

DIAGNOSIS AND TREATMENT OF INGUINAL CANAL DISRUPTION

- A COMMON CAUSE OF GROIN PAIN IN ATHLETES

By David Wales MCSP MSc

INTRODUCTION

Inguinal canal disruption occurs frequently in sports such as soccer, rugby, hockey, and gaelic football. Azurin et al (1) have reported that 80% of athletes who presented with chronic groin pain were found to have inguinal canal disruption upon surgical investigation. Beddy (2) has postulated that up to 10% of the population suffer from an inguinal hernia at some time in their life. Generally, hernia repair is the most commonly performed general surgery procedure (3) with almost 800,000 cases per year in the US.

Numerous conditions affecting the inguinal canal have been described in the literature - sports hernia, inguinal hernia, Gilmore's groin, posterior abdominal wall disruption and posterior inguinal wall disruption. The common finding in these conditions is inguinal canal disruption, although the common nomenclature tends to be a 'hernia', whether there is a hernia present or not.

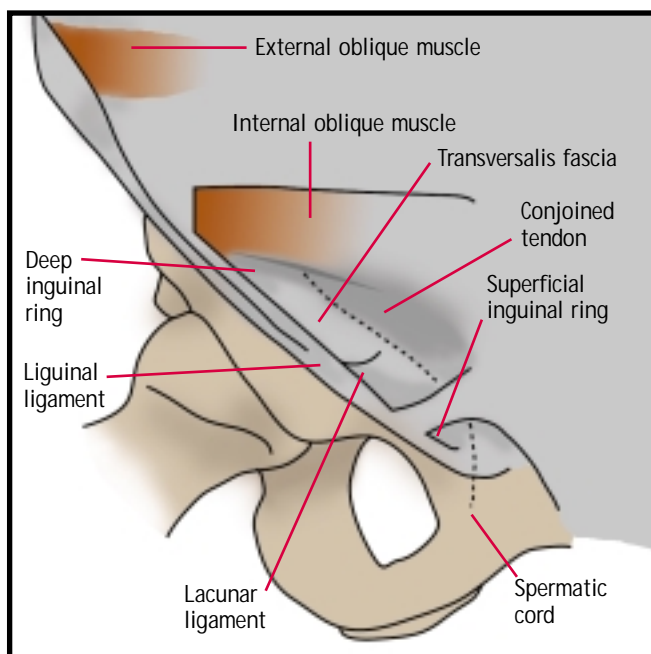


Figure 1: The anatomy of the inguinal canal

For such a common condition, there is still a lack of consensus over the management of inguinal canal disruption. This article aims to give an overview of the most common conditions that affect the inguinal canal in sporting individuals.

PATHOGENESIS

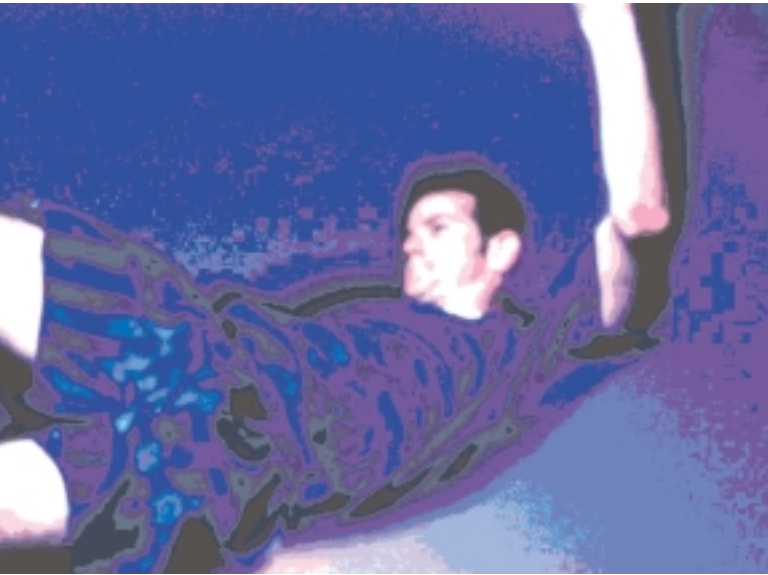
The inguinal canal is the region between the abdomen and inner thigh, through which the testes and spermatic cord (or round ligament in females) descend. The posterior wall, or 'floor', of the inguinal canal is formed by the transversalis fascia and the conjoined tendon of the internal oblique and transversus abdominis muscles, which is attached to the pubis at the point directly behind the superficial inguinal ring. The anterior wall of the inguinal canal is formed by the external oblique aponeurosis, with the termination of this aponeurosis at the inguinal ligament forming the inferior boundary of the inguinal canal (4).

A range of pathological findings involving the inguinal canal have been described, including tears of the external oblique aponeurosis (5-7), herniation through the posterior inguinal wall (8), tears to the internal inguinal ring and internal oblique muscle (9), torn conjoined tendon detached from the pubic tubercle and dehiscence between the conjoined tendon and inguinal ligament (5).

The most common forms of inguinal canal disruption in professional soccer players are inguinal hernia and Gilmore's groin. An inguinal hernia refers to any protrusion of the abdominal contents through a weakness in the posterior wall and crural orifices of the inguinal canal. Inguinal hernias are classified as either 'indirect' and 'direct'. Indirect inguinal hernias are the most common type of hernia, occurring in a pre-formed sac within the inguinal canal.

Symptoms of an indirect inguinal hernia include groin pain and visible bulging on exertion, and a positive cough reflex can occur in any age, without sporting or work related stress. In contrast 'direct' inguinal hernias are acquired due to work and sporting exertions. They account for 10-15% of all herniae. Direct inguinal hernias develop through the posterior wall of the inguinal canal. There is no visible bulging.

Gilmore's groin is characterised by a torn external oblique



aponeurosis (producing dilation of the superficial inguinal ring); torn conjoint tendon detached from the pubic tubercle; and a separation (dehiscence) of the conjoint tendon from the inguinal ligament. There is no herniation with Gilmore's groin.

In men the spermatic cord descends through the inguinal canal, through the myo-pectineal orifice, between the deep inguinal ring

and the superficial inguinal ring. This gender difference in anatomy has been proposed as the reason why the incidence of inguinal canal disruption is higher in males. Primates and Goldacre (10) estimated that the lifetime risk of inguinal hernia in men is about 27%, which is 9-fold the risk for women. Rutkow (3) states that inguinal hernia repairs are carried out at a 12:1 male:female ratio in the United States.

Fruchaud (11) classically stated that the essential conditions for the development of inguinal canal disruption are:

- i) increases in intra abdominal pressure (provided by work and sports) and
- ii) weaknesses in the posterior wall of the inguinal canal and crural orifices

It is widely believed that the tissues which form the inguinal canal are subject to shearing forces during sports and work activities, but there is no objective evidence for this. However the tissues of the inguinal canal can become stretched during kicking and other movements that require an extreme range of hip abduction. This stretched tissue is then subject to an outward force from intra abdominal pressure. During standing normal intra abdominal pressure is around 15-20 mmHg. When straining during work and sports this pressure can rise to between 100 and 150 mmHg (11). The transversalis fascia, oblique muscle layers and conjoint tendon can become stretched as a reaction to extreme strains during this stress

TABLE 1: DIFFERENTIAL DIAGNOSIS AND POTENTIAL CAUSES OF GROIN PAIN

DIFFERENTIAL DIAGNOSIS	TYPICAL PRESENTATION	INVESTIGATIONS
Tendinopathy in the adductors/ iliopsoas/rectus femoris	Gradual onset, worsening with activity. Can be localised with muscle testing.	MRI preferable to US as a wider picture of pathology can be seen. Isolated US can sometimes miss extent of tissue damage.
Osteoarthritis of the hip	More prevalent with advancing age. Capsular pattern; Trendelenburg gait.	X-ray
Acetabular labrum tears	History of hip trauma during work or sport. Pain or 'catching' on specific hip movements.	MRI arthrogram (CT arthrogram if loose bodies suspected)
Stress fractures of the pelvis and hip	Gradual onset, exacerbated by activity. Diffuse aching pain in the hip and groin region, which may refer down the thigh.	MRI
Slipped upper femoral epiphysis	Onset aged 10-14 typically. Vague groin, hip and thigh pain, may be accompanied by a limp.	Frog view x-ray
Osteitis pubis/pelvic instability	Gradual onset of groin and pubic pain. Acute tenderness on palpation of the pubis.	<ul style="list-style-type: none"> ■ Stork x-ray ■ MRI ■ Corticosteroid injection
Lumbar spine pathology	Facet syndrome and herniated disc at L1 - L2 levels can produce referred pain in the groin region. Back pain may not be present.	MRI Lx spine
Obturator nerve entrapment	Exercise can induce pain and there may be pain and weakness on hip adduction.	Nerve conduction studies
Benign bone tumours	Can produce vague hip and groin pain with a gradual onset that may be exacerbated by activity.	X-ray
Varicocele	'Bag of worms' swelling that disappears when lying supine; maybe accompanied by an ache in the groin.	
Genito urinary problems	Pain and/or discharge with micturation. Swollen testes. Skin changes.	

DIAGNOSIS AND TREATMENT

mechanism. Gradually, microtrauma and fascial sprains can lead to tissue damage and inguinal canal disruption over a period of time. However in some cases a specific incidence can lead to macrotrauma; Jerry Gilmore (personal communication) has indicated that 28% of Gilmore's groins occur following a specific incident such as forced abduction, or a collision or mis-kicking.

Lau et al (article in press) (12) have found that a family history of hernia was the most important determinant factor for developing an inguinal hernia in adult males. A male with a family history of hernia is 8 times more likely to develop an inguinal hernia. It may be that inherited similarities in posture, anatomy and tissue histology can predispose to the development of inguinal canal disruption.

DIAGNOSIS AND DIFFERENTIAL DIAGNOSIS

Patients presenting with inguinal hernia and Gilmore's groin are typically male adults, who participate in kicking sports and/or multi directional sports that require rapid twisting and turning movements.

Both inguinal hernia and Gilmore's groin are characterised by groin pain and weakness during sports movements, particularly twisting and turning. This pain usually radiates to the adductor muscle region and even the testicles, although typical of groin pain it is often difficult for the patient to pin-point.

Following sporting activity the person with inguinal canal disruption will typically experience groin stiffness and soreness. For instance, the day after a soccer match, getting out of bed or a car

DIAGNOSTIC PITFALLS!

Groin pain is notoriously difficult to diagnose. Investigations can occasionally produce red herrings. Pubic bone marrow oedema is often found on MRI in professional soccer players. Radiologists can report this as osteitis pubis (although true osteitis pubis is characterised more by changes at the pubic symphysis itself). Once the diagnosis of osteitis pubis has been made by the radiologist, there is a danger that conservative treatment can complacently focus on this. The symptoms improve with relative rest and repeat MRI 6-8 weeks later shows resolution of the earlier reported pubic bone marrow oedema. However this is often a false positive and the symptoms return on resumption of activity, because an inguinal canal disruption is present.

Conversely a dilated superficial inguinal ring can often blind the clinician to the presence of other pathologies. Pelvis and hip x-rays are essential to complete the clinical picture, before surgery to repair the inguinal canal, as bony pathologies and pelvic instability may be missed.

may be uncomfortable. Any exertion that increases intra-abdominal pressure, such as coughing, sneezing or sporting activity can cause pain. Resisted bilateral adduction is often weak and reproduces discomfort.

The onset of symptoms is gradual in most cases. In the early stages these symptoms may settle within a day or two and the person may



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CLINICAL TIP

Remember, forces across the anterior pelvis are implicated in the aetiology of several of these conditions. Athletes who are subject to these forces may be suffering from two or more of these conditions concurrently.

be able to continue playing their sport, but the problem usually gets progressively worse. The pain is rarely excruciating and is often described more as 'discomfort'. The most frustrating complaint is the inability to twist, turn or kick a ball properly, together with a loss of speed. This has an adverse effect on sporting performance.

Over a period of months there can be a significant deterioration in functional ability during sports. This frustrating decline is often compounded by a torturous referral pathway. It is not unusual for these patients to have been referred via several healthcare professionals, without effective treatment largely due to the difficulty of providing a definitive diagnosis. Several diagnostic investigations may have failed to show the underlying cause of the problem and these merely add to the diagnostic confusion.

Pain in the groin and pelvis can be referred from a number of problems in the groin and pelvic region, as well as injuries to the lumbar spine, the hip joint, the sacro-iliac joint, the abdomen and the genito-urinary system (see Table 1). This means that the diagnosis of inguinal canal disruption requires skilful differentiation. The diagnosis of inguinal canal disruption is based on the patient's history and clinical signs. The most notable clinical sign is dilation of the superficial inguinal ring on the affected side, which can be palpated when the scrotum is inverted with the examiner's finger. The scrotal sac is inverted upwards following the direction of the spermatic cord. Dilation of the superficial inguinal ring and/or pain is a positive sign of inguinal canal disruption.

Where an inguinal hernia is present, this can be visualised using ultrasound scanning. The hernia protrusion can be seen to push through the posterior inguinal wall when the patient increases intra abdominal pressure by straining. In the case of Gilmore's groin, dilation of the superficial inguinal ring can be the sole objective finding. Because there is no herniated tissue, imaging cannot confirm the diagnosis.

MANAGEMENT STRATEGIES AND TREATMENT

Conservative treatment cannot cure inguinal canal disruption. Conservative treatment can be used to improve sporting function and may allow an athlete to continue to compete for a period of weeks or even months, but it will not resolve the anatomical disruption of the inguinal canal. Physiotherapy treatment involves stabilising and strengthening the muscles of the pelvic region. Typically the athlete continues to perform wearing warm pants, until an opportune time can be arranged for surgery.

Inguinal canal surgery has evolved as surgeons continue to further understand the functional anatomy of the groin region. A range of surgical techniques can be applied to the spectrum of pathologies that are characterised by inguinal canal disruption. Many surgeons now perform inguinal hernia surgery under local anaesthetic. Depending on the individual circumstances of the patient, considering their age, occupation, general health and the size and

degree of the inguinal canal disruption, the surgical technique is chosen which is 'tailored' to the patient's situation. Mesh techniques have been developed for patients who have large defects in the wall of the inguinal canal or for older patients where the abdominal wall is weak. A square surgical mesh is stitched onto the muscle layers of the abdominal region in order to repair the hernia.

The minimal repair is an out patient technique that has been developed by Professor Ulrike Muschaweck of The Hernia Center, Munich. It is a mesh free technique which is used for patients who have a big defect in the transversalis fascia, while the muscle layers are still intact. A local anaesthetic is used and the patient can walk out of the operating room.

Gilmore's groin repair is done under a general anaesthetic. The transversalis fascia and torn conjoined tendon are sutured. The repaired conjoined tendon is re-attached to the pubic tubercle and inguinal ligament; and the torn external oblique aponeurosis is repaired with sutures. The wound is closed with subcuticular sutures and steri-strips. Discharge from hospital is normally the day following surgery.

THE AUTHOR

David Wales is a clinical specialist physiotherapist who has worked full time for Arsenal Football Club for the past six years. After graduating in physiotherapy at the University of Manchester, he was awarded a Masters degree in Sports Medicine and Rehabilitation from the University of the West of England. David is also Medical Director of www.PhysioRoom.com - the UK's leading sports injury website.



References

1. Azurin DJ, Go LS, Schurit A, McShane J et al. Endoscopic preperitoneal herniorrhaphy in professional athletes with groin pain. *Journal of Laparoendoscopic and Advanced Surgical Techniques* 1997; 1:7-12
2. Beddy P, Ridgway PF, Geoghegan T, Peirce C, Govender P, Keane FBV, Torreggiani WC and Conlon KCP Inguinal hernia repair protects testicular function: A prospective study of open and laparoscopic herniorrhaphy. *Journal of the American College of Surgeons* 2006;1:17-23
3. Rutkow IM. Demographic and socioeconomic aspects of hernia repair in the United States in 2003. *The Surgical Clinics of North America* 2003;5:1045-1051, v-vi
4. Teague DC. Inguinal anatomy and retropubicvascular hazards of the ilioinguinal approach. *Operative Techniques in Orthopaedics* 1997;3:175-183
5. Gilmore J. Groin pain in the soccer athlete: Fact, fiction and treatment. *Clinics in Sports Medicine* 1998;4:787-93, vi.
6. Williams P, Foster ME Gilmore's Groin - or is it? *British Journal of Sports Medicine* 1995 29(3):206-208
7. Brannigan AE, Kerin MJ, and McEntee GP. Gilmore's Groin repair in athletes. *The Journal of Orthopaedic and Sports Physical Therapy* 2000;30(6):329-332
8. Malycha P, and Lovell G. Inguinal surgery in athletes with chronic groin pain: The sportsman's hernia. *The Australian and New Zealand Journal of Surgery* 1992;62(2):123-125
9. Simonet WT, Saylor HL III et al. Abdominal wall muscle tears in hockey players. *International Journal of Sports Medicine* 1995;16(2):126-128
10. Primatesta, P and Goldacre, MJ Inguinal hernia repair: incidence of elective and emergency surgery, readmission and mortality. *International Journal of Epidemiology* 1996;25 (4):835-839
11. Fruchaud H. *Anatomie chirurgicale des hernies de l'aine* Gaston Doin & Cie, France, 1956
12. Lau H, Fang C, Yuen WK and Patil NG. Risk factors for inguinal hernia in adult males: A case-control study. *Surgery (article in press available online 31 July 2006)*

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