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Mini Review

Evaluation, Diagnosis and Management of Persisting Pain Post Sportsman's Groin Repair

Aali J Sheen*

1. Department of Surgery, Manchester University NHS Foundation Trust, Manchester, U.K. M13 9WL
2. Manchester Academic Health Sciences Centre (MAHSC), Faculty of Biology, Medicine and Health, University of Manchester, Manchester, U.K
3. Fortius Clinic, 17 Fitzhardinge Street, London, U.K. W1H 6EQ

***Corresponding author:** Aali J Sheen, Department of Surgery, Manchester University NHS Foundation Trust, Manchester, UK, M13 9WL

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Abstract

Aim: This article is aimed as a guide to a clinician who sees a patient representing with persistent groin pain after they have undergone a sports hernia repair. **Methods & Results**: Groin pain related to a repetitive strain injury better known as either inguinal disruption, athletic pubalgia or more commonly the sportsman's groin is discussed. Once a diagnosis of the loss of the inguinal canal integrity or a posterior wall weakness is diagnosed and then surgically treated by any technique, any further recurrence or persistence of groin pain requires evaluation for the other possible causes of groin pain. Diagnoses such as an adductor tendinopathy, rectus abdominis origin tear, femoroacetabular impingement, pubic bone oedema or even the presence of a true hernia must again be re-evaluated. Any specific management will subsequently be aimed at the other cause (s). **Discussion**: Understanding of the complexity of the groin both anatomically, as well as physiologically, will help diagnose and treat persistent and recurrent groin pain, with a multi-disciplinary approach key to a successful outcome.

Keywords: Inguinal Disruption; Sportsman's Hernia; Athletic Pubalgia; Persistent Groin Pain; Recurrent Groin Pain; Musculoskeletal-Tendinous Injury.

Introduction

The sportsman's groin over the years has developed several nomenclatures. It has been described as 'Athletic pubalgia', 'Inguinal disruption' and now more commonly 'Inguinal-related' groin pain [1]. The British hernia society produced the first consensus statement in 2014 from which the term inguinal disruption was coined [2]. This was followed by the Doha consensus which sub divided groin pain into four different entities of which one of them was inguinal related pain with the others named as iliopsoas-related, adductor related and pubic-related pain [1]. Importantly it is well understood that the symptoms of groin pain attributed to a repetitive strain injury, can arise due to a single defined entity. However, it is more commonly known to be multifactorial, with at least two or three pathologies presenting concomitantly, with the inguinal canal just being one piece of the jigsaw [3].

Once the inguinal canal has been determined as the main cause of the groin pain, even if other causes do exist but to a lesser degree; the groin is generally repaired with reinforcement of the posterior wall, where many techniques have been described to date with no surgical method used, whether using open or laparoscopic exhibiting outright superiority [4]. Any further or persistent pain will require a re-investigation for the other causes of possible pain arising from the other anatomical as well as pathophysiological considerations that interact with the inguinal canal as depicted below (Figure 1) [4,5]. These aetiologies are then in turn managed expediently with this article exploring the recommended care pathway for those patients with on-going groin pain. However, prior to any re-evaluation and treatment, ensuring that the patient has undergone rehabilitation with physiotherapy including core stability exercises and improvement of abdominal wall and pelvic stability is recommended as the initial step [2,3]. It is also important to recall from the prior assessment of any other musculotendinous injury that was present, as this is the case for at least 25% of patients and therefore concentrate initial re-evaluation here initially with a multidisciplinary approach needed due to the complexity of the groin [3].

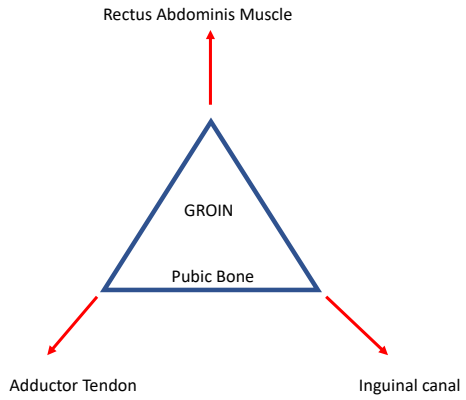

Figure 1: Relationship between inguinal canal and muscle group/ tendons which can all lead to groin pain

Evaluation of on-going Groin pain

It is very difficult for all surgeons, especially when you have already undertaken a presumed and successful operation, for that patient to then return to your clinic and explain that their pain is persisting or has not improved since their surgery especially when performing the exercise or action that stimulates the pain. The initial steps in this scenario, would be to re-evaluate the patient by physical examination, to make sure there has been no sequelae from their operation, with a complication such as a persistent seroma, hematoma, and wound infection. After such an evaluation, if negative, indicating that there is no sequalae from groin surgery, such as mesh complication or a nerve injury, it would then be important, especially early in their post-operative recuperation period, to encourage an enhanced rehabilitation programme with further physiotherapy, core exercises and strengthening of the abdominal wall muscles for at least three months after surgery [2]. Any suggestion of chronic post operative inguinal pain (CPIP) should be reassessed as per the international groin hernia guidelines where a possible nerve injury or mesh complication is investigated [5].

It is when this fails, after a recommended period of at least three months, revisiting previous investigations becomes important and mandatory. Council and evaluation from other clinicians is considered good practice, especially with the help of a chartered physiotherapist and a Hip specialist, but now increasingly sports physicians are being consulted for an opinion.

Below the pathologies that one must consider more carefully when revisiting such patients with recurrent pain following an inguinal canal repair, are discussed. This manuscript does not discuss any post operative chronic inguinal pain issues that may arise following inguinal canal surgery.

Rectus origin aponeurotic plate injury

The Rectus abdominis (RA) muscle originates from the pubic crest between the pubic tubercle and symphysis and inserts into the 5th to the 7th costal cartilages as well as the xiphoid process of the sternum. The muscle is interrupted (but not all the way through) by three (or more) fibrous bands called the tendinous intersections,

1. The most superior intersection is generally at the level of the xiphoid.
2. The lower intersection is at the level of umbilicus.
3. The middle one is at the midway between them.

It is innervated by the spinal nerves T7 to T12 (ventral rami) and supplied by branches of the superior and inferior epigastric artery. The main actions for rectus abdominis include flexion of the trunk (flexion of thoracic and lumbar spine), drawing pubic symphysis and sternum toward each other. Tenses the anterior wall of the abdomen and assists in compressing the contents of the abdomen. It also play an important role in core stability as well as posterior pelvic tilt.

Any subsequent injury to the origin of the RA will give rise to groin pain and it is also one of the entities described as a core muscle injury [6]. This is primarily diagnosed with a simple clinical assessment eliciting pain on sitting up under resistance, followed by magnetic resonance imaging (MRI). The mainstay of treatment is recognised with physiotherapy concentrating on core stability exercises [2]. Any Musculo-tendinous injury will also be accompanied with rest and anti-inflammatory medication (Figure 2) (see - Groin assessment algorithm).

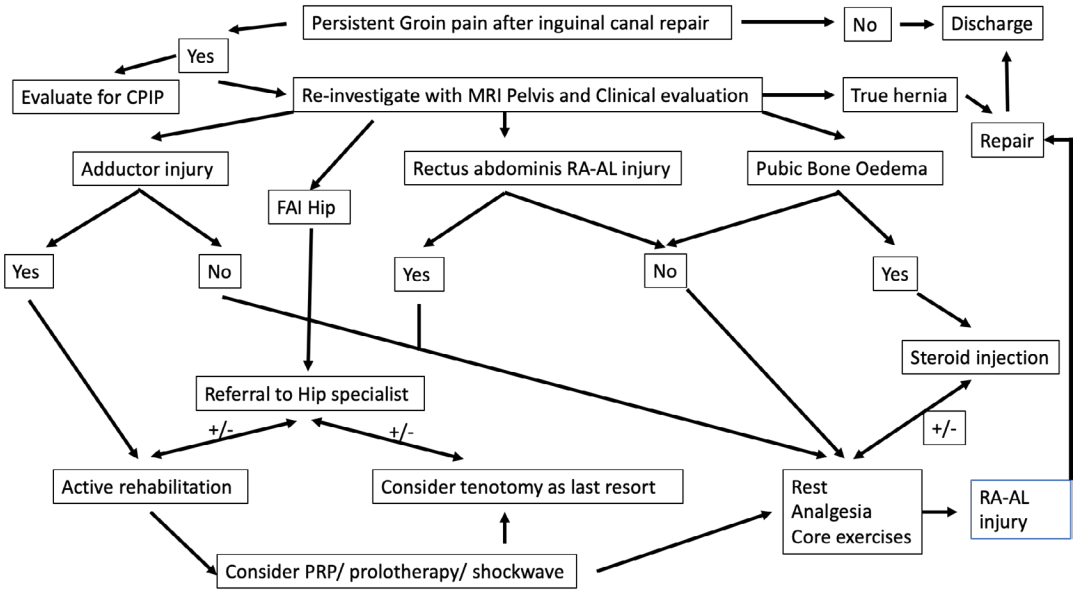

Figure 2: Groin assessment algorithm.

Summary guide in the evaluation and subsequent treatment of persistent groin pain after inguinal canal surgery has been undertaken.

PRP – platelet-rich plasma injection

Prolotherapy – dextrose solution injected into the tendon to stimulate healing

Shockwave – use of a vibrator gun to promote an enhanced 'massage' to affected tendon

RA-AL – rectus abdominis-adductor longus plate injury

CPIP – Chronic post operative inguinal pain [4].

Temporary relief of pain can also be instilled by injecting the painful area with a combination of local anaesthesia and steroid. Such an injection may be regarded as both therapeutic by relieving the affected area of pain, but also diagnostic as any relief of pain will help determine the likely source of the pain. Conversely if the injection does not help abate the pain, it will help exclude this site as a possible source of pain. Unfortunately, there is no data studying the long-term effects of such injections, but one study and it took surgery on 100 patients that had failed relief or resolution of their symptoms with steroid injections where they had suffered an MRI diagnosed rectus adductor longus aponeurotic (RA-AL) plate injury [7]. This study evaluated 85 of the patients and found that return to their chosen sport was a mean of 4.1 months + 2.3 months (range 1-12 months) when an adductor-to-rectus abdominis turn-up flap surgical procedure was undertaken. The hypothesis is centred around chronic microtears and strain on the RA-AL complex, with some of the patients having undergone an inguinal hernia repair in the past. Repairing the RA-AL plate did provide benefit to many patients, and it is procedure worth considering in such refractory cases.Good liaison and clinical interaction with a chartered physiotherapist as well as hip specialist are recommended in any further care that may be required.

Adductor tendinopathy

The adductors, commonly known as the hip adductors, are a collection of five muscles located in the medial compartment of the thigh and are responsible for thigh adduction, flexion, external rotation and pelvic stabilisation. These muscles are the adductor longus, adductor brevis, adductor magnus, gracilis and pectineus. The adductor longus is commonly injured at its origin which is from the body of the pubis, inferior to pubic crest and lateral to pubic symphysis. The muscle inserts into the inferior aspect of the upper third of the femur, with branches of the profunda femoris artery its blood supply. Its nerve supply is from the obturator nerve L2-4. On injury it presents with groin pain. The injury can be present along with loss of the integrity of the inguinal canal, with up to 25-40% of patients with groin disruption also presenting with an adductor tendinopathy [8]. An adductor longus tendon disruption can present with severe, sharp pain on the inside of the thigh. There can also be a sudden "popping" noise at the time of the injury, which indicates possible complete severance of the tendon from the pubic bone. Bruising or tenderness in the affected area can also be seen with any injury or tendinopathy leading to a loss of strength in the thigh [8].

The adductor tendons are closely involved in what can be described as the 'groin girdle' and should always be clinically revaluated especially if patients re-present with groin pain after undergoing reparative surgery on the inguinal canal. It is important to recognise at this point that any re-evaluation will be aimed at assessing long-term adductor injuries over the acute tendon disruptions. Clinical revaluation has been shown to have a good correlation with MRI findings [8], with high negative predictive values shown with passive adductor stretch (100%) and with palpation pain at the adductor longus insertion (98%). Three quarters of adductor injuries are avulsions [9,10] but the subsequent care remains controversial in terms of conservative over surgical re-implantation with some advocating the size of the avulsion as a possible determinant on the choice of management [11]. However, a recent systematic review shows how surgery and conservative or non-operative management for avulsions with a mean size of 3.3cm + 0.6 gives no advantage in return to normal pre-injury activity and they also have a statistically significant longer return to sport (3.9 ± 1.5 months *vs*. 2.2 ± 1.0 months, P = 0.0001), so surgery has its caveats for adductor avulsion injuries [12]. Most studies advocating surgical reimplantation are composed of anecdotal evidence with subjective data suggesting operative intervention based on a single surgeon experience [13].

Adductor injuries need to be managed with consideration of the extent of the injury itself with concentration on both symptom control and return to normal functionality. Other recommended treatments include active rehabilitation, compression & massage therapy with platelet rich plasma therapy (PRP) and prolotherapy (injecting an irritant solution into a joint or tendon, normally composed of dextrose solution to stimulate inflammation and thereby promote accelerated healing to take place) all demonstrating benefit with experience [14]. Extracorporeal shockwave treatment (ESWT) for a stubborn adductor tendinopathy has also been shown albeit anecdotally, to help many patients with reduce pain and increased function of the adductor tendon, with a study demonstrating such non-operative treatment displaying a positive effect on patients with a diagnosis of groin injury such as osteitis pubis [15]. But this has not been evaluated accurately enough with clinician experience remaining the mainstay of any such treatment provided, with over 90% of patients describing some benefit [15]. All forms of care must involve the advice from a chartered physiotherapist and involve a rehabilitation programme geared towards improving core exercises and pelvic strengthening [16].

There are advocates of more aggressive treatment for adductor injuries such as an adductor tenotomy even after an inguinal canal repair [17]. Although there is no randomised controlled trial evidence to support this operation, there is some anecdotal data which generally advocates the use of an adductor tenotomy but combined with inguinal canal surgery [16]. The main issue with these studies is without controls, it is near impossible to say which treatment, the inguinal canal repair or the adductor tenotomy, actually had the greatest contribution to the resolution of the patient's symptoms [17,18]. More controlled studies are required in this specific area, but this operation should not ideally be the first line treatment. An adductor tenotomy risks weakening the tendon and also can delay full resumption of sporting activities especially at the same high level due to the loss of the strength and integrity of the adductor tendon, therefore this operation is not undertaken lightly without vast experience in this field.

The pyramidalis-anterior pubic ligament-adductor longus complex (PLAC)

An interesting hypothesis was brought forward, predominantly by evaluating both cadavers and MRI imaging of athletes, which postulates a relationship between the pyramidalis muscle with the adductor longus complex [19]. Both have embryologically separate derivations and therefore their anatomical relationship, nerve and blood supplies are entirely separate. Pyramidalis blood supply is the inferior epigastric artery and the adductor longus from the branches of the femoral and obturator arteries. So, a relationship between the two muscle entities where their relative functions are dependent on each other is difficult to comprehend scientifically or anatomically. Importantly this muscle is estimated to be absent in 15% of people. The question arises as to what is the cause of pain in those patients without a pyramidalis muscle? This question hasn't been answered, also any aponeurotic fascial sheath injury generally does not require a repair and the pyramidalis muscle itself is routinely divided in lower midline incisions, especially Pfannenstiel incisions, with no reports to date of these patients presenting with post operative groin pain. Other studies defining groin injuries with radiological findings have also failed to confirm PLAC as an entity [20].

Essentially this so-called 'PLAC' injury is being increasingly reported by Radiologists. One would hesitate to recommend any treatment for this condition other than physiotherapy and rest with improvement of core stability with surgery rarely indicated unless a true hernia is present.

Femoroacetabular impingement (FAI)

A multidisciplinary approach to groin pain is always recommended and this is especially so as conditions such as femoroacetabular impingement (FAI), which is also known as hip impingement syndrome, can be a cause of groin pain. It arises because of abnormal friction arising between the femoral head and acetabular junction resulting in a chondral and labral injury [21]. It normally presents with pain on acceleration sports as well as squatting, climbing stairs and prolonged sitting [22]. The two types of FAI, cam and pincer require evaluation by an orthopaedic surgeon with a correct diagnosis key to its successful management [23]. Physiotherapy remains a key component of its treatment and

a close working relationship with a hip specialist is recommended [24].

Ilio-psoas related groin pain (tendinopathy/ bursitis/ syndrome)

Ilio-psoas pain can arise as result from excessive hip flexion such as seen in kicking [3]. It presents as a poorly localised ache deep inside of the groin, so it is a known differential for groin pain [3]. Other commonly described pathologic conditions include iliopsoas bursitis, tendonitis, impingement, and snapping [25].

The first step in trying to diagnose iliopsoas pain is deep palpation in the pelvis and also on examination, eliciting any pain on passive and active hip flexion [25,26]. A classic feature or clinical sign is an iliopsoas overstretch that is exacerbated on resisted hip flexion in the stretched position [3]. Diagnosis is made by both clinical and radiological findings with ultrasound and MRI both used, with MRI images highlighting changes in signal intensity in the muscle and tendon [25]. Iliopsoas bursitis is another condition that can add to the conundrum of causes of groin pain, but this presents more so with a 'snapping' hip [27]. The first-line treatment for iliopsoas disorders (syndrome) is typically conservative, including activity modification, physical therapy, myofascial issue massage, nonsteroidal anti-inflammatory drugs, and in some cases corticosteroid injections into the tendon [26,27]. Using a multidisciplinary approach is key to establishing a soft tissue treatment programme of the iliopsoas tendon with all treatment in this area ideally being coordinated along with a hip specialist and/or sports physician [3,25,26]. Summary guide in the evaluation and subsequent treatment of persistent groin pain after inguinal canal surgery has been undertaken.

Discussion

The is the first article to discuss what the next steps should be when a patient re-presents after a sport hernia repair with persistent groin pain whilst carrying out the pain eliciting action. Importantly it does not concentrate on the groin repair undertaken with any subsequent complications that may arise such as chronic mesh related pain, as a cause of the persisting pain. It is reasonable to assume that these patients require an investigation mirroring a detective returning once again to the scene of a crime knowing reluctantly that they are starting all over again. But this time with a magnifying appraisal of all the evidence to date thereby scouring for that missing piece of the jig saw.

The groin remains a complex anatomical structure with the pubic bone lying medially, the inguinal ligament laterally and the abdominal wall muscles aponeurosis forming the inguinal canal walls which converge to produce the conjoined tendon. Closely related will be the origins of the rectus abdominis muscle as well as the adductor complex, thereby creating a diagnostic conundrum as to the exact aetiology of any presenting groin pain. Once the inguinal canal has been determined as the main cause of pain, in some cases as the main pathology detected preoperatively, it is subsequently repaired. The choice of repair will remain surgical preference. Any further pain after surgery will be once more scrutinised and more than likely related to the other possible causes of groin pain rather than a recurrence of any inguinal disruption. Recurrent inguinal disruption has never or rarely been described and is a diagnosis that technically does not exist, as any inguinal related recurrent pain will most likely be secondary to the occurrence of a true inguinal hernia. The other causes, which are mainly musculotendinous in nature and are diagnosed with careful physical examination as well as further MRI imaging [1,2].

Conclusion

A multidisciplinary approach utilising the expertise of a hip specialist and a chartered physiotherapist remain key to a successful outcome, especially in refractory cases with a complete re-investigation of the causes of groin pain [2]

Ethics approval

Not required

Consent to participate

Not required

This is a review article summarising an important topic in sports health by one author – There is no patient data so no ethic approval was required.

Consent for publication

Only one author and consent has been signed

Availability of data and materials

N/A

Competing interests

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Authors' contributions

Only one author who is written and designed the manuscript

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