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 bone9,12 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.
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. Invari-

ably, there is tenderness of the pubic symphysis, adductor muscle origins, and immediately surrounding soft tissues. Coventry and Mitchell 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.

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.
The sacroiliac joint may be present. In patients with suspensions from the adductor tendon insertion and stress injury to the symphysis pubis.

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 play. 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 validated scientifically. The mainstay of treatment remains nonoperative. Choosing nonpainful and nonimpact exercises is fundamental for the initial therapy program. Some authors have reported success with early judicious use of intraarticular corticosteroid injections rather than waiting for the course to become chronic in nature. 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 osseous pubis. There are 2 basic bony surgical approaches, each with pros and cons. Some authors have reported success with early judicious use of intraarticular corticosteroid injections rather than waiting for the course to become chronic in nature. 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.

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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. Coventry and Mitchell 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 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 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.

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 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. 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
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.

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