 0.78)                                                                                                                                                       |

Table showing the rate of chronic pain between the various inguinal hernia repairs and method of mesh fixation

## The Treatment of Chronic Pain following Hernia Repair

The management of chronic pain following inguinal hernia repair can be categorized into non-surgical and surgical approaches. Non-surgical management includes the administration of non-neuropathic medications such as steroids and non-steroidal anti-inflammatory drugs (NSAIDs), as well as neuropathic medications like gabapentin, tricyclic antidepressants, and opioids. Surgical intervention for chronic pain involves performing a selective or triple neurectomy, which may be executed using either open or laparoscopic techniques (Nguyen et al., 2016). Triple neurectomy entails the excision of the ilioinguinal, iliohypogastric, and genital branches of the genitofemoral nerve. It is essential to remove the entire length of the nerve and ligate the ends to prevent neuroma formation (Amid, 2004). In a study conducted by Campanelli et al. on the surgical treatment of chronic pain post-inguinal hernia repair, 46 patients were included, with 44 undergoing triple neurectomies and 2 undergoing iliohypogastric neurectomies. Follow-up results indicated that 40 patients experienced complete pain resolution, demonstrating the efficacy of surgical management for chronic pain (Campanelli et al., 2013).

Beel et al. conducted a systematic review on the surgical treatment of chronic pain following inguinal hernia repair. The review encompassed 18 studies that employed selective and triple neurectomy for managing chronic pain, with success rates ranging from 33% to 100%. Notably, triple neurectomy was identified as an effective method for managing chronic pain post-inguinal hernia repair (Beel & Berrevoet, 2022). In a separate systematic review and meta-analysis, Charitakis et al. examined various neurectomy techniques for treating chronic pain after inguinal hernia repair. This analysis included 15 studies involving 701 patients. The findings indicated that triple neurectomy achieved an overall pain improvement rate of 98.2%, whereas double neurectomy had an improvement rate of 80.1% but was associated with a complication rate of 15.3%. The endoscopic retroperitoneal approach demonstrated the highest success rate of 95.5%, albeit with a complication rate of 28.7% (Charitakis et al., 2025).

## Conclusion

Chronic pain is a notable complication following adult inguinal hernia repair, potentially affecting physical, psychological, and social well-being. Despite a substantial reduction in recurrence rates due to modern tension-free techniques, chronic pain continues to pose a significant challenge. This condition is multifactorial, encompassing neuropathic injury, mesh-related inflammation, fibrosis, and central sensitization. Identified risk factors include younger age, severe early postoperative pain, recurrent hernias, and nerve injury. Prevention necessitates meticulous surgical techniques, appropriate nerve management, the use of lightweight mesh, and optimized perioperative analgesia. A structured diagnostic and therapeutic approach is imperative, with treatment options ranging from medications and nerve blocks to neurectomy and mesh removal in selected cases. Future advancements in surgical technology and pain science may further alleviate the burden of chronic pain and enhance long-term outcomes following inguinal hernia repair.

## Declaration

**Conflict of interest:** There is no conflict of interest.

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