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Operative Techniques in

Sports Medicine

Osteitis Pubis

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The task of diagnosing and managing groin pain in the athlete represents a formidable challenge for sports medicine experts. Osteitis pubis should be considered in all athletes with groin pain, especially those athletes who participate in forceful kicking or running sports. Athletic osteitis pubis is believed to be caused by microtrauma and/or instability of the pubic symphysis, in contrast to obstetrical and urologic osteitis pubis, which are not associated with sporting activity. Osteitis pubis has been identified in a variety of sports including fencing, ice hockey, wrestling, Olympic walking, rugby, tennis, running, football, diving, and basketball. In athletes, osteitis pubis may evolve into a chronic, painful, disabling condition causing significant amounts of lost playing and practice time. Nonoperative treatment is successful in the majority of cases; however, complete recovery may take months. For cases that are recalcitrant to conservative treatment, surgical procedures addressing the abnormal pubic symphysis inflammation and instability have been described. Before surgery, it is critical that the clinician is certain of the diagnosis and that other disorders causing groin pain are ruled out. This article will take a detailed look at osteitis pubis and the procedures designed to treat this disorder when nonoperative measures fail.

KEYWORDS pubalgia, groin strain, adductor strain, gracilis syndrome, osteitis pubis, sports hernia, sportsman hernia, hockey groin syndrome

Osteitis pubis in the athlete is a painful, inflammatory, noninfectious, condition of the pubic symphysis and surrounding structures.[1-5] Most of the early literature on this subject emerged from the field of urology and was associated with complications such as infections and surgical trauma.[1,2,3,5]

There are 4 primary clinical types: (1) noninfections osteitis pubis associated with urologic procedures, gynecologic procedures, and pregnancy; (2) infectious osteitis pubis associated with local or distant infection loci; (3) sports-related or athletic osteitis pubis; and (4) degenerative/rheumatologic osteitis pubis. It is imperative that all factors, such as infections, urologic, gynecologic, and rheumatologic issues, are taken into consideration when osteitis pubis is being worked up and managed.

The pathogenesis of this disorder remains obscure. Among athletes, the etiology is considered to be associated with muscle imbalance, pelvis instability,[4,6] and chronic overuse injury to the bone and joint.[4,5,7-10] Muscle imbalance between the abdominal wall musculature and hip adductor muscles has been suggested as a major etiologic factor.[9,10] The muscles implicated include the rectus abdominus, gracilis, and adductors longus.[5,8] The abdominal and adductor muscles have a central point attachment on the symphysis pubis but act antagonistically to each other, predisposing the pubic symphysis to harmful forces and microtrauma. These antagonistic forces are most prevalent in kicking sports, such as soccer or football (Fig. 1). Abnormal vertical motion of the pubic symphysis, greater than 2 mm, is considered a contributing factor.[11] It is unclear if the inflammation process of osteitis pubis causes the increased vertical motion or if osteitis pubis is antecedent to the increased vertical motion. An evaluation of pubic symphysis vertical motion with single-leg standing plain radiographs (flamingo views) is therefore an important aspect of the groin pain workup. Chronic stress injury to the pubic bone[8,12] caused by repetitive kicking such as seen in soccer, hockey, and Australian rules football may be another etiologic factor in athletes. The increased magnetic resonance imaging (MRI) signal intensity of the pubic symphysis in symptomatic Australian rule football players has been seen.[12] Abnormal signal intensity on MRI because of bone marrow edema, similar to the MRI findings seen in true stress fractures, is the characteristic finding.

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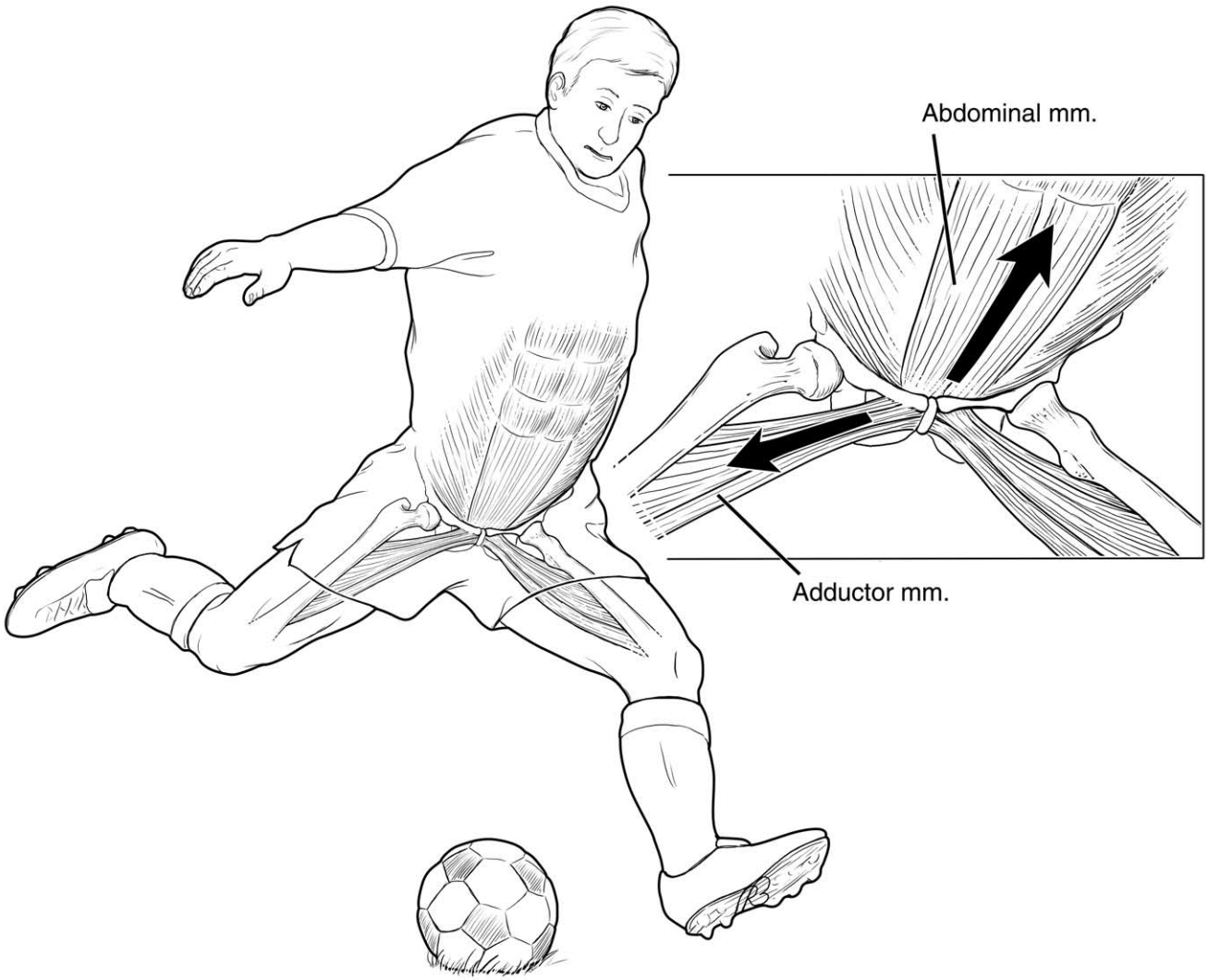

Figure 1 Core imbalance: antagonistic muscle forces centered on the pubic symphysis indicated by the arrows. Muscle imbalance across the pubic symphysis occurs because of eccentric loading and overloading from abdominal muscle pull superiorly and hip flexors, adductors, and abductor muscles pulling inferiorly. Physiotherapy is aimed at eliminating these muscle imbalances through core strengthening and providing a stable platform.

Clinical Presentation

Osteitis pubis is not only a diagnostic problem but also a therapeutic dilemma often requiring a multidisciplinary approach. Making the diagnosis of osteitis pubis is not difficult when the pain pattern is straightforward and the radiographs corroborate the diagnosis. However, the physician is faced with a difficult diagnostic challenge when an athlete presents with groin pain and nondiagnostic imaging studies, especially if the symptoms are ambiguous. Osteitis pubis usually presents with pubic symphysis or proximal adductor pain. The onset may be either acutely after a distinct kicking event or insidiously. The pain may involve the lower abdominal, hip, perineal, and scrotal areas, adding uncertainty to the diagnosis.

The athlete's symptom will be aggravated by activities that require sudden hip flexion or rotation which occurs with running, kicking, jumping, and single-leg pivoting. Invariably, there is tenderness of the pubic symphysis, adductor muscle origins, and immediately surrounding soft tissues[4,13,14] Coventry and Mitchell[2] described 2 provocative maneuvers: (1) the rocking cross-leg test in which the patient sits with 1 knee crossed over the other and the examiner bears down on the crossed knee while holding down the opposite iliac crest and (2) the lateral pelvis compression test done with the patient on their side and the examiner presses the presenting wing. The examiner can also provoke the symptoms by having the patient increase their internal abdominal pressure by coughing, sneezing, or doing the Valsalva maneuver.[5]

The diagnostic workup for patients presenting with groin pain is individualized and dependent on location and characteristics of the pain. After a meticulously detailed examination, the physician should obtain high-quality plain radiographs of the hip and pelvis. Radiographic changes commonly lag behind clinical symptoms by 2 or 3 weeks.[1]

Figure 2 Anteroposterior pelvis radiograph showing classic findings of osteitis pubis.

Typical radiographic findings include marginal irregularity, symmetrical bone reabsorption, widening of the symphysis, reactive sclerosis along the rami, and sacroiliac joint irregularities[2] (Fig. 2). Additionally, on radiographs, cortical avulsions from the adductor tendon insertion and stress injury to the sacroiliac joint may be present.[9,13,15] In patients with suspected instability of the pubic symphysis, single-leg standing anteroposterior radiographs of the pubic symphysis (flamingo views) should be obtained.[7,11] Vertical motion greater than 2 mm is considered abnormal. Laboratory analysis adds little to the evaluation except for ruling out the presence of other pathological processes such as infection, spondyloarthropathies, and malignancies. The diagnosis of osteitis pubis can be assisted with further studies such as a 99m Technetium isotope bone scan and MRI. The computed tomography (CT) scan is useful for identifying other conditions presenting with groin pain such as pelvic and hip stress fractures, pelvic abscesses, and bony avulsion fractures. In patients with radiographic changes suspicious for infection and who may have other supportive data such as laboratory infection parameters, a CT-guided aspiration is useful for the diagnosis of infection.

It is important to be mindful of the broad differential diagnosis for groin pain. In cases that do not seem to follow the expected clinical course, the clinician should consider other possibilities such as referred pain from the lumbosacral spine including spinal stenosis, discogenic pain, and herniated nucleus pulposus. Other etiologies causing groin pain include pelvis stress fractures, abdominal wall tears (sports hernias), intra-articular hip problems, nerve entrapment syndromes (ilioinguinal and genitofemoral), and snapping hip. A referral to a general surgeon, urologist, or gynecologist is sometimes warranted in uncertain cases.

Treatment

Not only can the diagnosis pose a serious challenge for the most experienced sports medicine specialist but so can the treatment, especially in the competitive athlete who is in a hurry to return to a race or a match. It is imperative to consider anterior abdominal wall abnormalities such as sports hernia, also know as athletic pubalgia, Gilmore's groin, Hockey groin syndrome, gracilis syndrome, and sportsman hernia. Surgical treatment of the pubic symphysis in the presence of a sports hernia is certain to fail. The treatment and management of sports hernia is covered in other chapters of this journal. We recommend that the sports medicine clinician be thoroughly versed with the diagnostic steps and the treatment of both osteitis pubis and sports hernia in the kicking athlete.

In osteitis pubis, a drawn-out clinical course is frequently seen, which challenges the physician, patient, trainers, and coaching staff; therefore, education is critical. The duration of symptoms may last from 4 to 9 months.[13,16] The full spectrum of conservative measures includes rest, physical therapy, ultrasonography, nonsteroidal antiinflammatory drugs, oral glucocorticoids, radiation therapy, anticoagulation, intravenous pamidronate, and corticosteroid pubic symphysis injections.[1,2,4,16,17,20] The effectiveness of the majority of these treatments has not been validated scientifically. The mainstay of treatment remains nonoperative.[2,4,5,16,20,21] Choosing nonpainful and nonimpact exercises is fundamental for the initial treatment; if the activity causes pain, then it should be curtailed. Shock-absorbing footwear may also diminish the shear forces across the symphysis pubis. The ideal physical therapy program has not been clearly determined for osteitis pubis.[21] To decrease detrimental antagonistic muscle forces at the pubis symphysis, core stability, strengthening, and muscle force balancing is at the core of any good physiotherapy program.[18-21] Studies evaluating the effectiveness of intra-articular pubic symphysis steroids are limited. For cases that remain significantly symptomatic, a steroid injection is the next step. It has been suggested that a quicker return to full athletic activities could be accomplished with early judicious use of intraarticular corticosteroid injections rather than waiting for the course to become chronic in nature.[16] In a study evaluating the effectiveness of pubic symphysis steroid injections, the authors injected the pubic symphysis 7 to 10 days after the onset of symptoms with an anesthetic/steroid mixture consisting of 4 mg dexamethasone, 1 mL 1% lidocaine, and 1 mL bupivacaine. Pubic symphysis injections can be performed in an office setting without the use of fluoroscopic guidance. These injections will serve the dual purpose of being diagnostic and therapeutic. The technique relies on reliably palpating the pubic symphysis, feeling the pop sensation as the needle penetrates the pubic symphysis, and appreciating unhindered flow of anesthetic solution as it enters the joint. Advancing the needle more than 1 inch may cause injury to the spermatic cord or penetration of the urinary bladder.

Operative Procedures

Surgical procedures such as partial wedge resections of the symphysis pubis and arthrodesis with and without hardware should be reserved for those patients with recalcitrant disabling osteitis pubis.[2,4,6,14] There are 2 basic bony surgical approaches, each with pros and cons. Some authors[4] have

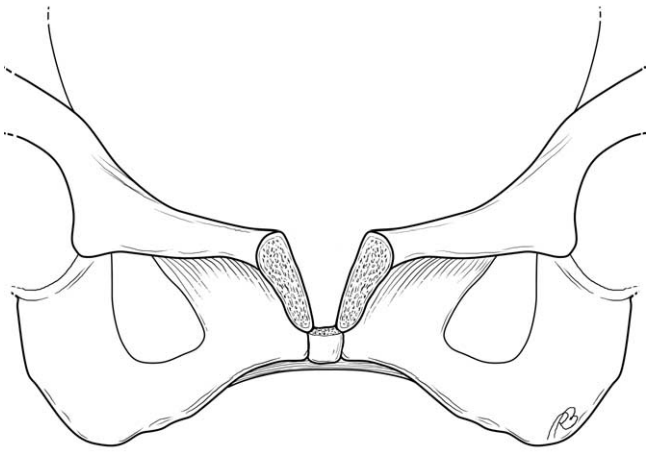

Figure 3 Trapezoidal wedge resection.

recommended plate arthrodesis augmented with cortical bone graft, whereas others have recommended a wedge resection of the symphysis (Fig. 3). The success of these 2 techniques has been studied to a limited degree, and the few published reports available are limited to small case reports. Those who prefer the trapezoidal wedge resection believe that removal of the superior portion of pubic symphysis will preserve the stout inferior arcuate pubic symphysis ligaments, thereby preventing future instability.[2,14] Coventry and Mitchell[2] noted rapid resolution of symptoms in 2 patients who underwent a trapezoidal wedge resection and concluded that surgical measures may shorten the clinical course of recalcitrant osteitis pubis. Grace and coworkers[14] published their work on 10 patients who underwent a similar wedge resection after completing at least 6 months of conservative treatment. At an average postoperative follow-up of 92 months, 7 of the 10 patients were very satisfied with their results, but 3 were not. Interestingly, 2 of these 3 patients had developed pelvic instability. These authors concluded wedge resection of the symphysis pubis is useful as a first-line surgical procedure because of its short operative time, reliability, and low complication risk. However, this study also brought to light the possibility of late pelvis instability caused by anterior pelvis disruption. Williams and coworkers[6] evaluated the benefits of pubic symphysis bone grafting supplemented by compression plating in a group of rugby players with pelvic instability. These patients had undergone at least 13 months of conservative treatment and were all found to have pelvic instability seen on flamingo views (>2-mm vertical motion). At a mean follow-up of 52.4 months, all patients were free of symptoms. Postoperative flamingo views confirmed a successful arthrodesis without residual pubic symphysis instability. The authors concluded that compression plate fusion and bone grafting yielded an excellent fusion and offered a low complication rate. An arthrodesis with a compression plate was determined to offer the longest durability by lessening the chance for a stress fracture at the arthrodesis site and also lessening the risk for late pelvis instability associated with the wedge resection.[22]

Most of the literature regarding surgical management of osteitis pubis has focused exclusively on bony procedures. The available reports on soft-tissue procedures, such as adductor muscle releases, are limited. A case report by Wiley[15] reported favorable results after surgically excising cortical avulsion of the gracilis tendon at the pubic symphysis. Unpublished case studies in soccer players also support an adductor release in patients with osteitis pubis.

In our practice, if an athlete has undergone 9 months of observation, physiotherapy, nonsteroidal anti-inflammatory drug treatment, and 3 pubic symphysis steroid injections, then operative intervention is considered. Before considering surgery, the patient is referred to a general surgeon specialized in sports hernias. If the patient is not deemed a surgical candidate for herniorrhaphy and anterior abdominal wall repair, then pubic symphysis stabilization is considered. The research available does not categorically support either the trapezoidal wedge resection or the plate arthrodesis. In our practice, we prefer the plate arthrodesis because of its theoretical durability and decreased chance of failing. The patient should be empowered in the decision-making process by educating them about the respective pros and cons of each procedure. The trapezoidal wedge resection is offered to patients who prefer the less invasive surgical technique but who are aware of the increased risk for future sacroiliac joint instability and possibly more complex surgery.[22] If the patient has documented vertical instability, then we recommend a pubic symphysis plate arthrodesis augmented with bone graft as described later. Additionally, we include a proximal adductor release with adjunctive drilling or curettage of the symphysis bone to enhance the healing capacity.

Procedure: Pubic Symphysis Arthrodesis Using a Compression Plate and Bone Graft

The patient is positioned in the supine position. A Pfannenstiel's transverse abdominal incision is made. The

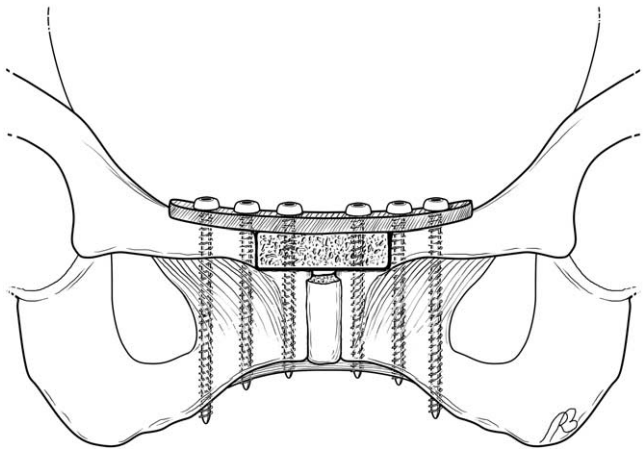

Figure 4 Pubic symphysis compression plate arthrodesis augmented with cortical-cancellous bone graft.

Scarpa's and Camper's fascia is divided in the same direction as the skin incision. Access to the anterior pubic symphysis is accomplished by splitting the central linea alba of the rectus abdominus, and the 2 bellies are separated. The granulation tissue overlying the pubic symphysis and adductors is debrided.

An elevator is used to subperiosteally dissect anteriorly and inferiorly so that the bilateral adductors can be released off the bone using a bovie. Frequently, cortical avulsions or calcifications are identified and debrided. Once the adductors are released, a small drill or sharp curette is used to decorticate the inferior pubic bone. The inferior arcuate ligament of the pubic symphysis is not violated.

The superior pubic symphysis is partially resected of its central hyaline cartilage, disk, and cortical bone. A block of superior pubic symphysis bone and cartilage is resected. The resected block will be filled by an inlaid cortical-cancellous allograft or iliac crest bone graft. The resected block of pubis is approximately 1 cm × 1 cm × 4 cm. Before laying down the cortical-cancellous bone graft, a mixture of bone graft substitute and allograft croutons is packed into the prepared pubic symphysis and beneath the cortical-cancellous bone graft. A large temporary pelvic reduction clamp is applied across the prepared pubis so that the fusion site can be compressed while the plate is being secured. A contoured 6-hole low contact dynamic compression (LCDC) plate matched with six 3.5-mm bicortical screws is used (Fig. 4). The LCDC plate is chosen over the pelvic reconstruction plate because of its increased stiffness and strength. An oscillating pelvis fracture drill bit adaptor is used so that the soft tissues do not get caught up and torn apart by a conventional spinning drill bit. Additionally, the oscillating drill provides better sensory feedback while drilling through the inferior cortices of the pubic symphysis. A broad malleable retractor is placed anterior to the bladder to protect it from misdirected drills and screws. The 2 central screws transverse the cortical-cancellous bone graft, whereas the remaining outer screws only penetrate the pubic symphysis. Intraoperative fluoroscopic imaging is used to check for proper hardware placement.

Immediately postoperatively, ice is applied to the scrotal area and strict rest is encouraged so that scrotal swelling can be reduced. Postoperatively, the patient is protected from weight bearing by using a wheelchair for first 6 weeks and then crutches for up to 12 weeks. Limited activities are continued until the patient is asymptomatic and plain radiographs show a fully incorporated graft. While waiting for graft incorporation, the athlete may be allowed to participate in low impact activities such as cycling, elliptical machine, and swimming.

Summary

The main points of the workup and preoperative considerations for athletes with groin pain are as follows:

1. In cases of recalcitrant symptoms, re-evaluate your diagnosis. Have a low threshold for gynecologic, urologic, and general surgery consultations. Also consider referred pain from spine disease.
2. Rule out sports hernia: careful digital examination of scrotum, spermatic cord, inguinal ring, and conjoined tendon of abdominal wall. Sports hernia is actually a misnomer because a bulge is rarely present in these cases. An MRI may be helpful in identifying a tear of the anterior abdominal wall musculature (external oblique aponeurosis, superficial inguinal ring, conjoined tendon). A diagnostic lidocaine injection (steroid should not be injected) into the abdominal wall superior to the pubic symphysis might prove useful.
3. Before osteitis pubis surgery, send all patients to a general surgeon qualified to evaluate and treat for sports hernia. If the evaluation is negative, then proceed with the surgical plan addressing the pubic symphysis.
4. Imaging studies: Plain radiographs to include AP pelvis, AP outlet/inlet views and single leg AP standing views (flamingo views) for vertical instability. MRI and bone scan to evaluate for abdominal wall abnormalities, intrapelvic diseases, and stress fractures.
5. Laboratory analysis: consider rheumatologic screening with complete blood count, sedimentation rate, C-reactive protein, rheumatoid factor, antinuclear antibody, and HLA-B27. Have a low threshold for a rheumatologic consultation.
6. Infection workup: blood cultures, labeled white blood cell scan, and CT-guided aspiration.

Conclusion

The workup for groin pain in the athlete mandates a comprehensive and thorough diagnostic and management approach. In athletes who participate in kicking sports, osteitis pubis should be highly considered in the differential diagnosis. Nonoperative treatment is usually successful; however, the period of recovery is frequently protracted and therefore trying to the patient and clinician. For the few cases that become recalcitrant to conservative measures, plate arthrodesis with bone graft becomes a viable and durable option.

References

1. Abrams M, Sedlezky I, Stearns DB: Osteitis pubis. N Engl J Med 240: 637-641, 1949
2. Coventry MB, William MC: Osteitis pubis: Observations based on a study of 45 patients. J Am Med Ass 178:898-905, 1961
3. Gamble JG, Simmons SC, Freedman M: The symphysis pubis. Anatomic and pathologic considerations. Clin Orthop 203:261-272, 1986
4. Harris NH, Murray RG: Lesions of the symphysis pubis in athletes. J Bone Joint Surg [Br] 56:563-564, 1974
5. Lentz SS: Osteitis pubis: A review. Obstet Gynecol Surg 50:310-315, 1995
6. Williams PR, Thomas DP, Downes EM: Osteitis pubis and instability of the pubic symphysis. When nonoperative measures fail. Am J Sports Med 28:350-255, 2000
7. Chamberlain W: The symphysis pubis in the roentgenol examination of the sacro-iliac joint. AJR Am J Roentgenol 24:621-625, 1930
8. Major NM, Helms CA: Pelvic stress injuries: The relationship between

osteitis pubis (symphysis pubis stress injury) and sacroiliac abnormalities in athletes. Skeletal Radiol 26:711-715, 1997
9. Miller J, Schultz A, Anderson G: Load displacement behavior of the sacroiliac joints. Orthop Res 5:92-101, 1987
10. Hanson PG, Angive, Juhl J: Osteitis pubis in sports activities. Physician Sports Med 10:111-114, 1978
11. Walheim G, Olerun S, Ribbe T: Mobility of the pubic symphysis measurements by an electromechanical method. Acta Orthop Scan 55:203-208, 1984
12. Verral GM, Slavotinek JP, Fon GT: Incidence of pubic bone marrow oedema in Australian rules football players: Relationship to groin pain. Br J Sports Med 35:28-33, 2000
13. Fricker P, Taunton J, Ammann W: Osteitis pubis in athletes: Infection, inflammatory or injury? Sports Med 12:266-279, 1991
14. Grace JN, Sim FH, Shives TC, et al: Wedge resection of the symphysis pubis for the treatment of osteitis pubis. J Bone Joint Surg [Am] 71: 358-364, 1989
15. Wiley JJ: Traumatic osteitis pubis: The gracilis syndrome. Am J Sports Med 11:360-363, 1983
16. Holt MA, Keene JS, Graf BK, et al: Treatment of osteitis pubis in athletes. Results of corticosteroid injections. Am J Sports Med 23:601-606, 1995
17. Watkin NA, Gallegos CR, Moisey CU: Osteitis pubis. A case of successful treatment with anticoagulants. Acta Orthop Scand 66:569-70, 1995
18. Rodriguez C, Miguel A, Lima H, et al: Osteitis pubis syndrome in the professional soccer athlete: A case report J Athl Train 36:437-440, 2001
19. Anderson K, Strichland SM, Warren R: Hip and groin injuries in athletes. Am J Sports Med 29:521-533, 2001
20. Lynch SA, Renstrom P: Groin injuries in sports: Treatment strategies. Sports Med 28:137-144, 1999
21. Holmich P, Uhrskou P, Ulnits L, et al: Effectiveness of active physical training as treatment for long-standing adductor-related groin pain in athletes: Randomised trial. Lancet 353:439-443, 1999
22. Moore RS, Stover MD, Matta JM: Late posterior instability of the pelvis after resection of the symphysis pubis for the treatment of osteitis pubis. J Bone Joint Surg [Am] 80:1043-1048, 1998