

Chronic Pain Following Inguinal Hernia Repair: An Update: Narrative Review Article

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Abstract: Chronic pain is one of the most significant long-term complications following inguinal hernia repair and has increasingly become a major outcome measure alongside recurrence rates. Chronic pain is generally defined as pain persisting for at least three months after surgery. It may range from mild discomfort to severe debilitating pain that adversely affects quality of life, daily activities, and employment. The etiology is multifactorial and includes neuropathic injury to the ilioinguinal, iliohypogastric, and genital branches of the genitofemoral nerves, mesh-related inflammation, fibrosis, mesh contraction, and periosteal injury. Risk factors include younger age, female sex, preoperative pain, severe early postoperative pain, recurrent hernia repair, and open mesh techniques. Diagnosis requires careful clinical assessment to identify neuropathic and non-neuropathic mechanisms. Management involves a stepwise approach ranging from pharmacological therapy and nerve blocks to neurectomy and mesh removal in selected cases. This review summarizes 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 described as pain at the operative site that persists beyond 3 months. The incidence of chronic pain following inguinal hernia repair may vary from 6% to 51.6%. The nature of chronic pain can be divided into neuropathic and non-neuropathic pain, and some of the risk factors include young patients who undergo inguinal herniorrhaphy, the presence of pain preoperatively, the presence of severe pain in the immediate postoperative period, and female patients (Nikkolo & Lepner, 2016). Open herniorrhaphy is often associated with a higher rate of chronic pain when compared to laparoscopic hernia repairs. The type of mesh used (e.g., heavyweight vs. lightweight) and the method of mesh fixation (e.g., sutures/tackers vs. glue fixation) also influence outcomes. Chronic pain management can be divided into medical management, which may involve analgesia or pain specialist referrals; surgical management can be divided into performing a neurectomy and mesh removal (Boaventura *et al.*, 2022; Ferzli *et al.*, 2007).

The European Hernia Society guidelines for the treatment of inguinal hernia in adults have recommended a multidisciplinary approach to the treatment of chronic pain following herniorrhaphy. The method of performing an inguinal hernia repair and the type of mesh that is used are important factors for determining the risk of chronic pain. Surgical treatment for chronic pain, such as neurectomy, removal of mesh, or staples, may be beneficial in selected patients (Simons *et al.*, 2009). The HerniaSurge guidelines by the Australasian Hernia Society have described chronic pain following herniorrhaphy as moderate pain that affects normal daily activity that occurs for more than 3 months following hernia repair. The risk factors for chronic pain include young age, the presence of pain preoperatively, the presence of pain in the postoperative period, recurrent hernia, and open hernia repair. The awareness and recognition of the nerves during hernia repair is essential to reduce the risk of chronic pain (Tran, 2018).

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This review article aims to examine the definition of chronic pain following herniorrhaphy. We will look at the risk factors, diagnosis, and treatment of chronic pain following herniorrhaphy. A comprehensive literature review was conducted using PubMed, Google Scholar, Semantic Scholar, and Cochrane databases to identify original research studies, observational studies, clinical trials, clinical reviews, review articles, systematic reviews, and meta-analyses from 1990 to 2026. The search employed the following keywords: "Chronic Pain," "Inguinodynia," "CPIP," "Risk Factors," "Inguinal hernia," "Herniorrhaphy," and "Neurectomy." All articles were in English, and additional articles were identified through manual cross-checking. Case reports, commentaries, and editorials were excluded, while all articles involving adult patients were included in this review.

DISCUSSION

Definition of Chronic Pain Following Inguinal Hernia Repair

The International Association for the Study of Pain (IASP) has defined chronic pain as pain lasting for more than 3 months following inguinal hernia repair. Chronic pain is further defined as neuropathic pain arising because of nerve injury or disease affecting the somatosensory system in patients who did not have groin pain before undergoing inguinal hernia surgery (Alfieri *et al.*, 2011; Schug *et al.*, 2019). Inguinodynia is another term that is used to describe chronic postoperative groin pain following inguinal hernia repair that occurs three months following inguinal hernia repair and can be characterized as 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 on the incidence of chronic pain following inguinal hernia surgery. A total of 18 studies with 29,466 patients were included. The pooled incidence of chronic pain was 17.01% (95%CI,12.78-21.71), with the incidence of chronic pain in Europe being 18.65% (95% CI, 13.59- 24.29); for Asia it was 14.70% (95%CI,7.87-23.17) and in North America it was 6.04%(95%CI,4.62-7.64). This study concluded that the incidence of chronic pain following hernia repair is relatively high (Chu.Z, 2024). Kumar *et al.*, conducted a retrospective study to look at the chronic pain following laparoscopic and open inguinal hernia repair. There were 454 patients in this study, with 240 patients undergoing laparoscopic hernia repair and 214 patients undergoing open hernia repair. Chronic pain was observed in 30% of the patients, with a higher incidence noted in those patients who had undergone open hernia repair (Kumar *et al.*, 2001). Poobalan *et al.*, also conducted a retrospective study on the incidence of chronic pain following inguinal hernia repair and noted that the incidence of chronic pain was 30% (Poobalan *et al.*, 2000). Lundstrom *et al.*, conducted a prospective cohort study on the patient-reported rates

of chronic pain after groin hernia surgery. A total of 22,917 patients were included in this study, and with a response rate of 75.5%, the incidence of chronic pain following groin hernia surgery was 15.2%, and it was lower in those who had undergone laparoscopic inguinal hernia surgery than in those who had undergone open hernia surgery (Lundström *et al.*, 2018).

Nienhuijs *et al.*, conducted a systematic review of chronic pain following mesh repair for inguinal hernia. There were 34 studies in this review, and the incidence of chronic pain was 11%, with more than a quarter of them experiencing moderate to severe pain (Nienhuijs *et al.*, 2007). Charalambous *et al.*, conducted a meta-analysis of randomized controlled trials on the incidence of chronic pain following open mesh inguinal hernia repair. There were 9 studies with 1510 patients included in this study, and the incidence of chronic pain was 9.4% at 6 months and 4.8% at 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. There were 1761 patients in this study, and the incidence of chronic pain in those patients who underwent mesh repair was 38.6%, and in those who underwent non-mesh repair was 33.3% (Bande *et al.*, 2020). Comparison of the incidence of chronic groin pain after laparoscopic and open inguinal hernia repair was assessed by a prospective cross-sectional study. A total of 120 patients were included in this study, and there were no significant differences regarding the incidence of chronic pain between laparoscopic and open inguinal hernia repair at 6 months (Patil *et al.*, 2026).

Risk Factors for Chronic Pain following Inguinal Hernia Repair

A Systematic review on the risk factors for chronic pain following inguinal hernia repair was conducted by Reinpold. 113 studies were included in this review, and the risk factors with strong evidence for chronic pain include female gender, young patients, the presence of high-intensity preoperative pain, increased high-intensity postoperative pain, and open hernia techniques (Reinpold, 2020). Kalliomäki *et al.*, looked at the risk factors for long-term pain after inguinal hernia repair. 519 patients were included in this study, and the authors concluded that young age, female sex, open hernia repair, and recurrent hernia were risk factors for chronic pain (Kalliomäki *et al.*, 2008). A prospective study was conducted by Pierides *et al.*, on the factors that predict chronic pain after open inguinal hernia repair. A total of 923 patients were included in this study, and the presence of pain, heavy-weight mesh, and recurrence are associated with a higher risk of chronic pain following hernia repair (Pierides *et al.*, 2016).

Forester *et al.*, looked at the predictors of chronic pain following laparoscopic inguinal hernia repair. A total of 960 patients were included in this study, and age above 45, female sex, preoperative pain,

recurrent hernia, High American Society of Anesthesiologists (ASA) score, and intra-operative placement of a urinary catheter were risk factors for chronic pain following inguinal hernia repair (Forester *et al.*, 2021). A systematic review and meta-analysis on the perioperative risk factors for persistent postoperative pain following inguinal hernia repair was conducted by Alaverdyan *et al.*, A total of 140 studies were included in this review, and younger patients were at a higher risk of chronic pain (OR=1.80, 95% CI, 1.46-2.11), female sex was associated with a higher risk of chronic pain (OR=1.90, 95% CI, 1.23-2.94), preoperative pain was also a risk factor for chronic 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 risk factors for chronic pain (Alaverdyan *et al.*, 2024).

Van den Dop *et al.*, conducted an observational cohort study on the significant factors that contribute to chronic postoperative pain following inguinal hernia repair. A total of 4016 patients were included in this study, and postoperative pain at one month was a greater risk factor for chronic pain than preoperative pain (12.3% vs 3.6%) (van den Dop *et al.*, 2022). A retrospective study by Dennis *et al.*, also concluded that the presence of severe pain on presentation before inguinal hernia repair and history of chronic pain were risk factors for chronic pain following inguinal hernia repair (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 on chronic pain following inguinal hernia repair using heavyweight or lightweight mesh. 412 patients were randomized to 178 patients who used heavyweight mesh and 185 patients who used lightweight mesh. There were no differences in the incidence of chronic pain between the two mesh groups, but lightweight mesh was associated with reduced groin discomfort (Rutegard *et al.*, 2021). A prospective study comparing chronic pain following lightweight and heavyweight mesh for open inguinal hernia repair was conducted by Melkemichel *et al.*, A total of 23,249 patients were included in this study, and there were no significant differences regarding chronic pain between the use of lightweight and heavyweight mesh in open inguinal hernia repair (Melkemichel *et al.*, 2020). A prospective randomized controlled trial comparing chronic pain in lightweight versus heavyweight mesh in laparoscopic inguinal hernia repair was conducted by Prakash *et al.*, A total of 140 patients were randomized, with 65 patients who underwent repair with lightweight mesh and 66 patients who underwent repair with heavyweight mesh. There were no differences in the rate of chronic pain between the two types of mesh that were used for hernia repair (Prakash *et al.*, 2016).

A randomized controlled trial comparing groin pain characteristics following self-gripping mesh and sutured polypropylene mesh for open inguinal hernia repair was conducted by Zwaans *et al.*, A total of 274 patients were included in this study, and after a follow-up of 3 years, the chronic groin pain was similar between the groups (Zwaans *et al.*, 2018). A meta-analysis of chronic pain following the use of sutured and non-sutured open mesh inguinal hernia repair was conducted by Van Steensel *et al.*, A total of 23 studies with 5190 patients were included in this study. The incidence of chronic pain after 12 months of follow-up was similar between both groups (OR=0.70, 95% CI, 0.30-1.66) (van Steensel *et al.*, 2019). Matikainen *et al.*, examined the impact of mesh type and fixation methods on chronic pain after Lichtenstein repair for inguinal hernia. 625 patients were included in this study, with 216 patients undergoing glue fixation, 202 patients undergoing self-gripping mesh, and 216 patients undergoing sutured fixation. The patients were followed for 5 years, and there were no significant differences regarding chronic pain between the various methods of fixation (Matikainen *et al.*, 2021).

Chronic Pain and the Type of Inguinal Hernia Repair

A systematic review and meta-analysis of randomized controlled trials on chronic pain following mesh versus non-mesh inguinal hernia repair was conducted by Öberg *et al.*, A total of 23 studies with 5444 patients were included in this study, and there were no differences regarding the prevalence of chronic pain between non-mesh and mesh repair. Median of 3.5% (0-16.2%) versus 2.9% (0-27.6%) (Öberg *et al.*, 2018). A Cochrane review on mesh fixation with glue versus suture for chronic pain and recurrence for the Lichtenstein hernioplasty was conducted by Sun *et al.*, There were 12 studies with 1932 patients in this review, and glue fixation was associated with a 32% reduction in chronic pain (OR=0.63, 95% CI, 0.44- 0.91) in the short term and may be beneficial in reducing chronic pain (Sun *et al.*, 2017). Carvalho *et al.* conducted a systematic review and meta-analysis on chronic pain after the Shouldice versus the Lichtenstein repair for inguinal hernia repair. There were 10 studies with 4122 patients in this study, and the Shouldice repair was associated with a 33% relative risk reduction of chronic pain when compared to the Lichtenstein repair (RR=0.66, 95% CI, 0.56- 0.78) (Silva Carvalho *et al.*, 2026).

A meta-analysis of postoperative pain using non-sutured or sutured single-layer open mesh repair for inguinal hernia was conducted by van Steensel *et al.*, A total of 23 studies with 5190 patients were included in this study, and there were no differences regarding chronic pain between both methods of fixation of the mesh at 12 months follow-up (OR=0.70, 95% CI, 0.30-1.66). This study concluded that there was no difference regarding chronic pain between both methods of mesh fixation (van Steensel *et al.*, 2019). A randomized trial comparing chronic pain following the Shouldice,

Lichtenstein, and transabdominal preperitoneal (TAPP) hernia repairs was conducted by Koninger *et al.*, 280 patients were divided into 93 patients who underwent the Lichtenstein repair, 93 patients who underwent the Shouldice repair, and 94 patients who underwent the TAPP. Chronic pain was observed in 36% of patients in the Shouldice repair, 31% in the Lichtenstein repair, and 15% in the TAPP repair. This study showed that chronic pain was more common following open inguinal hernia repairs (Koninger *et al.*, 2004).

A systematic review and meta-analysis on chronic pain following inguinal hernia repair was conducted by Harpreet *et al.* There were 22 studies with 10,853 patients that were included in this review, with 5171 patients undergoing the laparoscopic repair and 5682 patients undergoing the open repair. At 2 years, there was no difference regarding the risk of chronic pain in both the laparoscopic and open hernia repairs (RR=0.70, 95% CI, 0.47-1.03), and at 4 years, the risk of chronic pain was reduced in the 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 <i>et al.</i> , 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 <i>et al.</i> , 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 <i>et al.</i> , 2022	Systematic review & Meta-analysis	10,853	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 <i>et al.</i> , 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 treatment of chronic pain after inguinal hernia repair can be divided into non-surgical and surgical management. Non-surgical management involves the use of non-neuropathic drugs like steroids and non-steroidal anti-inflammatory drugs (NSAIDs), and neuropathic drugs like gabapentin, tricyclic antidepressants, and opioids. The surgical treatment of chronic pain involves performing a selective or triple neurectomy, which can be performed as an open or laparoscopic method (Nguyen *et al.*, 2016). Triple neurectomy involves excising the ilioinguinal, iliohypogastric, and genital branches of the genitofemoral nerve. The entire length of the nerve should be removed, and the ends should be ligated to prevent neuroma formation (Amid, 2004). Campanelli *et al.*, conducted a study on the surgical treatment of chronic pain after inguinal hernia repair. A total of 46 patients were included in this study, with 44 patients undergoing triple neurectomies and 2 undergoing iliohypogastric neurectomies. Upon follow-up, 40 patients had complete resolution of pain, and this study showed that chronic pain can be managed surgically (Campanelli *et al.*, 2013).

A systematic review on the surgical treatment for chronic pain after inguinal hernia repair was

conducted by Beel *et al.*, There were 18 studies in which selective and triple neurectomy were performed for the management of chronic pain. The success rate ranged from 33% to 100%, and triple neurectomy was found to be effective in the management of chronic pain following inguinal hernia repair (Beel & Berrevoet, 2022). Charitakis *et al.*, conducted a systematic review and meta-analysis on the different neurectomy techniques for treating chronic pain following inguinal hernia repair. There were 15 studies with 701 patients, and triple neurectomy had an overall pain improvement rate of 98.2%, while double neurectomy had an overall pain improvement rate of 80.1%, but it had a complication rate of 15.3%. The endoscopic retroperitoneal approach had the highest success rate of 95.5%, and it had a complication rate of 28.7% (Charitakis *et al.*, 2025).

CONCLUSION

Chronic pain is a significant complication following adult inguinal hernia repair and may impair physical, psychological, and social well-being. Although recurrence rates have decreased substantially with modern tension-free techniques, Chronic pain remains an important challenge. The condition is multifactorial, involving neuropathic injury, mesh-related inflammation, fibrosis, and central sensitization. Younger age, severe early postoperative pain, recurrent hernias, and nerve injury are recognized risk factors.

Prevention through meticulous surgical techniques, appropriate nerve management, lightweight mesh utilization, and optimized perioperative analgesia remains crucial. A structured diagnostic and therapeutic approach is essential, with treatment ranging from medications and nerve blocks to neurectomy and mesh removal in selected cases. Future advances in surgical technology and pain science may further reduce the burden of Chronic pain and improve long-term outcomes after inguinal hernia repair.

Conflict of Interest: There is no conflict of interest

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