



Inguinal Hernia Repair Complications the Significance of Nerve Entrapment and Chronic Postoperative Inguinal Pain (CPIP)



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Abstract

Introduction: The definition of chronic postoperative inguinal pain (CPIP) is “bothersome pain impacting daily activities lasting at least 3 months postoperatively”. CPIP risk factors are well known but clinicians may neglect them in clinical routine despite the significance of indication for operation and selection of operative technique.

Methods: We performed a search in PUBMED and Google Scholar for inguinal hernia repair, inguinal nerve entrapment, chronic groin pain, and chronic postoperative inguinal pain.

Results: Predictors for chronic pain after inguinal hernia repair may be age, female sex, preoperative pain, prior inguinal hernia repair, mesh, postoperative complications, and postoperative pain. Ilioinguinal nerve identification is a fundamental step to reduce or avoid postoperative pain. Postoperative assessment of CPIP may use clinical and ultrasound examination, Magnetic Resonance Imaging, and neurological mapping. In most clinics and ambulatory hernia centers, however, follow-up after inguinal hernia surgery is not a routine procedure and complications may pass unnoticed. Scar tissue, mesh, sutures, and inguinal nerves should be the focus of intraoperative tissue preparation. The etiology of pain after inguinal hernia repair surgery is often multifactorial. Injury to or scarring around the inguinal nerves in the operative region may be a key factor in causing CPIP or inguinal neuralgia (ilioinguinal syndrome). There should be a thorough investigation of possible causes of chronic pain before deciding on the operation and the type of operation (Orthopedic, open inguinal access, or laparoscopic inguinal repair). Chronic pain may have several releasing factors (orthopedic, intra-abdominal, vascular, nerve entrapment). When conservative treatment fails, surgical interventions including tailored neurectomy and hernia mesh removal may be beneficial for patients with CPIP. The inguinal nerve entrapment in the external oblique aponeurosis may require an open approach. Conclusion: CPIP is a serious complication affecting the quality of life, health care system, and society. Surgeon experience and expertise including preoperative analysis, intra-operative thorough tissue dissection with identification of inguinal nerves CPIP may not avoid CPIP completely.

Keywords: Inguinal Hernia Repair; Complication; Chronic Pain; Chronic Postoperative Inguinal Pain; Nerve Entrapment; Multimodal Treatment; Neurectomy; Ilioinguinal Syndrome

Abbreviations: CPIP: Chronic Postoperative Inguinal Pain; PCP: Postoperative Chronic Pain

Introduction

Ilioinguinal-iliohypogastric nerve entrapment has been described as early as 1942 as a rare but proven cause of chronic inguinal pain [1]. The definition of chronic postoperative inguinal pain (CPIP) is “bothersome moderate pain impacting daily activities lasting at least 3 months postoperatively”. CPIP risk factors include young age, female gender, high preoperative pain, early high postoperative pain, recurrent hernia, and open repair but may be neglected in clinical routine [2]. The ilioinguinal nerve

is vulnerable when it exits from the external oblique muscle medial to the anterior superior iliac spine [3]. Nerve entrapment may be caused by a suture in groin hernia repair [4], groin injury of soft tissue (tear in the external oblique muscle and aponeurosis) [5], or connective tissue insufficiency and soft tissue neuro-histological factors [6]. However, the differential diagnosis may require a criminalistic instinct to recognize the true cause of pain.

Cutaneous nerve entrapment may be a result of surgery and could lead to significant, difficult-to-treat chronic pain [7].

Narita et al. reported that all patients with preoperative pain had intraneural fibrosis within the ilioinguinal nerve, and its degree had a positive correlation with the pain duration [8]. The presence of preoperative pain may be significant for the decision to operate and the true indication for operation, e.g., nerve entrapment versus arthritic hip. CPIP could lead to an inability to work and a loss of quality of life. Careful posture due to CPIP may affect the hip and spine giving rise to further damage. The prevalence rate of postoperative chronic pain (PCP) ranges from 0-63%. Chronic postoperative inguinal pain, CPIP, may afflict 10% to 15% of the nearly 700,000 Americans having inguinal hernia surgery every year [9-12].

Methods

We performed a search in Pubmed and Google Scholar for inguinal hernia repair, inguinal nerve entrapment, chronic groin pain, and chronic postoperative inguinal pain. We structured the text in (pre-operative, intra-operative, post-operative assessment) analysis of possible anticipable factors, management and reporting of CPIP.

Assessment

Preoperative assessment

Preoperative assessment of pain is indispensable. Predictors for chronic pain after inguinal hernia repair were age, female sex, preoperative pain, prior inguinal hernia repair, use of multifilament polyester mesh, hernia sac defect < 3 cm, postoperative pain, and having a history of ipsilateral inguinal hernia repair, direct hernia, previous Lichtenstein or plug repair, bilateral repair or postoperative complications [13-15]. However, it is an individual decision to weigh the risk factors. Risk factors for CPIP with strong evidence include female gender, young age, high intensity of preoperative pain, high early postoperative pain intensity, history of chronic pain other than CPIP, operation for a recurrent hernia, and open repair technique. Risk factors for CPIP with moderate evidence include postoperative complications, neurolysis, and preservation of the ilioinguinal nerve in Lichtenstein repair. Risk factors for CPIP with lower evidence but not insignificant include genetic predisposition (DQB1*03:02 HLA haplotype), lower preoperative optimism, high pain intensity to tonic heat stimulation, inadequate suture/staple/clip mesh fixation, ignorance of the inguinal nerves, less experienced surgeon, sensory dysfunction in the groin, and worker's compensation [16]. Authors found some factors not to be associated with the occurrence of residual pain. Gender, method of anesthesia during surgery, hernia sac diameter, postoperative complications, hernia type, need for emergency operation, the reducibility of the hernia sac, and complete dissection of the hernia sac, hernia type, and surgical technique may not influence CPIP [17,18].

However, almost one-fifth of women suffered chronic pain after groin hernia repair. Chronic pain is more common for women than

men [19]. Many other conditions (e.g., hip, pubic bone, adductor muscles) may cause pain in a similar location [20]. Sports hernias are a complex cause of chronic groin pain in athletes, posing diagnostic and treatment challenges for clinicians [21]. Patients with CPIP may have pre-existing complex psychosocial issues [22]. The ilioinguinal, iliohypogastric, genitofemoral, obturator and pudendal nerves are the major sensory nerves that may be involved in chronic groin and genital pain. High-resolution ultrasound is increasingly used for visualizing small peripheral nerves, and magnetic resonance imaging provides an anatomical overview of the relationship between small nerves and surrounding structures [23]. Genitofemoral neuralgia is a cause of neuropathic pain. The symptoms are groin pain, paresthesias, burning sensation spreading from the lower abdomen to the medial aspect of the thigh, scrotal pain, labia majora, and mons pubis. Genitofemoral neuropathy may be caused by iatrogenic nerve injury during open and laparoscopic inguinal herniorrhaphy. Diagnosis of genitofemoral neuralgia can be challenging, due to the overlap in sensory distribution with the ilioinguinal and iliohypogastric nerve. Differential nerve blocks are recommended to differentiate the nerves [24].

Intra-operative assessment

Intra-operative ilioinguinal nerve identification in open inguinal hernia repair may be a fundamental step to reduce or avoid postoperative pain. A thorough search for nerve entrapment, especially when scar tissue and tissue adhesions in long-standing hernia presence may warrant extensive dissection of the inguinal canal. Prophylactic tailored ilioinguinal neurectomy may offer advantages concerning pain, although it might be possible that in a small number of cases paresthesia and hypoesthesia may be consistent postoperatively. Surgeons should discuss with patients and their families the benefits and potential risks of neurectomy before performing the hernioplasty. Hernia type and surgical techniques may not influence CPIP. However, experience and expertise of the treating surgeon may do.

Postoperative assessment

Postoperative assessment in the case of chronic pain may use clinical and ultrasound examination, Magnetic Resonance Imaging, and neurological mapping. Acute postoperative pain may be a strong predictor for persistent pain following both open anterior and laparoscopic hernia repair. Surgical site infection and hematoma may be responsible for persistent pain following open anterior hernia repair [25]. However, CPIP rates may not be different for laparoscopic and open mesh repair [26]. The rate of chronic postoperative inguinal pain of any degree ranged from 10%-63%, and the rate of moderate-to-severe pain ranged from 1%-18%. The rates of chronic postoperative inguinal pain reported in the included highly cited studies are possibly inaccurate, excessive, and outdated [27].

Analysis of possible anticipable factors

Factors preoperative

Anticipable preoperative factors adding to the risk of CPIP have been listed above. Postoperative pain after one month may be a greater risk factor for CPIP development than preoperative pain. The etiology of CPIP at one year may differ from that at two years. Patient and surgical factors influence the onset of CPIP at one year [28].

Factors intra-operative

Anticipable intra-operative factors may be preceding operations (Caesarean section, laparoscopic or open inguinal hernia repair, prostate resection). Scar tissue, mesh, sutures, and inguinal nerves should be the focus of intraoperative tissue preparation. An association between surgical expertise and CPIP is highly likely [29]. A mesh may be used without fear of causing chronic pain. Patients with an absorbable mesh seem to have less chronic pain following inguinal hernia surgery compared with permanent meshes [30,31], although the type of mesh may not be relevant for CGP [32] nor mesh fixation technique or non-mesh repair [33-36]. Glue may reduce postoperative chronic pain [37]. Mesh repairs may reduce visceral or neurovascular injuries, making mesh repair a common repair approach [38]. Laparoscopic inguinal hernia repair may be associated with reduced early postoperative pain, earlier return to work/activities, less chronic pain, hematoma, and wound infection compared to the Lichtenstein tension-free repair [39]. Factors found to be associated with impairment of function due to pain were medial hernia, and open repair technique [18]. Smaller inguinal hernias have been identified as an independent patient-related risk factor for developing CPIP [40]. Surgically and ultrasono graphically relevant structures ("landmarks") in open hernia repair need to be taken into account to avoid damage to nerves [41]. However, the surgeon experience and expertise may be a major factor in the development of CPIP.

Factors postoperative

Anticipable postoperative factors causing CPIP may be postoperative complications. At the 2-year follow-up, CPIP was registered in 4.2% of cases, of which 63.5% were potentially surgery-related (no-relevant preoperative pain) and 36.5% were possibly due to the postoperative persistence of preoperative pain [42]. The presence of recurrent hernia and early severe pain after the index operation seemed to predict longstanding inguinal pain [43].

The etiology of pain after inguinal hernia repair surgery is often multifactorial though injury to or scarring around the nerves in the operative region. This is thought to be a key factor in causing chronic post-operative hernia pain or inguinal neuralgia.

Management

Preoperative management

There should be a thorough investigation of the cause of chronic pain before deciding on the operation and the type of operation (open inguinal access or laparoscopic inguinal repair). Chronic pain could have several releasing factors (orthopedic, intra-abdominal, vascular, and neurological). The inguinal nerve entrapment in the external oblique aponeurosis may need an open approach to perform tailored neurectomy.

Intra-operative management

Surgical techniques that avoid nerve damage should be applied whenever possible. Ilioinguinal nerve identification in open inguinal hernia repair may be a fundamental step to reduce or avoid postoperative pain. Prophylactic tailored ilioinguinal nerve neurectomy may offer advantages concerning pain but may cause paresthesia and hypoesthesia in some patients. The surgeon should discuss consequences of persisting CPIP versus paresthesia/hypoesthesia preoperatively with the patient [44]. For CPIP the focus should be on nerve recognition in open surgery and, in selected cases, prophylactic pragmatic nerve resection (Hernia Surge 2018)

Postoperative management

Kehlet et al. recommended aggressive early therapy to downsize the intensity of acute postoperative pain, which may cause a persistent pain state. Genetic factors may affect the peripheral and central nervous system leading to chronic and neuropathic pain. Multimodal pharmacological therapy may be effective in these cases [45]. The etiology of CPIP may be multifactorial. Neuropathic and nociceptive components may overlap. However, it is emphasized that the best strategy is to avoid CPIP concerning patients, health care, society, and quality of life [46]. Several treatment options for genitofemoral neuralgia exist – radiofrequency ablation and cryoablation, pharmacologic, behavioral, and interventional modalities, e.g., nerve blocks. In case conservative methods fail, triple neurectomy, meshoma removal, and neuromodulation including stimulation of the dorsal root ganglion may help [2,24,47,48].

The rate of chronic pain after inguinal hernia mesh repair can reach 51.6% due to entrapped nerves in mesh or sutures [49]. Multimodal pain control may have disadvantages despite the beneficial effects of non-opioids and regional anesthesia adjuvants. The efficacy and safety of perineural steroids, opioid use, and substance abuse may be escalated in cases where patients are discharged after outpatient surgery with more chronic opioid therapy. A lack of consensus on the definition of CPIP further aggravates the problem [50,51]. It is necessary to rule out other causes of chronic pain by clinical and ultrasound or MRI examination before operation and to wait in selected cases

[52]. Chronic groin pain is a complex problem with no universal solution [53]. Tailored neurectomy may reduce postoperative pain rate and pain score without difference in postoperative numbness, sensory disturbance, and secondary complications rate [54]. Injury to or scarring around the nerves in the operative region may be treatment resistant to conservative treatment. The entrapment of inguinal nerves may be a key factor in causing chronic post-operative hernia pain or inguinal neuralgia (ilioinguinal syndrome). Ultrasound-guided microwave ablation has emerged as pain relief [55]. The dermatome sensory mapping may help to prepare and analyze neurectomy [56].

According to updated information, there is small high-level evidence for non-surgical treatment of CPIP. Reports suggest to start with the least invasive treatment moving to more invasive procedures upon lack of effect [57]. When non-operative methods fail, surgical interventions including tailored neurectomy and hernia mesh removal have proven to be beneficial for patients with CPIP [11]. Nanotechnology may represent a valuable tool for drug transportation including liposomes and nanocapacitor-based devices/patches to reduce the use of opioids in surgical patients [58].

Reporting

In most clinics and ambulatory hernia centers, follow-up after inguinal hernia surgery is not a routine procedure. Complications may pass unnoticed, thus impairing quality assessment. Questionnaires provide valuable information concerning postoperative complications. Questionnaires should become an integrated part of routine postoperative assessment [59]. The Q1.6 Inguinal Hernia application continuously measures patient-reported outcomes (PROs) by sampling experiences through brief, digital, and condition-specific questions. This may overcome the limitations of paper questionnaires and give real-time insight into patient recovery [60].

Summary and Conclusion

The definition of chronic postoperative inguinal pain (CPIP) is “bothersome pain impacting daily activities lasting at least 3 months postoperatively”. CPIP risk factors are well known but clinicians may neglect them in clinical routine despite the significance of indication for operation and selection of operative technique. Predictors for chronic pain after inguinal hernia repair may be age, female sex, preoperative pain, prior inguinal hernia repair, mesh, postoperative complications, and postoperative pain. Ilioinguinal nerve identification is a fundamental step to reduce or avoid postoperative pain. Postoperative assessment of CPIP may use clinical and ultrasound examination, Magnetic Resonance Imaging, and neurological mapping. In most clinics and ambulatory hernia centers, however, follow-up after inguinal hernia surgery is not a routine procedure and complications may pass unnoticed. Scar tissue, mesh, sutures, and inguinal

nerves should be the focus of intraoperative tissue preparation. The etiology of pain after inguinal hernia repair surgery is often multifactorial. Injury to or scarring around the inguinal nerves in the operative region may be a key factor in causing CPIP or inguinal neuralgia (ilioinguinal syndrome). There should be a thorough investigation of the cause of chronic pain before deciding on the operation and the technique of operation (Orthopedic, open inguinal access, or laparoscopic inguinal repair). Chronic pain may have several releasing factors (orthopedic, intra-abdominal, vascular, nerve entrapment).

When conservative treatment fails, surgical interventions including neurectomy and hernia mesh removal may be beneficial for patients with CPIP. The inguinal nerve entrapment in the external oblique aponeurosis may require an open approach and tailored neurectomy. CPIP is a serious complication affecting the quality of life, health care system, and society. Surgeon experience and expertise including preoperative analysis, intra-operative thorough tissue dissection with identification of inguinal nerves CPIP may not avoid CPIP completely.

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