Loss of range of motion of the hip joint: a hypothesis for etiology of sports hernia

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Summary

Background: **sports hernia is a well-recognized cause of groin pain in athletes involved in sports, especially football and rugby. Loss of range of motion of the hip joint is a possible contributory factor to stress across the symphysis pubis leading to the instability.**
Methods: **twenty-five athletes presenting with sports hernia were matched to age, sex, physical/sports activity and co-morbidities with twenty-five athletes without sports hernia. The range of movement of both the hips was compared in athletes of both the groups.**
Results: **there was marked restriction of internal rotation with the hip flexed to 90 degrees (average 17 degrees) and external rotation (average 26 degrees) in sports hernia group compared to the control group. Other movements of the hip were comparable in both the groups.**
Conclusion: **the study highlights observation of limitation of hip rotation with the hip flexed to 90 degrees as a possible factor in the aetiology of sports hernia. There may be an association with other pathologies of the hip such as impingement that requires further investigation. Though this study has its limitation in being a small number and a case control study, it does helps in understanding the possible mechanism of development of this condition.**

KEY WORDS: sports hernia, groin pain, hip movements, osteitis pubis.

Introduction

Hernia has been described as the condition of a weakened posterior wall of the inguinal canal (transversalis fascia), resulting in chronic activity-related pain in the groin and surrounding structures. Athletic pubalgia[1], sportsman's hernia[2], incipient hernia[3], osteitis pubis[1], Gilmore's groin[4], hockey groin syndrome[5] and Ashby's inguinal ligament enthesopathy[6] are some of the terms that have complete or partial overlap with sports hernia.
Osteitis pubis is a separate recognised condition, but has been commonly associated with the obscure groin pain[7] and misinterpreted as sports hernia.
Having said that, hernia is not an appropriate term for this condition, since, in many cases, an actual hernia is not seen[8,9]. A *hernia* is defined when an internal part of the body pushes through a weakness in the muscle or surrounding tissue wall. Hackney first coined the term sports hernia because of the similar pathology as in inguinal hernia[1].
Several theories exist in the literature regarding the cause of sports hernia[7,10-14]; most theories implicating the overuse syndrome. According to one theory, hip abduction, adduction, and flexion-extension with the resultant pelvic motion produce a shearing force across the pubic symphysis, leading to stress on the inguinal wall musculature perpendicular to the fibres of the fascia and muscle[3,15]. Pull from the adductor musculature against a fixed lower extremity can cause significant shear forces across the hemipelvis[10]. Subsequent attenuation or tearing of the transversalis fascia or conjoined tendon has also been suggested as the source of pain[1]. Other studies have reported abnormalities at the insertion of the rectus abdominis muscle[5,16-18].
The possible aetiologies for groin pain are vast, cover a wide range of physiologic systems and medical subspecialties, and require a thorough history and examination. Insidious onset of unilateral groin pain is the most commonly reported symptom with injuries of this type.
Though the actual cause of sports hernia is unknown various theories have been proposed but none of them have been proven. We propose that loss of range of motion of the hip is a significant factor in the etiology of this condition.

Material and methods

The study

Twenty-five athletes presenting with sportshernia were prospectively matched to age, sex, sports,

physical activity and co-morbidities with twenty-five athletes without sports hernia (control group) over a one-year period were included in the study. The range of movement of both the hips was compared in athletes of both the groups. The results were compared in the two groups. The hospital audit and ethics committee approved the study.

The control group

The control population consisted of volunteers sampled from fracture clinic who had presented with upper limb injuries. To be included in the analysis, volunteers confirmed they had no prior history of groin pain or any previous hip or knee surgery. The control group was matched with the study group based on age, sex, co-morbidity, sports and physical activity (Tab. 1).

The study group

25 consecutive patients presenting to our clinic with sports hernia were recruited in the study. Fifteen patients had bilateral symptoms where as ten patients had unilateral symptoms. All patients were investigated to confirm that they do not have any inguinal hernia or any other known cause of groin pain. These include ultrasound examination; x-ray examination and MRI to rule out femoral acetabular impingement. Patients with cam, pincer or combined type of impingement on x-rays/MRI were excluded from the study. All patients had started with insidious onset of unilateral groin pain.
Two assessors checked the range of movements of both the hips in the two groups using a digital goniometer. Three reading were taken by each of the assessor to avoid inter-observer and intra-observer error. The average of each of the reading was finally accepted. The results of range of movement were compared in the two groups for flexion, extension, abduction, adduction, internal rotation and external rotation with the patient supine and prone. The patients were asked to do the movements actively first explaining them what to do and then passive range of movement was checked to see if there is any increase in the range of movement.

Table 1. Matched sports hernia group and control group.

	Sports hernia	Control group
Number	25	25
Age	23.2 (17-35)	22.8 (16-34)
Sex	Males 18	Males 18
	Females 7	Females 7
Comorbidities	Asthma 3	Asthma 2
	Diabetes 1	Diabetes 1

Operative findings

Operative findings included weakening and thinning of the conjoined tendon of transversalis and internal oblique muscles. The weakness amounts to a direct hernia. With a short duration of symptoms the defect seems to be more to the medial end of the inguinal canal. The repair tightens up the weaknesses, drawing down good tissue to strengthen the attenuated tissues. The surgical technique used does not seem to matter providing tension is restored to the muscles of the posterior wall of the inguinal canal.
All patients who underwent surgical treatment were assessed at one year after the surgery to compare their range of movements preoperatively and post operatively.

Results

We found significant differences in restriction of internal and external rotation in the sports hernia group when compared to their corresponding age-gender matched control. Statistical analysis was done using SPSS ver 21 (IBM, New York, USA).
There was marked restriction of internal rotation with the hip flexed (average 17.4 degrees) and external rotation (average 26.2 degrees) in sports hernia group compared to the control group. This was statistically significant using paired t test (p value 0.03). Other movements of the hip were comparable in both the groups (Tab. 2).
Patients with unilateral symptoms had decrease of internal rotation and external rotation by 20 degrees in the affected side compared to the unaffected side.
There was a gradual improvement of all movements of the hip in patients who underwent surgery at one year and was compared to the control group. The results were statistically significant for internal rotation of the hip using paired t-test (p value 0.02) (Tab. 3).

Discussion

Our study highlights that the restriction of rotation of the hips can be a pre-disposing factor in the pathogenesis of the sports hernia. There was marked restriction of internal and external rotation in the study

Table 2. Range of hip movements in the control and the study group.

Movements	Study Group (Range) Affected side	Control group (range)
Flexion	122.30 (110-130)	122.20 (112-129)
Extension	10.30 (8-14)	11.40 (9-16)
Internal Rotation	**17.40** (10-23)	**40.90** (37-45)
External Rotation	**26.20** (23-29)	**45.10** (42-55)
Abduction	35.20 (30-39)	35.90 (33-42)
Adduction	27.10 (24-29)	26.20 (23-31)

Table 3. Range of movement in the Study group pre and 1-year post surgery.

Movements	Pre surgery	1 year post surgery
Flexion	122.30 (110-130)	1250 (110-133)
Extension	10.30 (8-14)	13.20 (9.2-15.8)
Internal Rotation	**17.40** (10-23)	38.20 (34-43)
External Rotation	**26.20** (23-29)	39.40 (35-45)
Abduction	35.20 (30-39)	36.30 (32-40)
Adduction	27.10 (24-29)	28.20 (25-30)

group compared to the control group. Patients with unilateral symptoms had decrease rotation in the affected side compared to the unaffected side.

Lacroix et al.[5] believed that the abnormality existed in the external oblique muscle and aponeurosis. Another study suggested entrapment of the genital branches of the ilioinguinal or genitofemoral nerves may be the source of pain[16]. Young adult soccer[1,2,4,10,19-22] and rugby[1,11,18,21,23] players have been reported to be the most frequent victims of sport hernia according to vast majority of published studies and review articles. Runners[1,8,10,11,22,24] and American football players[2,24,25] are also known to suffer from this injury.

Some groin injuries are effectively treated by non-surgical treatment. Conventional physiotherapy has little to offer. Patients report a long-term failure of conservative treatment. These included stretching and strengthening exercises from physiotherapists in addition to electrical modalities. Local anaesthetic and steroid injections provide no lasting relief, if at all.

Rest settles the pain, but it returns rapidly on resuming sport. The average duration of symptoms to presentation averaged 20 months with a range of 6 weeks to 5 years. Excellent results can be achieved with surgical repair, over 80% returning to competition and all patients reporting improvement.

An alternative theory is that it is simply a chronic stretching of the posterior inguinal wall due to the excess demands of sport[3]. The condition is rare amongst females, probably less than 2%[1]. The history is similar to the male, but the examination is more difficult. The painful cough impulse can be detected as easily in a thin athletic person, but a small amount of subcutaneous fat can obscure the impression of a bulge.

It is important to understand that loss of internal rotation can be one of the factors predisposing to the development of sports hernia and more work can be done at the physiotherapy level to identify these patients and work on improving their range of movement.

Restriction of rotation of hip as a causative factor for sports hernia has never been reported in the literature. Factors to improve rotations of the hip in high-level athletes can be used to decrease the incidence of sports hernia. We propose athletes should be checked for rotation of the hips and specific rehabilitation targeted at improved rotation might be helpful in treating this condition.

The authors understand the limitations of the study having a small number in the two groups but it still highlights the importance of limitation of hip rotation as a causative factor for the pathogenesis of sports hernia.

Conclusion

Sports hernia is a recognised condition and various hypothesis has been proposed[16,18,21,26]. We propose a hypothesis and possible remedy so that this condition can be avoided in athletes with predisposing factors[12, 23]. The study gives a comprehensive review of the sports hernia and proposes a hypothesis for the cause of sports hernia along with treatment options. This hypothesis has never previously been described in the literature. The study highlights the importance of looking for restricted range of hip rotation in patients with symptoms suggestive of sports hernia and targeted physiotherapy to improve rotation in helping to resolve the symptoms.

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