Treatment of chronic pain post inguinal hernia repair

By

WorkSafeBC Evidence-Based Practice Group

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About this report

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The Evidence-Based Practice Group was established to address the many medical and policy issues that WorkSafeBC officers deal with on a regular basis. Members apply established techniques of critical appraisal and evidence-based review of topics solicited from both WorkSafeBC staff and other interested parties such as surgeons, medical specialists, and rehabilitation providers.

Cite as

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List of abbreviations

<table>
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<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>CCT</td>
<td>Controlled clinical trial</td>
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<tr>
<td>IASP</td>
<td>International Association for the Study of Pain</td>
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<td>MPR</td>
<td>Mesh plug repair</td>
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<td>PHS</td>
<td>Prolene hernia system</td>
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<tr>
<td>PRF</td>
<td>Pulsed radiofrequency</td>
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<tr>
<td>QOL</td>
<td>Quality of life</td>
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<tr>
<td>RCT</td>
<td>Randomized controlled trial</td>
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<tr>
<td>SCS</td>
<td>Spinal cord stimulation</td>
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<tr>
<td>TAPP</td>
<td>Transabdominal preperitoneal patch plasty</td>
</tr>
<tr>
<td>TENS</td>
<td>Transcutaneous electrical nerve stimulation</td>
</tr>
<tr>
<td>TEP</td>
<td>Totally extraperitoneal patch plasty</td>
</tr>
<tr>
<td>VAS</td>
<td>Visual Analog Scale</td>
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Background

Chronic pain following inguinal hernia repair is quite common and may reduce quality of life. Determining the etiology of this multifaceted condition can be challenging.

The response of a patient to hernia repair is affected by their pre- and post-operative physical and psycho-social state. Clinical and technical aspects of the surgical operation may also play a major role in short- and long-term outcomes. The wide range of surgical techniques and materials available to choose from makes the appropriate decision by the surgeon crucial to the long-term success of the repair. For example, a surgeon may decide to perform an open or laparoscopic surgery; to use or not to use mesh; to select a light or heavy weight mesh; to place the mesh in the preperitoneal or extraperitoneal area; to fit it with sutures or glue; and to preserve or remove surrounding nerve(s).

Post-hernia repair pain is considered to be either “non-neuropathic” (resulting from scar tissue or mechanical pressure) or “neuropathic” (resulting from nerve injury or compression) or a combination of both. Neuropathic pain is reported to be more prevalent. Kalliomaki et al. state that as measured by various quality of life scales, “persistent post-herniorrhaphy pain is mainly neuropathic and has a substantial impact on health-related quality of life”. Though some authors studied chronic pain post-hernia repair at one year and beyond, in general, pain lasting beyond three months from the operation is considered to be “chronic”. It is suggested that chronic post-operative pain dissipates over time. Regardless, after hernia repair many patients experience chronic pain for a significant period of time. A 2012 Cochrane review by Willaert et al. reports the risk for post-hernia repair chronic pain to range from 7.83% to 40.47% and 2 to 4% of reported post-herniorrhaphy chronic pain is serious enough to affect patients’ daily activities. The incidence of debilitating pain is estimated to be 0.5 to 6% by an international group of experts. Given the frequency of hernia repair operations performed worldwide (annually, 2800 per million in the US and Europe), a considerable number of patients are affected by this disabling chronic pain. For example, in 2003, in the US, over 800,000 inguinal hernia operations were performed, possibly leaving an estimated 2000 patients with post-operative chronic pain affecting their daily lives. Recently, in the US, the number of people suffering from post-hernia repair disabling pain is estimated to be around 6,000 to 18,000 annually.

Inguinal hernias also constitute a sizable proportion of work-related injury claims which require surgical intervention. For example, in the period of 1987 – 2001, 5455 inguinal hernia claims were accepted at WorkSafeBC. Considering the various published statistics, possibly more than 100 claimants have suffered from post-operative chronic pain with a significant negative impact on their daily lives.

The objective of this review is to explore the literature around evidence-based treatment options for patients with chronic pain post inguinal hernia repair.
Methods

A literature search on electronic OvidSP databases was undertaken on July 26, 2012, employing the keywords inguinal or groin hernia repair/hernioraphy/hernioplasty, chronic/persistent/neuropathic pain, treatment/therapy; and combining these keywords with Boolean operators as appropriate.


Limits were employed during searching. Only articles in English, on humans, studying adult populations, and those that were published in the last 5 years were included. Study type was limited to controlled clinical trials, comparative studies, meta-analysis, and randomized controlled trials (RCTs). A flow diagram of the study selection methods is available in Appendix 1.

With the above-mentioned search strategy, we were not able to identify any studies on the treatment of post-hernia repair chronic pain. We then hand-searched (with no limits on publication year or study type) the reference lists of the potential articles collected in full-text during study selection. Additionally, we searched the literature on a few specific treatment modalities suggested for post-hernia repair chronic pain, such as neurectomy, pulsed radiofrequency (PRF), spinal cord stimulation (SCS) and transcutaneous electrical nerve stimulation (TENS), with no restriction on study type, extending the publication date range back to 2000.
Results

Most of the studies identified through our OvidSP databases search were efficacy studies comparing various surgical techniques or materials used for inguinal hernia repair. In these studies, chronic pain was often studied as a primary or a secondary outcome.\(^7\)\(^9\)\(^14\)\(^16\)\(^22\)-\(^35\) Except for a few proposed protocols,\(^11\)\(^36\) studies specifically on the “treatment of post-hernia repair chronic pain” were lacking. There were a few studies focusing on prevention of post-hernia repair chronic pain,\(^15\)\(^37\)\(^38\) while others attempted to determine predisposing factors.\(^1\)\(^39\)

I. Efficacy studies

Efficacy studies on hernia repair surgical techniques and materials reported on different outcomes (e.g., hernia recurrence, perioperative complications, hypoesthesia, surgery related chronic pain, quality of life). In a meta-analysis of studies comparing open vs. laparoscopic hernia repair techniques, O’Reilly et al. did not find one specific technique to be consistently better than the others for all outcomes. For example, they found that laparoscopic techniques were superior to open techniques in terms of chronic groin pain and numbness, but were inferior in terms of perioperative morbidity.\(^33\)

One problem regarding the use of chronic pain as an outcome of interest in efficacy studies of inguinal hernia repair is the fact that there is no standard measurement for it.\(^3\)\(^17\) Hence, it is difficult to compare results from different studies and to combine data to conduct a meta-analysis.

Table 1 lists efficacy studies found during our literature search which compared different surgical techniques and materials and reported post-hernia repair chronic pain as an outcome of interest.

II. Return to daily activities

Our literature search also found studies reporting on “return to daily activities” or “return to work”. Eker et al. found that “patients had faster time to return to daily activities (P<.002) and less absence from work (P=.001)” after TEP procedure compared to Lichtenstein hernia repair.\(^40\) Similarly, time to post-operative recovery and return to work were significantly shorter for TEP (P=.001) in the Bektas et al. study, which compared TEP and darn plication techniques.\(^31\) Sick leave time was statistically significantly shorter with the TEP group compared to the Lichtenstein group in both the Langeveld and Kouhia studies.\(^7\)\(^26\) Eklund et al. compared laparoscopic and Lichtenstein inguinal hernia repair, and found time to recovery to be one of the risk factors to determine post-hernia repair chronic pain. In a systematic review by Zhao et al., data from the included studies comparing mesh plug repair (MPR) technique and prolene hernia system (PHS) repair to Lichtenstein’s operation yielded shorter time to return to work. However, the difference between the groups was not statistically significant in any of these comparisons.\(^25\) The Koch et al. study found that time to return to work was statistically significantly shorter in patients with lightweight mesh compared to standard mesh.\(^41\) A 2010 meta-analysis by Karthikesalingam et al. found that time to return to work activities was significantly shortened by laparoscopic surgery. However, there was significant statistical heterogeneity associated with this outcome measure.\(^9\)
Table 1. Results related to post-hernia repair chronic pain in efficacy studies found during our literature search.

<table>
<thead>
<tr>
<th>No statistically significant difference between various surgical techniques</th>
<th>No statistically significant difference between various surgical materials</th>
<th>Statistically significant difference between various surgical techniques</th>
<th>Statistically significant difference between various surgical materials</th>
</tr>
</thead>
</table>
| Amato 2012  
Shouldice technique vs. other open techniques | Langeveld 2010  
Open mesh repair (Lichtenstein) vs. TEP | Bektas 2011  
TEP procedure vs. darn plication technique | Campanelli 2012  
Fibrin sealant vs. sutures |
| Demetrashvili 2011  
Lichtenstein vs. laparoscopic TAPP | Markar 2010  
Absorbable meshes vs. nonabsorbable meshes | Kouhia 2009  
Lichtenstein vs. TEP | Lovisetto 2007  
Tissucol fibrin glue vs. staples in laparoscopic TAPP repair |
| Eklund 2007  
Laparoscopic vs. Lichtenstein repair | Paajanen 2011  
Tissue glue vs. absorbable sutures in mesh fixation | Nienhuijs 2007  
Open preperitoneal Kugel vs. standard open anterior Lichtenstein procedure | |
| Karthikesalingam 2010  
Laparoscopic vs. conventional open surgery | Paajanen 2007  
Conventional polypropylene mesh, lightweight mesh or partly absorbable mesh | O’Reilly 2012  
Laparoscopic vs. open repair of primary unilateral inguinal hernia | |
| Kucuk 2010  
Moloney darn vs. Lichtenstein procedure |  |  | |
| Van Veen 2007  
Mesh vs. non-mesh primary inguinal hernia repair |  |  | |
| Willaert 2012  
Open preperitoneal techniques vs. Lichtenstein repair |  |  | |
| Zhao 2009  
Lichtenstein’s operation vs. MPR, or Lichtenstein’s operation vs. PHS repair, or mesh plug vs. PHS repair |  |  | |

III. Treatment modalities

We searched the literature for a number of specific treatment modalities which have been undertaken for post-hernia repair chronic pain. We sought studies published from 2000 onwards, with no restrictions on study type.

a. Neurectomy

Causes, prevention, and surgical treatment of postherniorrhaphy neuropathic inguinodynia: Triple neurectomy with proximal end implantation (Amid 2004)²

This paper reported on a case series of 225 patients suffering from chronic postherniorrhaphy neuralgia who underwent triple neurectomy (resection of ilioinguinal, iliohypogastric, and genital nerves) with proximal end implantation. All patients had a history of failed conventional pain management. The authors identified that out of 225 patients, 100 had neuropathic pain. The follow up at six months showed that 80% of the total number of
patients had full recovery, and with the exception of 4, all of the patients with workers’ compensation-related cases were able to return to work without any restrictions. The authors supported this surgical approach because it was a one-stage operation, avoiding repeat neurectomies. They underlined that “the most common cause of nerve injury is failure to identify and protect the nerves, particularly when dissection is minimized in order to complete the operation faster,” and they listed some technical recommendations for the success of inguinal hernia-repair operations.

**Management of Chronic Postoperative Groin Pain (Ducic 2008)**

The authors retrospectively studied 19 consecutive patients who were referred to their clinic for intractable post-operative groin pain due to neuroma or nerve entrapment. All were offered neurectomies. The main outcome of interest was a change in chronic pain pre- and post-neurectomy and was measured by patient self-assessment, using a Visual Analog Scale (VAS). The secondary outcome of interest was a 50% improvement on a quality of life (QOL) scale after neurectomy. They reported that 84% of patients had significant pain relief and improved QOL at a minimum of 1 year follow up after neurectomy. They recommended that neurectomy be a choice for surgical treatment for post-hernia repair chronic pain if appropriate selection of patients and surgical techniques are applied.

**b. Pulsed Radiofrequency (PRF)**

**Pulsed Radiofrequency for the Treatment of Ilioinguinal Neuralgia after Inguinal Herniorrhaphy (Rozen 2006)**

The authors reported on a case series of 5 patients with ilioinguinal neuralgia secondary to inguinal repair who received pulsed radiofrequency (PRF) as a treatment. The authors distinguished pulsed radiofrequency from “neurodestructive” radiofrequency treatment, which they defined to involve “a constant high frequency (500kHz), high temperature (80 – 82°C) electrical current” application to the tissue via an electrode. In contrast, they defined PRF as delivering “high intensity currents in pulses, allowing heat to dissipate during the latent period so that neurodestructive temperatures are not reached and neuritis-like reactions do not occur.” They treated each of the five patients at T12, L1, and L2 vertebral levels with root PRF at 42°C for 120 seconds per level. Four of the five patients responded to PRF successfully, with less pain, and “have been satisfactorily treated by oral medication to date.”

**c. Spinal Cord Stimulation (SCS)**

**Spinal Cord Stimulation as Alternative Treatment for Chronic Post-Herniorrhaphy Pain (Yakovlev 2010)**

The authors studied 15 consecutive patients (from 3 clinics) with intractable chronic pain post-herniorrhaphy. Conservative therapy had been tried and failed for all of the patients. The authors applied Spinal Cord Stimulation (SCS), a technique “to interrupt pain transmission from the viscera to the spinal cord,” via epidural access gained at T12/L1 or L1/L2 with the final leads located at T7-T8-T9. After all patients completed a 2-day trial, they were switched to permanent leads within a period of 2 to 4 weeks. At 12-month follow up, the authors reported significant pain relief (75% reduction in VAS) and decreased or discontinued pain medication use in all of the patients. This study is a report of a case series with 15 patients and there is no comparison
group. The authors acknowledged this and called for prospective studies to compare SCS to other less invasive interventions.

d. **Combined Spinal Cord and Peripheral Nerve Field Stimulation (SCS and PNFS)**

Combined Spinal Cord and Peripheral Nerve Field Stimulation for Persistent Post-Herniorrhaphy Pain (Lepski 2012)

The authors conducted a case series study of four patients with chronic post-herniorrhaphy neuropathic pain. They implanted electrodes into the epidural area of the spinal canal (generally T8-9) and into the subcutaneous tissue in the inguinal region. The test phase was 14 days, with 3 days using SCS, 3 days using PNFS, 3 days using both (SCS + PNFS), and 5 days off. The study found that combined SCS + PNFS obtained better results for neuropathic post-hernia pain, suggesting an additive effect of the simultaneous use of the two treatments for pain control. The follow-up period was 2 to 11 months. All four patients had some improvement in pain levels, with three having a stronger response. At follow-up, two patients were no longer taking medication. Given the possible benefits of lower medication intake, fewer surgical interventions, and reduced hospital stay after SCS + PNFS application, the authors suggested that a trial to test the cost-effectiveness of this treatment modality for patients with post-herniorrhaphy neuropathic pain was worthwhile.

e. **Transcutaneous Electrical Nerve Stimulation (TENS)**

The few studies we identified which utilized transcutaneous electrical nerve stimulation (TENS) for the treatment of post-hernia repair pain focused on post-operative pain, but not on pain continuing beyond three months and considered to be chronic.

**IV. Practice guidelines and review papers**

We also searched the literature for practice guidelines and review papers on the treatment of post-hernia repair chronic pain.

**Surgical management of chronic pain after inguinal hernia repair** (Aasvang 2005)

Aasvang and Kehlet undertook a literature review to examine neurectomy and mesh or staple removal as treatment options for chronic pain after inguinal hernia repair. They identified 35 papers on “surgical treatment for groin pain” and eliminated 18 of them (some did not have data on chronic pain, some were not available, etc.) They also cross-checked retrieved articles for additional references. The authors found the methodological quality of the neurectomy studies to be poor (none of the studies were randomized; the majority were observational studies describing usual clinical practice – with no comparison group; and some were case reports). “Lack of objective assessment of pain before operation, previous treatment, lack of neurophysiological examination to achieve a specific diagnosis, no standardized surgical procedure in a well defined patient population, lack of randomization and control group, and absence of detailed follow-up” hindered the interpretation of the findings that in general reported favorable outcomes. Regarding mesh or staple removal, the authors concluded that there were not sufficient studies at that time to reach any conclusion.
Pulsed Radiofrequency in the Treatment of Persistent Pain after Inguinal Herniotomy: A Systematic Review (Werner 2012)\textsuperscript{20}

Werner et al. undertook a systematic review of the literature on pulsed radiofrequency, which utilizes electromagnetic energy for the treatment of persistent pain following inguinal herniotomy. They searched PubMed, Embase and CINAHL and identified four case reports with a total of eight patients. The outcome of interest to measure the efficacy of PRF was pain relief and was reported to vary between 63% and 100%. During a follow up period of 3 to 9 months, no adverse effects or complications were reported. The authors stated that based on these four studies the evidence was low quality and the strength of recommendation was weak to moderate. In the discussion section of their paper the authors made six recommendations to improve the quality of PRF studies: The neuropathic pain component should be determined through neurologic examination with sensory testing, and should not be anticipated; Pain and pain-related functional impairment should be measured before and after treatment; Double-blinded, placebo-controlled study technique is needed to estimate the true value of diagnostic blocks applied before PRF; To establish evidence-based analgesia, sham-controlled studies are needed; Ultrasound-guided techniques should be used to document correct anatomic location, and to perform diagnostic blocks and the therapeutic procedure; How pain and pain-related functional impairment, and also adverse effects, have changed over time should be followed for 6 to 12 months, with appropriate intervals. The authors concluded that the guidelines they provided in the paper will help improve management strategies for this group of chronic pain-disabled patients.

Inguinodynia following Lichtenstein tension-free hernia repair: A review (Hakeem 2011)\textsuperscript{13}

In 2011, Hakeem and Shanmugam published a review discussing various aspects related to “chronic groin pain” which exists beyond 3 months post Lichtenstein hernia repair. The solution they suggested was preventative: “Careful intra-operative handling of inguinal structures and better patient counselling pre- and post-herniorraphy.”

International guidelines for prevention and management of post-operative chronic pain following inguinal hernia surgery (Alfieri 2011)\textsuperscript{17}

The authors reported the results of an international consensus conference held in Rome in 2008, which included both a working group and 200 people from an international audience of experts on the topic of post-operative chronic pain following inguinal hernia surgery. The group worked on consensus terminology and definitions. They suggested that the International Association for the Study of Pain (IASP) definition of “chronic pain”\textsuperscript{47} be modified to include “only chronic pain that is present from 3 months after surgery and which lasts beyond 6 months after surgery.” As a preventative approach for avoiding post-hernia repair chronic pain, this group of experts suggested that during hernia repair all three inguinal nerves need to be identified and preserved. If this was not possible due to structural issues, they suggested that any nerve in the way of a repair should be completely removed and not just cut. The experts also suggested that if a patient suffers post-hernia repair chronic pain, medical pain management should be the first choice. If a patient does not respond to medical treatment for more than 1 year after the operation, and if their quality of daily life has been compromised by the intensity of the pain, the experts then recommended triple neurectomy. Moreover, they noted that this operation needs to be performed by experienced surgeons.
Key messages

- Effective management of chronic pain following inguinal hernia repair should be based on a thorough examination of the etiology (history, physical examination, imaging studies, and other tests as needed).

- Neuropathic and non-neuropathic pain may require different pain management approaches.

- For non-neuropathic pain, depending on the cause of pain, a variety of approaches may be appropriate (e.g., non-steroidal anti-inflammatory drugs (NSAIDs), antibiotic therapy, local anesthetic/steroid injections, surgical re-exploration and mesh removal, or repair of recurrent hernia).

- Medical management of neuropathic pain should start with medical pain therapy (oral/local analgesics, opioids, sometimes anti-depressants) and if required switch to various treatment modalities such as nerve blocks with injection of local anaesthetics (with or without steroids), neurolysis, or minimally invasive techniques such as spinal cord stimulation (SCS), transcutaneous electrical nerve stimulation (TENS), or pulsed radiofrequency (PRF). Surgical intervention, often neurectomy, may be indicated.

- There is no consensus in the literature about which patients are appropriate candidates to benefit from surgical therapy (i.e., peripheral neurectomy).

- There is no consensus in the literature around clinical timing to switch from conservative therapy to surgical therapy. However, in general, patients are not offered surgical exploration before conservative therapy has been prescribed for at least 6 months.

- Patients who undergo surgical treatment for chronic post-herniorrhaphy pain should be selected carefully and should be informed about the risks of the intervention.
Limitations

Until now, few studies have focused on the treatment options for post-inguinal hernia repair chronic pain. Proposals for RCTs/meta-analyses have only recently been reported. The few studies available are not controlled trials, have small sample sizes, studied selected and usually consecutive groups of patients, do not all use standard tools to measure outcomes of interest, and do not have a consistent definition of “chronic pain” after hernia repair. With a lack of controlled comparative studies, the existing reviews and guidelines on the topic are based on clinical experience and expert opinion.
Summary and conclusions

Until conclusive studies are published on the treatment of chronic pain post-inguinal hernia repair, the common best practices of chronic pain management utilizing a biopsychosocial approach (e.g., medical pain management supported with patient and caregiver education, return-to-activity programs, and services from behavioral health experts) should apply. It remains important to tailor the pain management approach according to the type of the pain diagnosed (i.e., neuropathic, non-neuropathic, or both). Newly emerging treatment modalities (e.g., pulsed radiofrequency (PRF), spinal cord stimulation (SCS), transcutaneous electrical nerve stimulation (TENS)) should not be endorsed without a thorough evaluation of the individual patient.

With the large number of primary studies on the efficacy of hernia repair techniques, the number of systematic reviews and meta-analyses on the topic of “post-hernia repair chronic pain” is likely to increase. Conclusions from these publications can be expected to challenge current clinical practice and to address some of the surgery-related factors contributing to post-hernia repair chronic pain.
References


Appendix 1

Flow diagram (Study selection)

OvidSP databases search results
(n=603)

Inclusion limits employed:
- Humans
- Adults
- English
- Last 5 years
- Randomized controlled trials, controlled clinical trials, comparative studies, meta-analyses

Records excluded
(n=523)

Results after limits employed
(n=80)

Abstracts collected and reviewed for 80 citations

Abstracts excluded
(n=75)

Full text articles collected
(n=5)

No relevant articles found
(n=0)

References screened and additional searches on specific treatment modalities conducted