Surgery for posterior inguinal wall deficiency in athletes

P Steele[1], P Annear[2] & JR Grove[3]

[1]Sportsmed Subiaco, Perth, Western Australia. [2]Perth Orthopaedic and Sports Medicine Centre, Perth, Western Australia. [3]School of Human Movement and Exercise Science, The University of Western Australia.

This study retrospectively evaluated the outcome for patients undergoing herniorraphy for chronic groin pain due to posterior inguinal wall deficiency, and correlated the outcome with preoperative investigation findings. There were 47 patients (with a total of 52 herniorraphies) who were contacted by phone between six and 50 months post surgery. Subjects had a diagnosis of posterior inguinal wall deficiency made on history and clinical examination. Thirty seven patients had an ultrasound scan prior to the surgery (three bilateral) with a total of 40 symptomatic groins scanned. There were 26 abnormal scans (22 posterior inguinal wall deficiency and four hernias) and 14 normal scans. Twenty nine patients had a technetium-99m bone scan with 22 having increased uptake at the symptomatic pubic tubercle, while 13 had increased uptake at other sites in the groin. Seventy seven percent of patients had a full return to sport after surgery and the average time to return to sport was four months. There was no significant difference in outcome between subjects who had an abnormal ultrasound scan on the symptomatic side and those who had a normal scan. There was a significant difference in outcome between patients who had a bone scan with increased uptake at the symptomatic pubic tubercle and those who did not ($p < 0.04$). Our study supports previous research that good results can be obtained with surgery when posterior inguinal wall deficiency is the sole diagnosis. Ultrasound scan does not appear to aid in predicting surgical outcome, while the role of isotope bone scanning requires further study.

(J Sci Med Sport 2004;7:4:415–421)

Introduction

Posterior inguinal wall deficiency (PIWD) is also known as Gilmore's groin, incipient hernia, sports hernia and conjoint tendon injury[1]. Along with osteitis pubis and an adductor origin lesion, it is a common cause of chronic groin pain in athletes[2]. These conditions may be difficult to differentiate clinically, particularly with common areas of pain referral[3] and co-existence of multiple pathologies[3,4]. Conjoint tendon lesions occur in running and kicking sports, and are painful with coughing, sneezing or kicking[4,5]. Patients are tender with palpation of the superficial inguinal ring, particularly via the invaginated scrotum with or without a cough impulse[1]. The inguinal ring may also be dilated[6]. Patients with osteitis pubis have pain and tenderness at the pubic symphysis while those with adductor tendon lesions give a history of upper inner thigh pain and tenderness at the adductor origin[4].

Several investigations have been used to assist diagnosis in chronic groin pain. Herniography has been used to diagnose incipient hernias but is invasive and has a high false positive rate[4,7,8]. Ultrasound scanning has been used to

identify both hernias and bulging of the posterior wall[9]. However posterior wall bulging has been observed in asymptomatic groins and the significance of this is uncertain. Nuclear medicine bone scans using technetium-99m (Tc99m) may show increased uptake at the superior pubis, particularly if a conjoint tendon injury has occurred, or may reveal increased isotope uptake elsewhere, such as the pubic symphysis or adductor tendon origins[10]. Poor specificity in investigations, however, means their role in making a specific diagnosis in the groin is unclear.

For those patients with conjoint tendon lesions that do not respond to conservative measures, herniorraphy has proven to be an effective form of treatment[11,12,13]. The decision for isolated inguinal wall repair in a patient with chronic groin pain is currently made on clinical grounds. An investigation giving objective evidence of inguinal wall deficiency would be of great benefit in predicting good surgical outcome.

Our study retrospectively evaluates the outcome of those patients with a clinical diagnosis of groin pain due to posterior inguinal wall deficiency alone, and who proceeded to herniorraphy. In those patients on whom preoperative ultrasound and isotope bone scanning was performed, surgical outcome is correlated with preoperative investigation findings.

Methods

Subjects were patients of a single orthopaedic surgeon specialising in groin pain. During the period 1997 to 2001, 53 patients had isolated conjoint tendon repair performed. Forty seven patients were contacted by phone, and consented to completion of a verbal questionnaire. Six patients were lost to follow up. Four patients had bilateral repairs and one patient had a second operation on the contralateral side to his first. In total there were 52 repairs. At the time of questioning, 18 patients were within 12 months of surgery and 34 were greater than 12 months. The maximum post surgical period was 50 months.

Age range was 19 to 41 years old. Symptoms existed preoperatively on average eight months (range one to 48 months). The average rest period prior to operation was two months (range 0 to 36 months). Most subjects had rest or anti-inflammatory medication as part of conservative management before surgery. Sixty-five percent of patients had physiotherapy prior to surgery. The majority of injuries occurred in Australian Rules footballers, with soccer players

Sport	
Australian Rules Football	13
Soccer	13
Cricket	3
Touch Rugby	3
Hockey (Field)	3
Triathlon	1
Distance Running	1
Cycling	1
Water Ski	1
Total	**52**

Table 1: Sports participation leading to groin pain.

the next most common (Table 1). There was no difference in prevalence between right or left sides. Twenty nine subjects had gradual onset of symptoms, while 23 had an acute onset. There were no female patients. No patient was able to participate in his sport to a satisfactory level pre-operatively.

Diagnosis of conjoint tendon injury was made on the history of chronic groin pain in the inguinal region with or without radiation to the testicle or upper medial thigh, and worse with cough or sit-up. Palpation was carried out directly over the inguinal canal and superficial inguinal ring, and also via the invaginated scrotum. The tenderness was located at the superficial inguinal ring or conjoint attachment to the pubic tubercle and a cough impulse was occasionally found, though not considered essential for diagnosis. Patients with tenderness at the pubic symphysis or adductor origin were considered to have coexistent pathology and were not included in this study.

Thirty-seven patients had an ultrasound scan by one of three experienced musculoskeletal radiologists. Three patients had bilateral symptoms, so there was a total of 40 scans on the symptomatic side and 34 scans on the asymptomatic side as comparison. The radiologists reported any frank inguinal hernias (direct or indirect), abnormal posterior inguinal wall motion and adductor origin changes on both symptomatic and asymptomatic sides. On the symptomatic side, 26 had findings of a hernia or posterior inguinal wall deficiency, while 14 had a normal scan. On the asymptomatic side there were 13 scans with abnormal findings. Eleven of these had abnormal findings bilaterally, while two patients had abnormal findings on the asymptomatic side only (Table 2). The patient who underwent a second operation on his contralateral side had a normal ultrasound result on both sides.

Twenty-nine patients had a Tc-99m isotope bone scan, reported by two nuclear medicine physicians experienced in musculoskeletal imaging. They reported any increased uptake at the pubic symphysis, pubic tubercle and adductor origins bilaterally. There was an average period of four months between onset of symptoms and scanning. Twenty two had uptake at the pubic

	Symptomatic side (40)		Asymptomatic side (34)	
Normal	14		21	
Abnormal	22	PIWD (2 also partial conjoint tear)	10 1	PIWD Adductor tear
	4	Direct hernias	2	Direct hernias

Table 2: Preoperative ultrasound scan findings.

	Symptomatic side (29)		Elsewhere in groin (29)	
Normal	7		16	
Abnormal	22	pubic tubercle uptake	5	opposite tubercle uptake (1 also pubic symphysis)
			3	pubic symphysis uptake
			5	adductor origin uptake (1 also pubic symphysis)

Table 3: Preoperative bone scan findings.

tubercle on the affected side. Thirteen of the 29 patients scanned had positive findings elsewhere in the groin (ie, at the asymptomatic pubic tubercle, pubic symphysis or adductor origins). Five of these had no uptake at the symptomatic pubic tubercle (Table 3). The radiologists and nuclear physicians were not routinely blinded for the above scans. Nineteen patients had both an ultrasound scan and isotope bone scan performed.

All patients underwent a modified Bassini repair in which the transversalis fascia from the deep to superficial ring was reefed and attached to the inguinal ligament with a running 2/0 prolene stitch. A bioabsorbable mesh was inserted to enhance scar tissue formation and reinforce the posterior wall. No patient with a frank indirect hernia on examination was treated. It was the policy of the surgeon to refer these patients to a general surgeon for repair. All subjects were found to have thinning and bulging to a variable degree of the posterior inguinal wall at operation. In initial cases, a valsalva maneouvre was performed under general anaesthetic before and after repair to verify abolition of posterior wall bulging. This required endotracheal intubation and therefore was not routine procedure once the technique was established.

Results

Outcome measures were level of pain at time of interview and level of return to sport (Table 4). All patients felt the operation had improved their symptoms to some degree. Despite this, one patient was still unhappy with the outcome, while six others were partly satisfied. There was a full return to sport after 40 of the 52 groin repairs (77%) with the average time to return to sport being four months (range one to 12 months). Thirteen of the 18 subjects (72%) assessed within 12 months had a full return, which increased to 79% (27 of the remaining 34) over 12 months.

One patient who had fully returned to sport had a recurrence of symptoms six months later and had a second repair combined with adductor tenotomy on the same side. Three patients who only returned to a lower level of their desired sport and had continuing moderate symptoms were only six months post surgical. Three others in this group had further surgery; one had a further inguinal wall repair, one had an adductor tenotomy and one had a curettage of the symphysis pubis. During the period of the study, none of the patients with abnormalities on the asymptomatic side reported symptoms or went on to surgery.

Of the 26 subjects who had an abnormal ultrasound scan on the symptomatic side, 21 (81%) had a full return to sport after surgery. Ten of the 14 (70%) with a normal scan also had a full return to sport. In those subjects

No symptoms	27	Full return to sport	40
Improved, mild symptoms	15	Same sport, different level	10
Improved, significant symptoms	10	Unable to return	2
No change	0		
	52		**52**

Table 4: Outcome - symptoms and return to sport.

who had bone scanning, 18 of 22 (82%) with increased uptake at the symptomatic pubic tubercle returned fully to sport. Seven subjects had no uptake at the symptomatic pubic tubercle and four (57%) returned fully.

Statistical analyses

The outcome measures were analysed with regard to preoperative investigations using univariate analysis of variance. Using a significance level of $p< 0.05$ there was no association between either symptomatic outcome ($p= 0.51$) or level of return to sport ($p=0.29$) and ultrasound scan findings. There was a significantly better mean symptomatic outcome for the group with abnormal bone scans than that of the group with normal bone scans $F (1,25)= 4.89$, $p< 0.05$. Further analysis (Pearson correlation coefficient -0.29) allowed a prediction of 9% improvement in outcome in a patient with an abnormal scan. Similar results were seen when analysing level of return to sport, those with abnormal bone scans doing significantly better than those with normal scans, $F(1,25)= 5.17$, $p< 0.05$. When subjects had both ultrasound and bone scan performed there was no significant correlation between findings and surgical outcome.

Discussion

While most authors on this topic agree that herniorraphy produces good results in patients with chronic groin pain, there is some debate as to the exact pathology. Some researchers have described a tear of the external or internal oblique aponeurosis at the superficial inguinal ring[14,15,16], and suggest that herniorraphy successfully addresses these injuries. However Ingoldby[17] laparoscopically placed a patch on the posterior inguinal wall with good results, giving support to the theory that posterior weakness is the prime cause. The posterior inguinal wall bulging is thought to be due to weakening of the transversalis fascia[12] related to a repeated rise in intra-abdominal pressure. In our study several patients had a successful outcome from surgery even though the inguinal canal was apparently normal on ultrasound scanning. This either suggests ultrasound misses some of these cases of posterior wall deficiency or that bulging of the posterior wall is not the cause of the pain. It may be that by reinforcing the posterior wall the pain is relieved in another way, possibly restoring normal tension through the conjoint tendon.

Previous studies have shown a full return to sport rate of approximately 80%, and our results are in keeping with this. Our slightly lower rate may be due to the number of subjects still within 12 months of surgery. Subjects who did not have a good outcome from surgery may fall into four groups; those less than 12 months who may still improve, those who had the correct diagnosis but had pain arising from a complication of surgery (eg, inadequate repair or scarring), those with a coexistent source of pain in the groin and those who had the wrong diagnosis. There is little information regarding conservative treatment for true posterior inguinal wall deficiency but some authors[5,13] feel that it is rarely successful. A significant problem is that patients rarely present as soon as symptoms begin, and this may be the time when a period of rest may be most beneficial.

Several techniques have been used to assist in the diagnosis of the 'sports hernia'. Ultrasound scanning has shown promise as a non-invasive diagnostic

tool. The posterior inguinal wall deficiency can be seen at the level of the superficial inguinal ring as a convex anterior bulge with straining and ballooning of the inguinal canal[9]. However these features are subtle and this test is highly operator dependent. Orchard et al[9] found a high rate of abnormal ultrasound scans in a population of footballers, including those with no groin pain. There was a correlation between bilateral findings and a history of groin pain. He felt the presence of abnormal motion may be a precursor lesion. The fact that some of our patients with good results had normal scans would mean abnormal motion is not a mandatory precursor lesion. In our study there was no correlation between ultrasound findings and outcome. One could not predict good or bad outcome from preoperative scans. If clinical findings indicate sports hernia but ultrasound is normal, this study would suggest surgical repair could still be beneficial.

Previous research with nuclear medicine scanning has aimed to correlate findings with osteitis pubis rather than inguinal wall deficieny[3]. Like ultrasound scanning, the changes may be subtle and are best read by nuclear medicine physicians experienced in assessing musculoskeletal conditions. This study found a significantly better outcome after surgery in those patients with an abnormal bone scan on the symptomatic side. This suggests the absence of increased isotope uptake in the symptomatic conjoint should prompt the clinician to look for coexistent or alternate sources for the pain before committing to an isolated conjoint tendon operation. In this study, 69% of patients with bone scans positive at sites other than the symptomatic pubic tubercle had a full return to sport. Increased isotope uptake in these situations may reflect stress-related changes in the bone, and may not be significant until they are associated with clinical signs such as tenderness. Further studies are recommended, and should also involve magnetic resonance imaging (MRI). While it has been used to assess osteitis pubis[18], the role of MRI in inguinal wall deficiency is yet to be determined.

Limitations

This is a retrospective study and relies on the recall of patients for information prior to and after surgery. Not all patients had a bone scan and ultrasound scan, and this prevents calculation of true false positive and negative rates. In this study all patients who were surgically explored went on to have herniorraphy and this raises the possibility of bias in reporting abnormalities of the posterior wall at surgery.

Further research in this area would ideally involve a randomised prospective trial with one group being treated conservatively and all patients having investigations. This would involve using a pain scale pre- and postoperatively for accurate record of pain as well as a preoperative recording of functional level. However a randomised trial may be difficult in an area that involves a significant number of professional sportsmen who are unwilling to risk a potentially unsuccessful period of non-operative treatment.

Conclusions

Groin pain has a multitude of possible causes and requires careful history and examination before appropriate management is started. Posterior inguinal wall deficiency is a common cause of chronic groin pain and may be diagnosed on

clinical grounds. Ultrasound scan does not appear to aid in predicting surgical outcome, while the role of isotope bone scanning requires further study. Decisions to treat surgically should be based primarily on clinical grounds. When posterior inguinal wall deficiency is the single diagnosis good results can be obtained with surgery.

References

1. Hackney RG. The sports hernia: a cause of chronic groin pain. *Br J Sports Med 1993*;27:76-9.
2. Fricker P. Management of groin pain in athletes. *Br J Sports Med 1997*;31:97-101.
3. Ekberg O, Persson NH, Abrahamsson PA. Longstanding groin pain in athletes: a multidisciplinary approach. *Sports Med 1988*;6:56-61.
4. Lovell G. The diagnosis of chronic groin pain in athletes: a review of 189 cases. *Aust J Sci Med Sport 1995*;27:76-9.
5. Lynch S, Renstrom P. Groin Injuries in Sport. *Sports Med 1999*;28:137-144.
6. Renstrom P. Tendon and muscle injuries in the groin area. *Clinics in Sports Medicine 1992*;11:815-831.
7. Ekberg O, Blomquist P, Olsson S. Positive contrast herniography in adult patients with obscure groin pain. *Surgery 1981*;89:532-535.
8. Smedberg S, Broome A, Gullmo A et al. Herniography in athletes with groin pain. *Am J Surg 1985*;149:378-382.
9. Orchard J, Read J, Neophyton J et al. Groin pain associated with ultrasound finding of inguinal canal posterior wall deficiency in Australian Rules footballers. *Br J Sports Med 1998*;32:134-9.
10. LeJeune JJ, Rochcongar P, Vazelle F et al. Pubic pain syndrome in sportsmen: comparison of radiographic and scintigraphic findings. *European J Nuclear Med 1984*;9:250-3.
11. Smodlaka VN. Groin pain in soccer players. *Physician and Sportsmedicine 1980*;8:57-61.
12. Polglase A, Frydman G, Farmer K. Inguinal surgery for debilitating chronic groin pain in athletes. *Med J Aust 1991*;155:674-7.
13. Malycha P, Lovell G. Inguinal surgery in athletes with chronic groin pain: 'the sportsman's' hernia. *Aust NZ J Surg 1992*;62:123-5.
14. Simonet WT, Saylor HL, Sim L. Abdominal wall muscle tears in hockey players. *Int J Sports Med 1995*;16:126-8.
15. Gilmore OJA. Gilmore's Groin. Sportsmedicine and Soft Tissue Trauma 1992;3:3.
16. Williams P, Foster M. 'Gilmore's Groin'- or is it? *Br J Sports Med 1995*;29:206-8.
17. Ingoldby C. Laparascopic and conventional repair of groin disruption in sportsmen. *Br J Surg 1997*;84: 213-215.
18. Verrall G, Slavotinek J, Fon G. Incidence of pubic marrow oedema in Australian rules football players: relation to groin pain. *Br J Sports Med 2001*;35:28-33.