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REVIEW

Treatment of longstanding groin pain: a systematic review

S. G. Jørgensen[1] · S. Öberg[1] · J. Rosenberg[1]

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Abstract

Purpose The most effective treatment for longstanding groin pain with no hernia present has not been designated. The aim of this systematic review was to assess whether surgical or conservative treatment are the most effective in reducing pain and thereby returning patients to habitual activity.

Methods PubMed, Embase, and Cochrane were searched. We included adults diagnosed with longstanding groin pain with no hernia. Treatment included inguinal hernia repair, tenotomy, and nonsurgical management. Outcomes included return to habitual activity, pain, patient satisfaction, re-operations for the operated patients, and shift to surgery for the non-operated patients. We included randomized controlled trials and observational studies with more than 10 participants.

Results In total, 72 studies with 3629 patients were included. Only five studies used a comparison group. After inguinal hernia repair, 94% returned to habitual activity after median 10 weeks, 92% became pain free, and 92% were satisfied with their treatment. After adductor tenotomy, 90% returned to habitual activity after median 12 weeks, 90% became pain free, and 84% were satisfied. After combined inguinal hernia repair and adductor tenotomy, 97% returned to habitual activity after median 10 weeks, 92% became pain free, and 91% were satisfied with their treatment. After nonsurgical management, 80% returned to habitual activity after median 12 weeks, 67% became pain free, 56% were satisfied, and 21% shifted to surgery.

Conclusion We found that surgery seems to be more efficient in return the patients to habitual activity, reduce their pain, and satisfy them than conservative treatment.

Keywords Sports hernia · Athletic pubalgia · Inguinal disruption · Conservative treatment · Herniorrhaphy

Introduction

Longstanding groin pain without a hernia is a frequent problem in the population with a variety of underlying pathologies. When patients seek their doctor due to groin pain, the medical task is to define the aetiology. First, well-defined diagnoses should be excluded, such as inguinal- or femoral hernia, bursitis, osteoarthritis, stress fracture, or femoroacetabular impingement [1]. When these are excluded, the four groin pathologies explaining longstanding groin pain are inguinal-related, adductor-related, iliopsoas-related, and pubis-related groin pain. Inguinal-related groin pain is often referred to as a sports hernia, defined as unexplained longstanding groin pain with tenderness at palpation of the inguinal region and sometimes with pain radiating to the inner thigh or perineum. A sports hernia is by definition not a hernia [2] although the name indicates it. For this reason, the British Hernia Society recommends the name "inguinal disruption" instead of "sports hernia" to avoid confusion [1], but terms as sports hernia, sportsman's hernia, sportsman's groin, athlete's groin, etc., are still frequently used in the literature. The other pathologies explaining longstanding groin pain are: adductor-related groin pain, characterized by pain at the insertion of adductor longus and pain at adduction of the leg against resistance; iliopsoas-related groin pain, characterized by pain proximally on the anterior part of the thigh, more lateral than at adductor-related pain, and pain at flexion of the hip against resistance; and pubis-related pain, characterized by pain at the pubic symphysis [3].

The incidence of longstanding groin pain is unknown because of disagreement in both the name and description

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✉ S. G. Jørgensen
sara_gj_1992@hotmail.com

[1] Department of Surgery, Center for perioperative optimization, Herlev Hospital, University of Copenhagen, Herlev Ringvej 75, 2730 Herlev, Denmark

of the diagnoses. The condition is more common in athletes, especially in soccer, hockey, football, basketball, cricket, and rugby [4], but it is also seen in non-athletes [5–14]. Several pathologies are assumed to cause the pain, and the most efficient treatment is uncertain. For iliopsoas-related, adductor-related, and pubis-related pain, the treatment is physiotherapy and non-steroidal anti-inflammatory drug. In some cases of adductor-related pain, an adductor tenotomy may be performed. At present, treatment of inguinal-related pain consists of 2–6 months with nonsurgical management including physiotherapy, steroid or analgesic injections, or watchful waiting. If this does not relieve the groin pain, surgery is performed by inguinal hernia repair. Systematic reviews on the topic exist [15–20]: three provided an overview of the pathology and treatment options [15, 18, 19], one compared surgical and conservative treatment in pubic, abdominal, and adductor-related pain measured as return to play rates [16], and one investigated return to full sport after laparoscopic hernia repair [17]. None of these studies have compared efficacy of hernia repair, adductor tenotomy, and nonsurgical treatment of longstanding groin pain in both athletes and non-athletes, measured as return to habitual activity, pain reduction, satisfaction with the treatment, and shift from nonsurgical treatment to surgery. Since all these treatments are being used and sports hernias are seen in both athletes and non-athletes, it is important to designate the best treatment for this condition.

With this systematic review, the aim was to assess which treatment is most effective in reducing pain and thereby returning patients with longstanding groin pain to habitual activity. Four conditions are considered the aetiology to longstanding groin pain: inguinal-related /sports hernia, adductor-related, iliopsoas-related, or pubis-related groin pain.

Methods

This systematic review is reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [21] and was registered at PROSPERO (http://www.crd.york.ac.uk/PROSPERO/) with the registration number: CRD42018094691.

We included adults (≥ 95% over 18 years of age) with longstanding groin pain, defined as sports hernia, athletic pubalgia, sportsman's hernia, Gilmore's groin, sportsman's groin, athlete's hernia, athlete's groin, inguinal disruption, dilation of the external inguinal ring, conjoined tendon tears, inguinal ligament dehiscence, or groin pain of unknown aetiology fulfilling the criteria of inguinal disruption from the British Hernia Society [1]. The studies were excluded if a relevant differential diagnosis was described in addition to the groin pain, and where the pain may have originated from the differential diagnosis. Relevant differential diagnoses were defined as femoral- or inguinal hernias, fractures, bursitis, slipped epiphysis, acetabular injury, femoroacetabular impingement, osteoarthritis, and disruption in the hamstrings muscles [1]. Studies using open- or laparoscopic inguinal hernia repairs with or without mesh, adductor- or rectus tenotomies, or nonsurgical treatment including physiotherapy, injections, or no treatment (watchful waiting) were included. We included studies with one or several of the outcomes: return to habitual activity (rate and/or time), pain reduction, patient satisfaction, and re-operation or shift to surgery. Studies to be included were randomized controlled trials (RCTs), non-RCTs, and observational studies with at least 10 participants. RCTs were classified as cohort studies when only one of the comparison groups was included in this review, or when both groups ended in one treatment group. Systematic reviews, expert opinions, and conference abstracts were excluded. We had no limitations on the date of publication. Only published studies written in English, Danish, Swedish, and Norwegian were included. No ethical approval or informed consent were necessary according to Danish law.

We searched PubMed, Embase, and Cochrane with a search strategy created in co-operation with an informational retrieval specialist. We used the following search strategy in PubMed and adapted it to the other databases: ((((((((((((((((((((((((tendinitis) AND ((pubic) OR ((("Groin''[Mesh]) OR Groin) OR Groins)))) OR ((tendinopathy) AND ((pubic) OR ((("Groin''[Mesh]) OR Groin) OR Groins)))) OR groin pain) OR inguinal disruption) OR pubalg*) OR sportsman's groin) OR athlete groin) OR athlete hernia) OR athletes hernia) OR sports hernia) OR sportsman's hernia)) OR hockey groin)) OR symphysis syndrome)) OR iliopsoas dysfunction) OR pubic bone stress) OR Gilmore's groin) OR posterior wall weak*) OR conjoint tendon disruption) OR adductor related pain)) AND ((((((((((rehabilitation) OR physiotherapy) OR physical therapy) OR manual therapy) OR surgical therapy) OR conservative treatment) OR tenotomy) OR surgical intervention) OR management) OR surgery). The search was conducted the 22nd of February 2018. After a systematic search, we conducted a snowball search by screening the reference lists of included full-text studies and previous systematic reviews. Authors were contacted by email for unclearly described data. All studies were screened by title and abstract by two authors independently according to the eligibility criteria, and disagreements were discussed until consensus was reached. The full texts were screened by the first author and discussed with the second author when in doubt.

Data extraction was performed in a predefined Excel sheet that was pilot tested on 10 studies and redefined accordingly. The extraction was performed twice by the first author and discussed with the second author when in doubt. Information

extracted was: study type and year, characteristics of participants (number, age, and gender), description of the diagnosis, interventions (type and number of inguinal hernia repairs, tenotomies, and nonsurgical management), return to habitual activity (rate and time), pain reduction, satisfaction, re-operations or shift from nonsurgical management to surgery, follow-up time, and completion of last follow-up.

When the number of affected groins was not reported, it was assumed that one groin was affected per participant. We assumed that the patients were not athletes if this was not specifically mentioned in the article. If the origin of groin pain was not described, it was assumed that the patient had inguinal-related pain when an inguinal hernia repair was performed, and that the patient had adductor-related pain when an adductor tenotomy was performed. When a combination of inguinal hernia repair and adductor tenotomy was performed (referred to as "mixed surgery"), it was assumed that it was a combination of inguinal-related pain and adductor-related pain. All four pathologies are treated with nonsurgical treatment, and this treatment group consists of all four pathologies.

The risk of bias within individual observational studies and non-RCTs was assessed with the Newcastle–Ottawa scale [22]. When including a comparison group, the maximum score was nine points. When not including a comparison group, the maximum score was six. We chose 90% as adequate follow-up rate and six months as adequate length of follow-up. We defined professional athletes as a representative population and studies including these were rewarded a point. RCTs were assessed with the Cochrane risk of bias assessment tool [23].

As summary measures, categorical data were presented as crude rates (number with outcome/total number of patients), and/or median and range of reported percentages for each study. Continuous variables were presented with median value of the reported mean or median values (whatever was reported in the studies), and a range of the reported mean or median values. Satisfaction was split in a binary categorical variable in each study to ensure comparability. One group was defined as satisfied while the other was defined as not satisfied. We defined return to habitual activity as return to work, household, or lower level of sport if reported. When return to full sport was the only reported outcome, we used this outcome. Meta-analyses were planned if at least two homogenous studies compared the same intervention, including evaluating the risk of publication bias by Funnel plots.

Results

72 studies were included in the review [4, 6–14, 24–85], including 27 retrospective cohort studies, 42 prospective cohort studies, one RCT, and two retrospective case series. A flowchart presenting the study inclusion and exclusion process is presented in Fig. 1. Five of the studies included more than one treatment and reported the outcomes for each treatment separately [10, 42, 52, 62, 63]. In our review, the patients from these studies were allocated to the proper treatment group. The 72 studies included 3629 patients: 3289 athletes [24–50, 52–61, 63–68, 70–85] and 340 non-athletes [5–14]. Of the included studies, 26 used inguinal hernia repair as treatment [5, 11, 14, 24–46], 11 studies used tenotomy [10, 42, 47–55], 13 studies used combined inguinal hernia repair and tenotomy [6, 42, 52, 56–65], and 28 studies used nonsurgical treatment or no treatment [7–10, 12, 13, 62, 63, 66–85].

Most of the included studies did not have a comparison group and could thereby receive a maximum of six points in the risk of bias assessment. The observational studies and non-RCTs without a comparison group generally had a low risk of bias with a median of five out of the six points (range 3–6). Three studies did not describe how they determined the condition [9, 13, 46]. 25 studies had less than six months of follow-up [6, 9, 11, 13, 24, 25, 28, 29, 33, 34, 36, 40, 45, 46, 56, 58, 68–72, 75, 81, 83, 84]. 18 studies had a follow-up completion rate of less than 90% and did not provide an explanation for those lost to follow-up [5, 29, 30, 32, 35–37, 57, 59, 61, 64, 67, 69, 71, 75, 78, 81, 83]. Five observational studies had a comparison group and could reach a maximum of nine points [10, 42, 52, 57, 62]. They were awarded a median of six points out of the nine (range 6–7). None of the studies matched their cases and controls or performed adjusted analyses and could thereby not receive a point for this. One study did not describe the assessment of the outcome properly [10]. Two studies had a follow-up period shorter than six months [42, 52] and one study had a follow-up rate less than 90% [57]. The only RCT [63] had an unclear risk of selection bias: unclear risk in random sequence generation and low risk in allocation concealment and attrition bias. It had high risk of performance bias. The risk of detection bias, reporting bias, and other bias was unclear.

The patient characteristics and outcomes are divided into different treatment groups and are described for inguinal hernia repairs, tenotomy, mixed surgery (inguinal hernia repair combined with tenotomy), and nonsurgical treatment, respectively. The review contains 12 different surgical techniques, which are described in e-Table 1a–d. Different pathologies were found during surgery, including tears in the abdominal wall, tears in the rectus and adductor muscle tendons, tears in the conjoined tendon and external oblique aponeurosis, and dilation of the inguinal ring. An overview of the results of the review is presented in Table 1.

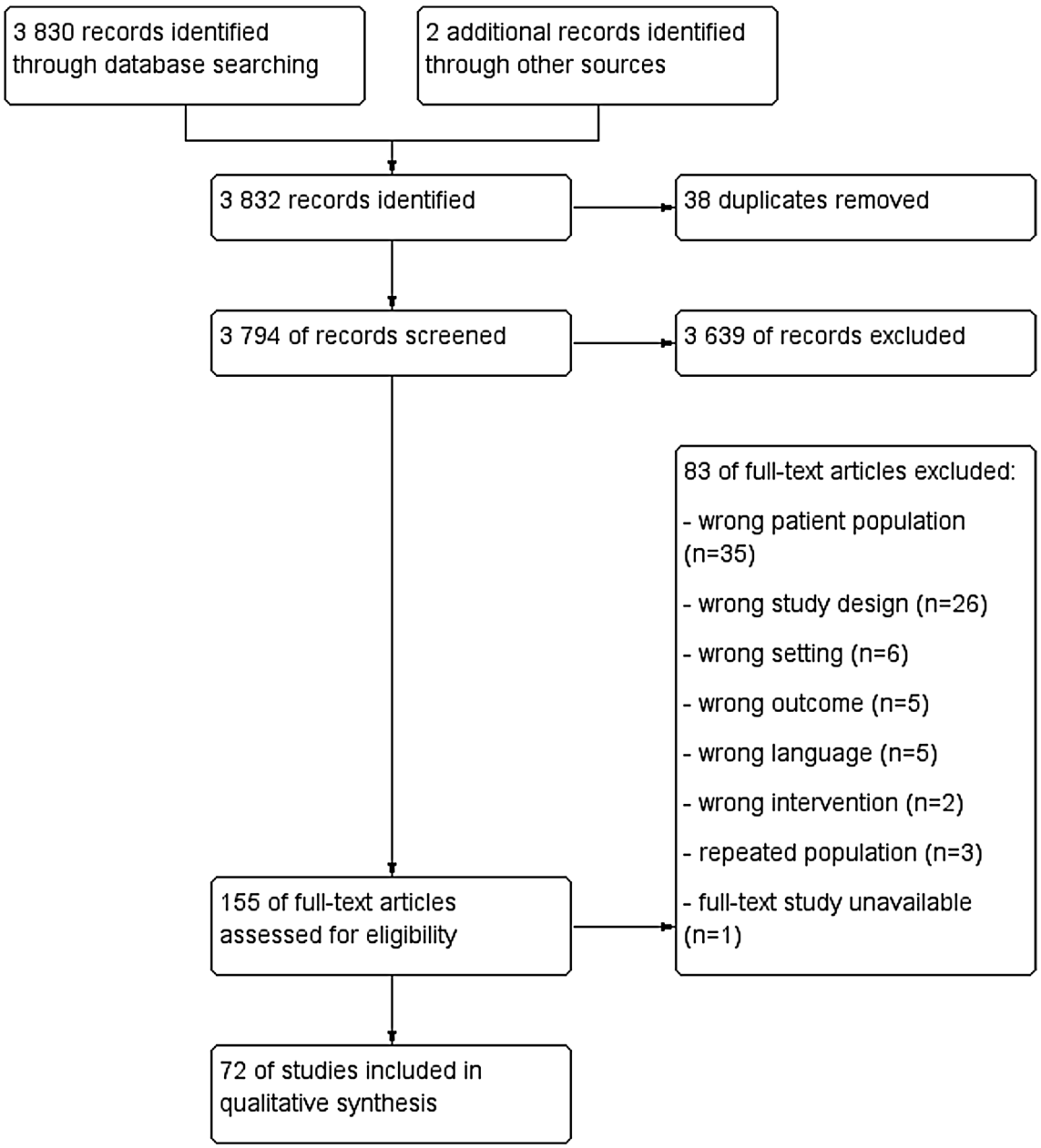

Fig. 1 Flow diagram of included and excluded studies

Inguinal hernia repair

Study characteristics are presented in e-Table 1a and the outcomes in e-Table 2a. The inguinal-related pain was treated with inguinal hernia repair in 26 studies, including 1678 groins in 1115 males, 28 females, and 319 of unknown gender. The range of reported mean age was 21–42 years. 19 studies had the inclusion criteria that the symptoms must be resistant to conservative management [5, 24, 25, 28, 30–33, 35–42, 44, 45]. The median of the reported mean/median time from symptom to surgery was nine months (range 3–20 months) reported by 13 studies [11, 14, 24, 26, 30, 35–38, 41, 43, 44]. The range of follow-up time was 4 weeks–94 months and the median completion of last follow-up was 100% (range 60–100%).

Return to habitual activity rate was reported in 23 studies [11, 24–36, 38–46]. Of the 1261 patients, 1189 (94%) returned to habitual activity (range in the individual studies 60–100%). The median time from surgery to return to habitual activity was 10 weeks (range 1–33 weeks) reported by 19 studies [11, 24, 28–34, 36, 38–42, 44–46].

Table 1 Summary of the results

Outcomes	Inguinal hernia surgery, reporting rate (no/total)	Tenotomy, reporting rate (no/total)	Combined surgery, reporting rate (no/total)	Nonsurgical treatment and no treatment, reporting rate (no/total)
Return to habitual activity rate	94% (23/26)	90% (9/11)	97% (13/13)	80% (19/28)
Median time to return to habitual activity (weeks)	10 (19/26)	12 (8/11)	10 (11/13)	12 (12/28)
Pain (reduction in VAS)	6 cm (8/26)	6 cm (1/11)	7 cm (3/13)	5 cm (10/28)
Patients without pain	92% (11/26)	90% (9/11)	92% (3/13)	67% (11/28)
Satisfied patients	92% (10/26)	84% (5/11)	91% (6/13)	56% (4/28)
Re-operation rate or cross-over rate[a]	1% (8/26)	4% (4/11)	1% (3/13)	2% (3/28)

Reporting rate, proportion of the studies that reported the issue; satisfaction, proportion of the patients that rated their treatment as satisfying

no number

[a]Cross-over in the nonsurgical group refers to the patients shifting from nonsurgical management to surgery

Pain was reported in 17 studies [5, 11, 14, 25, 27, 28, 31–33, 35–39, 41, 43–46]. Visual analogue scale (VAS) or numerical rating scale (NRS) scale were used by eight studies [5, 11, 31, 32, 35–37, 41]. The median of the reported mean pain reduction was six cm (range of the reported means 4–8 cm). Number of pain free patients was reported by 11 studies [14, 25, 27, 28, 33, 38, 39, 43–45]. Of the 386 patients, 356 became pain free (92%).

Satisfaction was reported in 10 studies [11, 26, 27, 32, 35–39, 45]. Of 428 patients, 392 (92%) were satisfied. Of the 1462 patients, 10 required a re-operation (7.7%) [24–28, 33, 41].

Tenotomy

Study characteristics are presented in e-Table 1b and the outcomes in e-Table 2b. The adductor-related pain was treated with tenotomy in 11 studies [10, 42, 47–55], including 514 groins in 435 males, six females, and 72 of unknown gender. The range of their reported mean age was 23–29 years.

All the studies had the inclusion criteria that the pain must be resistant to conservative treatment and the patient should try this prior to inclusion. The median of reported mean/median time from symptom to surgery was 17 months (range 5–20 months) reported by seven studies [10, 47–51, 55]. The range of the follow-up time was 18–26 months and the median completion of the last follow-up was 100% (range 91–100%).

Return to habitual activity rate was reported in nine studies [42, 47–52, 54, 55]. Of the 323 patients, 287 (90%) returned to habitual activity (range in the individual studies 69–100%). The median of the reported mean/median time from surgery to return to activity was 12 weeks (range 7–19 weeks) reported by eight studies [42, 47–52, 55].

Pain reduction was reported in six studies [47–50, 53, 55]. One cohort study reported pain reduction on a pain level scale [53]. Two studies assessed pain by VAS. One of these latter two studies found a mean reduction of 5.5 cm on a 10 cm scale [55]. The other study did not report the value before intervention and we could, therefore, not estimate the effect of surgery [47]. Number of pain free patients was reported by three studies [48–50]. They found that of the 70 patients, 63 (90%) were pain free after treatment.

A satisfaction measure was reported in six studies [10, 47, 49–51, 54]. Of 264 patients, 221 (84%) were satisfied. Of 513 patients, 21 (4%) required re-operation [10, 47, 54, 55].

Mixed surgery

Study characteristics are presented in e-Table 1c and the outcomes in e-Table 2c. The studies were included in this group if they used hernia repair combined with tenotomy. We included 13 studies with 824 treated groins in 528 males, 21 females, and 158 of unknown gender [6, 42, 52, 56–65]. The range of the mean age of the patients was 22–43 years. Of the 13 studies, nine had the inclusion criteria that the pain must be resistant to conservative management and the patient should have tried this prior to inclusion [6, 42, 52, 57–59, 62, 64, 65]. Median of the reported mean/median time from symptom to surgery was 10 months (range 5 months–1 year) reported by eight studies [6, 10, 52, 56, 59–61, 65]. The range of follow-up time was 8 weeks–7 years and the median completion of last follow-up was 100% (range 58–100%).

Return to habitual activity rate was reported by 13 studies [6, 42, 52, 56–65]. Of 687 patients, 669 (97%) returned to habitual activity (range in the individual studies 87–100%). Median of the reported mean/median time from surgery to return to activity was 10 weeks (range 2–52 weeks) reported by 11 studies [10, 52, 56–60, 62–64].

Pain reduction was reported by seven studies [6, 57, 59, 61–63, 65]. VAS was used in three studies with a median of the reported mean reduction of seven cm (range of the reported means 6.8–7.5 cm) [57, 62, 63]. Number of pain free patients was reported in three studies [6, 61,

65]. Of 278 patients, 256 (92%) were pain free. One study reported a median pain reduction from seven to three on a non-specified scale [59].

Satisfaction was reported in five studies [42, 52, 56, 57, 63]. Of 390 patients, 360 (92%) were satisfied. Of 707 patients, 4 required a re-operation (0.6%) [56, 59, 62].

Nonsurgical treatment or no treatment

Study characteristics are presented in e-Table 1d and the outcomes in e-Table 2d. The studies were included in this group if they managed the groin pain without surgery, including physiotherapy, osteopathy, injections, or no treatment (watchful waiting). This group includes 28 studies with 996 treated groins in 618 males, 45 females, and 284 of unknown gender [7–10, 12, 13, 62, 63, 66–85]. The range of the reported mean age was 24–43 years. Median of the mean/median time from symptom to inclusion of study was 10 months (range 1–2 months) reported by 10 studies [8, 66, 69–72, 77, 79, 81, 83]. The follow-up time was 1 week–20 years and the median completion of the last follow-up was 100% (range 87–100%).

Return to habitual activity rate was reported in 19 studies [10, 12, 13, 62, 63, 66, 70–73, 76–83, 85]. Of 625 patients, 498 (80%) returned to activity (range in the individual studies 12–100%). Median of the reported mean/median time from beginning of treatment/inclusion in study to return to activity was 12 weeks (range 3–78 weeks) reported by 12 studies [10, 13, 62, 63, 66, 70, 71, 78–80, 82, 83].

Pain was reported in 25 studies [7–9, 12, 13, 62, 63, 66–74, 76, 78–81, 83–85]. VAS or NRS were used in 10 studies with a median reduction of five cm (range 1–8 cm) [62, 63, 67, 74, 78, 79, 81, 83–85]. Number of pain free patients was reported in 11 studies [7–9, 12, 19, 66, 69, 71, 73, 76, 80]. Of 322 patients, 216 (67%) were pain free. Two studies described the pain reduction on an 11-point Likert scale with a mean/median reduction on seven and five points, respectively [13, 72]. One cohort study reported that the symptoms of the patients improved without specifying the statement [68]. One cohort study described pain reduction on The Copenhagen Hip and Groin Outcome Score (HAGOS) scale with a significant mean improvement from 64.2–78.3 ($p < 0.01$) [70].

Satisfaction was reported in six studies [10, 63, 70, 71, 81, 83]. Of 156 patients, 88 (56%) were satisfied. One cohort study used HAGOS quality of life scale with a significant mean improvement from 38.7 to 78.3 ($p < 0.01$) [70]. One cohort study used a non-specified satisfaction scale from 0 to 10 with a mean score of eight [82].

Of 947 patients, 21 (2%) shifted to surgery during the observation period [63, 67, 80]. Two patients shifted from no treatment to osteopathy and corticosteroid injections, respectively [80].

Studies with a comparison group

Five studies compared two or more treatments of the groin pain. Overall for these studies, both different treatments were used and with separate outcomes for each treatment. This included four cohort studies [10, 42, 52, 62] and one RCT [63]. Surgery was compared with nonsurgical treatment in two cohort studies [10, 62] and one RCT [63]: inguinal hernia repair combined with tenotomy was compared with nonsurgical treatment in one cohort study and one RCT [62, 63]; and tenotomy was compared with nonsurgical treatment in the other cohort study [10]. One cohort study compared two surgical approaches: inguinal hernia repair combined with tenotomy was compared with tenotomy alone [52]. The last cohort study compared three different surgical options: inguinal hernia repair combined with tenotomy, tenotomy, and inguinal hernia repair alone [42].

In the studies comparing surgery with conservative treatment, patients returned to habitual activity faster after surgery compared with conservative treatment. Operated patients returned to habitual activity after four [63], eight [62], and 10 [10] weeks and non-operated patients after 52–78 [62] and 12 weeks [10, 63]. Two studies found greater pain relief assessed with VAS in the operated patients than the non-operated, 7.5 cm [62] and 7.3 cm [63] in the operated compared with 3.5 cm [62] and 4.2 cm [63] in the non-operated group. The same two studies [62, 63] found that the operated patients generally had more severe pain at inclusion than the non-operated ones.

The cohort study with inguinal hernia repair combined with tenotomy compared with tenotomy alone found that more of the patients having combined surgery returned to habitual activity than those having tenotomy alone with 92% and 88% returning to habitual activity, respectively [52]. Those with combined surgery returned faster than those with tenotomy alone with 10.3 weeks compared with 11.7 weeks from surgery to return.

The cohort study with inguinal hernia repair combined with tenotomy compared with tenotomy alone and inguinal hernia repair alone found that patients receiving inguinal hernia repair returned to habitual activity after 4.4 weeks compared with 11.8 weeks in patients receiving tenotomy [42]. Time to return to habitual activity was not reported for combined surgery.

Quantitative synthesis

A meta-analysis was not possible because there were not two studies with comparable interventions. The two cohort studies that compared tenotomy with mixed surgery used laparoscopic hernia repair with mesh [52] and open hernia repair without mesh [42], which caused heterogeneity. Therefore, we did not estimate risk of publication bias by Funnel plots.

Discussion

In this systematic review, assessing the optimal treatment for longstanding groin pain, we found that surgical repair seems more efficient than conservative treatment in returning patients to habitual activity based on crude rates, with high patient satisfaction and reduced pain. Overall, mixed surgery was most effective in returning patients to habitual activity, but this combination should be reserved for combined aetiology for longstanding groin pain. Compared with nonsurgical or no treatment of longstanding groin pain, inguinal hernia repair was more successful when treating inguinal-related pain, and tenotomy without hernia repair was more successful to treat adductor-related groin pain. Overall the results indicate that surgery was better than nonsurgical treatment of longstanding groin pain.

The review has several strengths. First, it includes a great amount of studies and includes studies with both athletes and non-athletes, which gives it a higher external validity than previous systematic reviews on the subject [15–20]. Though longstanding groin pain can be caused by several pathologies, the patients look quite similar when presenting at the doctor's office. Therefore, we used broad definitions, trying to include all patients with longstanding groin pain. Another strength is that the observational studies had a low risk of bias, especially regarding patient selection. This study also has limitations. Few studies compared more than one intervention. Studies that had a comparison group used different interventions and reported different outcomes, which made meta-analyses improper, and we were only able to present a qualitative synthesis. Some studies reported a number of pain free patients but most of these studies did not report pain status for the remaining patients. Therefore, the results of these studies may be an overestimation of pain free patients, which gives a risk of selective reporting bias. The groups "mixed surgery" and "nonsurgical treatment or no treatment" probably consists of patients with all four entities of groin pain. Therefore, it is difficult to make direct comparisons of the different treatments. Relatively few studies reported the patients' satisfaction with their treatment and these studies used different scales, some ordinal and some binary, and some studies ranged all the way from "excellent" to "poor" while others ranged from "excellent" to "satisfied". Therefore, we did not find it likely that the rating "satisfied" meant the same across studies. We chose to split the satisfaction rating in two groups and divide the ratings for each study. In this way, all rating scales contained both a good and a bad rating no matter the range of the scale, and we defined the "good" group as "satisfied" patients. The primary outcome was return to habitual activity, which was not reported by all studies and which was measured differently across the studies.

Randomized controlled trials (RCTs) are lacking that compare different surgical options for patients with longstanding groin pain resistant to conservative treatment. These studies should specify the condition that caused longstanding groin pain and use validated pain questionnaires. In time, a systematic review on the treatment of longstanding groin pain can hopefully be based only on RCTs.

In conclusion, we found that surgery seems to be more efficient than conservative treatment in returning patients with longstanding groin pain to habitual activity, increasing patient satisfaction, and reducing pain.

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Compliance with ethical standards

Conflict of interest SGJ declares no conflicts of interest. SÖ declares no conflicts of interest. JR declares personal fees from Bard and Merck outside this work.

Ethical approval No ethical approval was necessary according to Danish law.

Human and animal rights This article does not contain any studies with human participants performed by any of the authors.

Informed consent No informed consent was necessary according to Danish law.

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