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Chronic Pain After Inguinal Hernia Repair: Pathogenesis, Assessment, and Management

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Abstract:

Background: Chronic pain after inguinal hernia repair is a clinically important complication that may persist for months, impair daily activities, and reduce quality of life. Although mesh-based open and laparoscopic techniques have lowered recurrence rates, postoperative pain remains a major concern. This review summarizes current evidence regarding the incidence, mechanisms, assessment, prevention, and management of chronic postoperative inguinal pain. Pain may arise from nociceptive tissue injury, inflammatory reactions, mesh shrinkage, recurrence, or neuropathic damage involving the ilioinguinal, iliohypogastric, or genitofemoral nerves. Important risk factors include preoperative pain, severe early postoperative pain, nerve injury, and inappropriate mesh fixation. Evaluation should include detailed history, physical examination, pain mapping, assessment of recurrence, and, when required, quantitative sensory testing or diagnostic nerve blocks. Management should follow a stepwise, multidisciplinary approach. Initial treatment consists of patient education, watchful waiting, maintenance of normal activity, and simple analgesics. Persistent symptoms may require nonsteroidal anti-inflammatory drugs, gabapentinoids, antidepressants, or other agents used for neuropathic pain. Local anesthetic injections can provide diagnostic information and temporary relief, whereas radiofrequency treatment or neuromodulation may be considered in selected patients. Surgery is reserved for refractory cases and may involve mesh removal, targeted or triple neurectomy, or a combination of procedures. Careful surgical technique, identification and protection of inguinal nerves, appropriate mesh selection, and cautious fixation are essential preventive measures. Outcomes depend on collaboration among surgeons, pain specialists, anesthesiologists, and patients, with treatment decisions guided by pain characteristics, previous repair, and functional impairment. Early recognition and individualized treatment are crucial for improving long-term outcomes.

Keywords: Inguinal hernia; Chronic postoperative pain; Neuropathic pain; Mesh repair; Neurectomy; Pain management.

Introduction:

Surgical repair is the definitive treatment for an inguinal hernia. As a general rule, all symptomatic inguinal hernias should be repaired when possible. In some asymptomatic hernias, watchful waiting can be an option. There is a multitude of different techniques for hernia repair with different complication and recurrence profiles **(1)**.

Chronic pain following inguinal hernia repair is reported in approximately 10% of cases overall. It remains a challenging problem and has superseded hernia recurrence as the primary complication. In open repairs, identification, and protection of the ilioinguinal, genitofemoral, and iliohypogastric nerves are essential in the prevention of nerve entrapment injuries **(2)**.

In laparoscopic repairs, it is essential to avoid using tacks or sutures to secure the mesh inferior to the iliopubic tract beyond the external iliac artery as this can cause injury of the genitofemoral or lateral femoral cutaneous nerve. When a nerve is injured, it should be transected and ligated proximally. Treatment of chronic pain should be conservative, and a multidisciplinary approach is essential. Anti-inflammatory medications should be used as first-line agents. When these are unsuccessful nerve blocks may be implemented. Groin exploration with neurectomy of all three nerves may be necessary and may improve pain when other treatments have failed **(3)**.

Postoperative chronic pain is a special entity within the domain of chronic pain. Chronic postoperative pain occurs following numerous kinds of surgery, from amputations to thoracotomies to inguinal hernia surgery. The chronic pain after inguinal hernia repair has been extensively studied; however, the management is still difficult. Around the globe, millions of groin hernia repairs are conducted annually and 8%–16% of these patients experience chronic pain to a degree that impairs their daily lives 6 months postoperatively. A few percent of these patients experience disabling pain, and due to the large number of groin hernia repairs, the number of patients with disabling pain and discomfort is an important clinical problem **(4).**

Hernia repairs and pain

Mesh-based repair is recommended for routine groin hernia surgery, with Lichtenstein open repair and laparoscopic techniques being the most commonly performed worldwide. Although laparoscopic approaches are associated with a lower risk of chronic pain, both techniques may still result in persistent postoperative pain **(4).**

Mesh characteristics and fixation methods may influence chronic pain outcomes. Lightweight meshes may reduce chronic pain in open Lichtenstein repair, while no clear benefit has been shown in laparoscopic repair. Glue fixation can reduce chronic pain in open repairs, but this advantage has not been consistently demonstrated in laparoscopic procedures **(5).**

Chronic pain after inguinal hernia repair may result from nociceptive tissue injury or neuropathic nerve damage. Careful surgical technique and gentle tissue handling are essential to minimize this risk. Current guidelines recommend identification of inguinal nerves without routine resection, although pragmatic nerve resection may be performed if nerves interfere with mesh placement **(6).**

Definitions and types of pain

Chronic (postoperative) pain has been defined as pain lasting at least 2–3 months (after surgery), but modifications are proposed to this timeframe. A group of experts in hernia surgery and chronic pain has suggested modifying the definition for chronic pain after hernia repair as pain lasting at least 6 months after operation. The reason for this extended period of time is because the inflammation around the mesh is still ongoing after 3 months, and there is a chance that some patients will improve substantially from 3 to 6 months postoperatively **(7).**

Pathogenesis

The cause of chronic pain following inguinal hernia surgery can be multifactorial and often it is not possible to point to a distinct reason for the pain in a specific patient. Pain can be caused by perioperative injury to nerves or nerves that are being stuck and damaged by sutures or perforated by fixation devices such as tacks. Nerves can also be trapped in a “meshoma”, which is when the mesh has shrunk with folding and wrinkling making a ball of mesh material, the so-called meshoma **(6).**

It is reasonable to imagine that some shrinking of the mesh, which is seen in most patients, can also entrap a nerve and thereby cause chronic pain. Pain can also be caused by the inflammation process around the mesh. It is sometimes not possible to diagnose the specific cause of pain in the individual patient. Furthermore, the distinction between neuropathic pain (pain caused by damage to nerves) and nociceptive pain (pain caused by the release of substances due to tissue damage or damage to organs) can be difficult. Some patients might have groin pain from other sources than their hernia repair such as hip pathology or pubalgia. Furthermore, some patients might have received a hernia repair due to these other pathologies, resulting in symptoms similar to a hernia **(6).**

When investigating the patient with chronic postoperative pain, it is important to look for a possible recurrence since the recurrence could be the reason for pain or discomfort. If a recurrence is present, it is indicated to repair the recurrence and hopefully that will relieve the complaints and discomfort of the patient. However, care should be taken when repairing recurrent hernias if there is also signs of neuropathic pain, since the patient might at the same time have damaged nerves. If there are damaged nerves, repair of the recurrence might not solve the problem for, and it is therefore recommended to also consider a neurectomy at the same time **(7).**

Preoperative and early postoperative pain

A patient's preoperative level of pain affects the risk of developing chronic pain following surgery. A large questionnaire study found that preoperative pain increased the risk of postoperative pain by a factor 1.5. However, preoperative pain is not a contraindication for surgery, but patients should be informed of the increased risk. Not only does the preoperative pain influence the risk of postoperative pain, but also there are strong indications that early high-intensity pain after surgery is a risk factor for developing chronic pain. Therefore, a standardized and effective postoperative analgesic regime could be recommended following inguinal hernia repair **(4).**

Assessment of pain and severity

In research settings, pain assessment should rely on validated questionnaires that evaluate both pain intensity and its impact on daily activities such as walking, standing, and driving. In routine clinical practice, however, these tools are often impractical, so assessment is mainly based on detailed history and physical examination. Some clinicians use a "pain mapping" technique with visual markers to document areas of pain, numbness, and normal sensation, which can help identify potential nerve involvement and guide treatment decisions. These maps may also be used for follow-up comparison or multidisciplinary discussion. More formal assessment can be performed using quantitative sensory testing (QST), which evaluates responses to stimuli such as pressure, temperature, and pinprick, although it is time-consuming and not widely used in routine care **(8, 9, 10).**

Watchful waiting

First-line management of chronic pain following inguinal hernia repair is to examine the patient and explain the condition. Since pain is declining with time after surgery, a watchful strategy can be tried in the beginning. However, a lifestyle change to sedentary activities is not recommended, and chronic pain can severely affect quality of life. Basic analgesics can be used in the period of watchful waiting. If there are no improvements in the condition after a few months, then systematic pharmacological interventions should be tried, preferably in collaboration with pain specialists. If the pain is bearable, it is import to inform the patient that pain will, for many patients, diminish with time **(11).**

Pharmacological interventions

Systematic pharmacological analgesics are used in the postoperative phase to reduce the acute pain. For chronic pain at the later stages, after 3–6 months, depending on definition, pharmacological interventions can be tried as a first-line treatment, using nonsteroidal anti-inflammatory drugs, gabapentinoids, tricyclic antidepressants, selective serotonin reuptake inhibitor/serotonin–norepinephrine reuptake inhibitor, and/or conventional analgesics. Topical administration of analgesics has also been considered. Patches with lidocaine and capsaicin for local application have been tested in randomized studies. Unfortunately, the studies have not been able to demonstrate a benefit, and these patches are therefore not recommended for the treatment of chronic groin pain **(12).**

Prevention of chronic pain with the use of preoperatively administered pharmacological interventions has been investigated, the hypothesis being that it could be possible to diminish postoperative pain and prevent central sensitization. A Cochrane review including 40 randomized clinical trials concluded, cautiously, that preoperatively administered ketamine may reduce the risk of chronic pain but that there is no evidence for recommending gabapentinoids, pregabalin, or other drugs for prevention of chronic postoperative pain. At this point, evidence is not strong enough to systematically recommend preoperative analgesics for the prevention of

chronic pain, but future studies might prove it beneficial, maybe especially in patients at high risk of developing chronic pain **(13).**

Injections

Injections with local anesthetics have been tested and are used for both the relief of pain and the diagnostic purposes in order to identify which nerves are involved in neuropathic pain. Fixed point injections do not have an effect on chronic postoperative pain compared with placebo treatment. In a study, it was tested to use injections at tender points, meaning that the point of injection was tailored to each patient depending on where in the groin the pain was. The study demonstrated some effect indicating that the peripheral nerves were involved in the chronic pain, but unfortunately, the effect did not last **(14)**.

A study on injections with a mix of lidocaine, corticosteroids, and hyaluronic acid has investigated the use of up to three repeated injections over 6 weeks in order to treat chronic pain compared with surgical neurectomy. The study demonstrated a 22% success rate, which was lower than the 71% success rate for the neurectomy group. In the study, 4% minor complications were found for injections. The injections were safe and minimally invasive, and the authors concluded that it should be considered to use injections before explorative surgery with neurectomy. Injections with alcohol can be used for neurolysis **(15).**

Radiofrequency treatment

Radiofrequency can be used to block the nerve by moderate heating (40°C) that does not result in thermocoagulation or can be used at a higher intensity, thereby heating the nerve resulting in ablation of the tissue. Radiofrequency can be done either at the peripheral level or at the vertebral level. A study investigated pulsed radiofrequency at the dorsal root ganglia with heating of the nerve to 40–42°C, demonstrating pain relief for up to 20 weeks. Another study investigated radiofrequency at a higher intensity, where the nerves were heated to 70–90°C, thereby causing thermocoagulation of the nerve, and demonstrated pain relief lasting up to 12 months **(16).**

Another option is to implant a device that stimulates the nerves (spinal cord stimulation), and this has been demonstrated to provide some relief up to 12 months. However, the current clinical use of radiofrequency or spinal implants is limited **(17).**

Surgery

If other treatments (watchful waiting, systemic analgesics, and injections) have been tried and failed, it should be considered to operate the patients for their pain (Figure 1). Different surgical approaches can be used to remove the mesh, perform a neurectomy, or a combination of both.

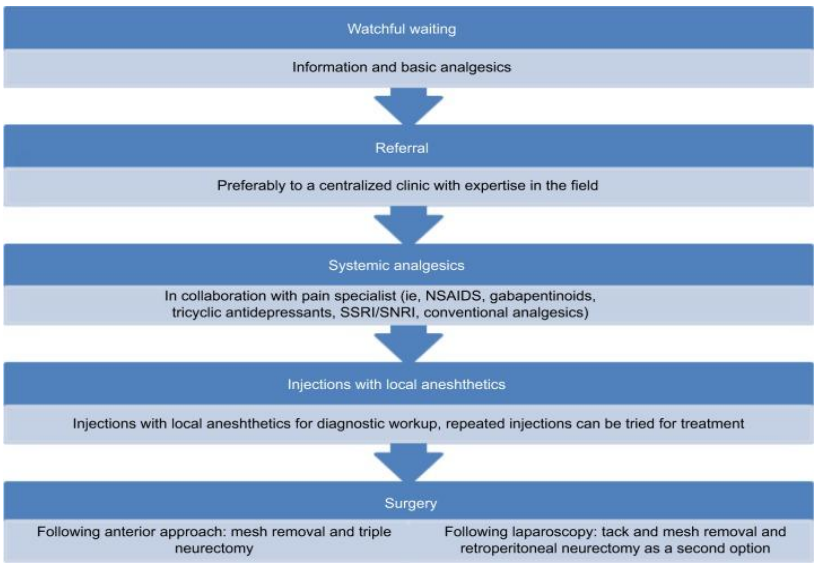


Figure 1. Proposed treatment options for chronic pain following inguinal hernia repair.

Note: A scaled approach is suggested if the patient's condition allows it.

Abbreviations: NSAID; nonsteroidal anti-inflammatory drug; SSRI, selective serotonin reuptake inhibitor; SNRI, serotonin–norepinephrine reuptake inhibitor **(6).**

References:

1. Han, S.-R., Kim, H.-J., Kim, N.-H., Shin, S., Yoo, R. N., Kim, G., . . . research. (2019). Inguinal hernia surgery in Korea: nationwide data from 2007–2015. 97**(1)**, 41-47.
2. Omar, A. A., Rageh, T. M., & Khater, Y. Z. M. J. M. M. J. (2018). Effect of neurectomy versus ilioinguinal nerve preservation in the Lichtenstein tension-free hernioplasty of inguinal hernia. 31(1), 152.
3. Hammoud, M., & Gerken, J. (2018). Inguinal hernia.
4. Andresen K, Burcharth J, Fonnes S, et al. Chronic pain after inguinal hernia repair with the ONSTEP versus the Lichtenstein technique, results of a double-blinded multicenter randomized clinical trial. Langenbecks Arch Surg. 2017;402(2):213–218.
5. Burgmans JP, Voorbrood CE, Simmermacher RK, et al. Long-term results of a randomized double-blinded prospective trial of a lightweight (Ultrapro) versus a heavyweight mesh (Prolene) in laparoscopic total extraperitoneal inguinal hernia repair (TULP-trial). Ann Surg. 2016;263**(5)**:862–866. : 10.1097/SLA.0000000000001579.
6. Andresen K, Rosenberg J. Management of chronic pain after hernia repair. J Pain Res. 2018 Apr 5;11:675-681.
7. Campanelli, G., Bruni, P.G., Morlacchi, A., Cavalli, M. (2017). Chronic Pain after Inguinal Hernia Repair. In: Campanelli, G. (eds) Inguinal Hernia Surgery. Updates in Surgery. Springer, Milano. https://.org/10.1007/978-88-470-3947-6_16
8. Robinson, C. L., Phung, A., Dominguez, M., Remotti, E., Ricciardelli, R., Momah, D. U., ... & Gill, J. (2024). Pain scales: what are they and what do they mean. Current pain and headache reports, 28(1), 11-25.
9. Oberg S, Andresen K, Rosenberg J. Gradual decline in prevalence of chronic pain after laparoscopic groin hernia repair: a nationwide cross-sectional questionnaire study. 2018 : 10.1007/s00595-018-1664-5. In press.
10. Ishida, Y., Okada, T., Kobayashi, T., Funatsu, K., & Uchino, H. (2022). Pain management of acute and chronic postoperative pain. Cureus, 14(4).
11. Fiore, G., Porto, E., Pluderi, M., Ampollini, A. M., Borsa, S., Legnani, F. G., ... & Locatelli, M. (2023). Prevention of post-operative pain after elective brain surgery: a meta-analysis of randomized controlled trials. Medicina, 59(5), 831.
12. Wijayasinghe N, Ringsted TK, Bischoff JM, Kehlet H, Werner MU. The role of peripheral afferents in persistent inguinal postherniorrhaphy pain: a randomized, double-blind, placebo-controlled, crossover trial of ultrasound-guided tender point blockade. Br J Anaesth. 2016;116(6):829–837.
13. Verhagen T, Loos MJA, Scheltinga MRM, Roumen RMH. The Groin-Pain trial: a randomized controlled trial of injection therapy versus neurectomy for postherniorraphy inguinal neuralgia. Ann Surg. 2017 Apr;:26. : 10.1097/SLA.0000000000002274. Epub.
14. Makharita MY, Amr YM. Pulsed radiofrequency for chronic inguinal neuralgia. Pain Physician. 2015;18(2):E147–E155.
15. Levine AB, Steven DA, Parrent AG, MacDougall KW. Successful long-term nerve root stimulation for chronic neuropathic pain: a real world, single center Canadian experience. Pain Physician. 2017;20(2):95–106.