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COMMENT

Invited commentary: persistent pain after inguinal hernia repair: what do we know and what do we need to know?

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Over the last 15 years, there is a general agreement that persistent pain complaints after groin hernia repair, which affects daily activities in about 2–10 % of patients, may be the most relevant outcome compared to the previous focus on recurrences [1]. The current issue of Hernia includes several papers on chronic post herniorrhaphy pain which deal with the prevention (role of gender, surgical approach, type of mesh and fixation methods), and the treatment (therapeutic blocks with local anaesthetics, surgical treatment) is therefore both relevant and timely. However, despite an overwhelming amount of publications on the topic, there is still a lack of sufficient knowledge to guide the hernia surgeon as to relevant preoperative risk factors, choice of surgical technique at the primary operation or the evidence for (non-)surgical therapy for established chronic pain, and the future strategies for improvement.

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Definition and assessment

Although the international definition of persistent postsurgical pain has been pain 2–3 months postoperatively, this should probably be extended to 6 months in hernia surgery, to allow the mesh-related inflammatory responses to decrease.

The assessment of pain-related influence on daily activities has been emphasised repeatedly and in future trials we need to agree and implement a uniform assessment with details on the functional consequences [2–5]. In this context, a more specific assessment of pain-related sexual dysfunction including dysejaculation needs to be addressed [6, 7]. In addition, testicular pain (orchialgia) should be differentiated from inguinal pain or scrotal skin pain and is probably even more difficult to treat. Too often in the past, chronic pain has been insufficiently reported as "yes" or "no".

Many authorities believe that nerve damage is the most important pathological mechanism for post herniorrhaphy groin pain. Nevertheless, the previously proposed classification of pain syndromes into "neuropathic" vs "nociceptive pain" [8] has limited practical significance, since we have no reproducible diagnostic methods to differentiate the two [9–11]. We have to take into account that in every open groin hernia operation branches or sub-branches of the inguinal nerves are damaged. So far, the specificity and sensitivity of nerve damage assessed by

quantitative sensory testing is limited [9–11]. Furthermore, the relative role of an intra-operative nerve damage vs later inflammatory-mediated "neuropathy" remains unknown, as is the specific role of mechanical or fibrotic responses of scar tissue formation. Finally, there is a need for clarification of the relative role of peripheral vs central neural mechanisms of pain perception [12].

Diagnostics

It is clear that a careful history and a structured physical examination play a crucial role in the diagnostic evaluation of groin pain, and standardisation is needed. Although several neuropathic pain questionnaires are available and should be used in future studies, there is until now no data to support that they help us to select a specific mechanism-based treatment. Obviously, a recurrent hernia needs to be excluded as well as other specific diseases in the anatomical region, but otherwise the exact role of imaging techniques in the operated field has not been clarified.

Diagnostic blocks have been used for decades, but there is no consensus of the best technique or the most appropriate drug(s). Conclusive data from randomised placebo-controlled trials are lacking [13, 14].

Prevention

Although several risk factors have been identified such as young age, female gender, preoperative pain, preoperative function of the nociceptive system and pain gene characteristics [15–17], this has so far not been translated into clinical useful methods for daily practice. Preoperative psycho-social factors are important for development of persistent postsurgical pain in a variety of operations [18], but do not seem to be as important in herniorrhaphy patients [15]. The role of preventive analgesia by local anaesthetics or systemic analgesics to prevent acute and chronic pain is still debatable [19, 20]. However, there is much evidence that a laparoscopic procedure may decrease the risk of persistent pain [1], probably due to less nerve injury [15]. Some data suggest that this is also the case when the mesh is placed in the preperitoneal space via an open (anterior) approach, as in the study of Koning et al. [21] on health status 1 year postoperatively in this issue of Hernia. The use of lightweight meshes in open groin hernia surgery is recommended not only due to a slightly reduced risk of persistent pain but also to reduction of the uncomfortable feeling of a foreign body [22–24]. The data regarding the best method for fixation of the mesh in open surgery is less conclusive but there are preliminary data that support the use of glue fixation to reduce chronic pain [25, 26]. However, more data are needed regarding the long-term risk of recurrences with lightweight meshes and/or glue fixation in relation to size and type of hernia. The retrospective study by Shaikh et al. [27] in this issue suggests that the use of skin staples instead of sutures for mesh fixation does not increase the risk for chronic pain. The study by Birk et al. [28] also in this issue shows promising results with the laparoscopic use of a self-gripping mesh without additional fixation. However, no conclusive data are available on choice of mesh or fixation techniques (no fixation vs (resorbable) tacks vs glue) to decrease the risk for chronic pain (without increasing the risk for recurrence) after a laparoscopic repair. The publication by Tolver et al. [29] in this issue shows that even after laparoscopic repair, female gender is a risk factor for chronic pain.

Since nerve injury either due to intra-operative damage or later inflammatory-mediated "neuropathy" is important, intra-operative identification of the nerves in open surgery should theoretically decrease the risk of surgical injury and is currently recommended by some [30–32] although still debated. Preventive transection of nerves is also debatable [31, 33, 34] and should therefore be considered only in selective cases to allow sufficient placement of the mesh and avoid close nerve contact with the mesh [30]. We feel surgeons should be aware of the exact nerve anatomy and document in detail in every operative report specific identification and possible manipulation to allow a better future understanding on this important topic.

Treatment

Once established, a persistent post herniorrhaphy pain syndrome may be difficult to treat because patients are commonly refractory to multiple different approaches. Compounding this problem is the issue of secondary gain especially in patients where there are workman's compensation considerations. In addition, existing treatment recommendations are not universally agreed upon. The use of lidocaine or capsaicin patches otherwise recommended in other neuropathic pain states has not been assessed after groin hernia repair with a "neuropathic" pain component and therefore requires future study. Conventional pharmacological treatment of "neuropathic" pain should always be tried despite lack of procedure-specific hernia data. The often used "therapeutic" neural blockades also require more studies with sufficient study design [13, 14] before final recommendations can be made regarding the exact technique (ultrasound-guided, which nerve(s) and what level (ilioinguinal, paravertebral, etc.). Thomassen et al. [35] report in this issue beneficial long-term effects of ilioinguinal/iliohypogastric nerve blocks comparing nerve stimulator- and ultrasound-guidance to administer the

block, without benefit for the latter. The administration of botulinum toxinum and other neuro-destructive techniques, such as alcohol or phenol, has been reported but has not been subjected to controlled trials and therefore is largely empiric. Transcutaneous electrical nerve stimulation (TENS) has until now not been studied specifically in patients with postsurgical groin pain [36]. Neuromodulation at the level of the spinal cord and/or peripheral nerves has only been described in small series, as the one by Possover in this issue [37]. Pulsed radiofrequency neuromodulation is another modality that has been used in the management of post herniorrhaphy groin pain, but the methodology in most studies [38, 39] is not sufficient to conclude that it is effective, and will require more study.

Reoperation with different types of neurectomy with or without mesh removal should be regarded as the last treatment option and has in many studies been shown to have beneficial effects in many chronic pain patients, as also demonstrated in two papers in this issue [40, 41]. However, long-term data on this topic are scarcely available. There is a definite need for multicentre/national collaboration using the same preoperative diagnostics, detailed patient characteristics, and response to previous non-surgical treatment to achieve a more optimal strategy for surgical treatment of these patients. The issues that need to be addressed include the best surgical approach which might be open, laparoscopic or combined, and the most appropriate technique or combination of techniques. These include triple or tailored neurectomy (partial or complete), mesh removal with or without new mesh placement, removal of fixation devices, and spermatic cord adhesiolysis/ microsurgical cord denervation [42] /orchiectomy. Indications vary also depending on the index operation [40, 41, 43, 44] and although promising, there is not enough available data to allow final recommendations.

Incapacitating post herniorrhaphy chronic pain seems to be more frequent after open repair but only very few studies have focused on the treatment of chronic pain after previous laparoscopic repair, in which cases the genitofemoral nerve is more at risk. Treatment of chronic pain after an open or laparoscopic preperitoneal mesh implantation is more difficult because of the complexity of removing prosthetic material and other hardware. In addition, any nerve intervention will probably only have a potential beneficial effect when performed proximal to the nerve lesion, i.e., on the iliopsoas muscle, and there is a scarcity of information about neurectomies in this location. Endoscopic approaches for retroperitoneal neurectomy have been described but the identification of the appropriate nerves can be difficult and serious complications have been reported [45–47].

In our opinion, patients with significant post herniorrhaphy groin pain after an inguinal hernia repair should be referred to a dedicated centre with a specific interest in this problem as surgical expertise has clearly been shown to be an important factor in achieving the best result possible [43]. In this context, a detailed and registered objective long-term follow-up after reoperation is required.

Socio-economic consequences

An incapacitating chronic post herniorrhaphy pain problem is extremely costly to the society and although several studies have demonstrated chronic post herniorrhaphy pain to influence quality of life, a detailed assessment of the economics of the chronic pain state needs to be performed [48].

Conclusions

Despite numerous publications during the last decade, our knowledge of the relative roles of pre-, intra- and postoperative factors for development of persistent post herniorrhaphy pain is incomplete. Consequently, firm, evidence-based preventive and treatment strategies are scarce. On the positive side, the risk of chronic pain is probably decreasing due to developments in laparoscopy, mesh types and fixation techniques as well as increased awareness of surgeons and attention to intra-operative nerve anatomy. Especially with respect to the longer learning curve for laparoscopic repair [49], this will inevitably lead to the discussion on the need for specialisation in hernia surgery to improve and secure optimal surgical technique. In addition, future strategies should involve a better understanding of the mechanisms and pharmacological prevention of chronic postoperative pain [50] and the role of central neuroplastic changes (= so-called central sensitisation) and deafferentation pain syndromes which might negatively affect the outcome of any peripheral surgical intervention [51, 52]. Multidisciplinary collaboration with pain clinic specialists is therefore necessary. Finally, there is a need for multicentre collaboration using similar protocols with sufficiently long follow-up (at least 1 year) to assess efficacy and side effects of different treatment principles for established persistent post herniorrhaphy pain. The future is now for such an approach compared to a continuous flow of publications from individual institutions with different and not always optimal methodology.

Conflict of interest None.

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