

Original Report

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Symphyseal Cleft Injection in the Diagnosis and Treatment of Osteitis Pubis in Athletes

OBJECTIVE. The purpose of this study was to describe the application, technique, and results of symphyseal cleft injection in athletes with osteitis pubis.

CONCLUSION. Symphyseal cleft injection is a useful technique for the diagnosis and treatment of osteitis pubis in athletes. The procedure is well tolerated and may facilitate early resumption of competitive duties.

The diagnosis of osteitis pubis can be difficult because radiographic appearances of this entity are commonly identified in the absence of symptoms [1]. In this report, we outline the use of symphyseal cleft injection or symphysiography as a diagnostic symptom provocation test and as a therapeutic maneuver to afford short-term treatment and symptom relief in affected patients.

Subjects and Methods

Patients

Sixteen high-level or professional athletes with clinically suspected osteitis pubis referred over a 6-month period were included in our study. Each patient complained of debilitating groin pain and had undergone conventional radiography and additional imaging—either scintigraphy ($n = 10$) or MR imaging ($n = 6$)—before being referred.

Diagnostic Criteria

The radiographic criteria for the diagnosis of osteitis pubis were visualization of an articular surface irregularity, erosion, sclerosis, and osteophyte formation. Symphyseal joint laxity or disruption was diagnosed in patients with widening of the joint space of more than 7 mm and malalignment of the upper margins of the superior pubic rami of more than 2 mm on flamingo views [2]. Scintigraphy was performed in three phases after the injection of

17–20 mCi (629–740 MBq) of ^{99m}Tc-methylene diphosphonate using a high-performance collimator and camera (ADAC Laboratories, Milpitas, CA). Imaging was performed at 1 min and at 2 hr to 500,000 counts.

Scintigraphic criteria for the diagnosis of osteitis pubis were focal accumulation of radionuclide at or adjacent to the symphysis pubis on delayed scans. Radionuclide uptake was graded as normal, moderately increased, or markedly increased with reference to the adjacent neck of the femur.

MR imaging was performed on a 1.5-T scanner (Gyrosan Interna; Philips Medical Systems, Best, The Netherlands) using a phased array pelvic coil. The following sequences were performed: coronal turbo spin-echo T1-weighted (TR/TE, 620/20; low-high mapping), axial turbo spin-echo T2-weighted (TR/effective TE, 2000/80; linear mapping), and coronal turbo short tau inversion recovery (TR/effective TE, 2000/20; inversion time, 160 msec; linear mapping). The slice thickness was 4 mm, and the field of view was 25 cm. The MR imaging criteria for the diagnosis of osteitis pubis were visualization of an articular surface irregularity on coronal T1-weighted images (Fig. 1) and axial T2-weighted images (Fig. 2) and paraarticular marrow edema on fat-suppressed coronal images (Fig. 3).

Symphyseal Cleft Injection (Symphysiography)

In each patient, we performed symphysiography with fluoroscopic guidance using an aseptic protocol. After cutaneous injection of 2 mL of 1% lignocaine, a 22-gauge needle was introduced into the symphyseal cleft midway between the upper and lower

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margins of the symphysis. Once the needle reached the outer margin of the joint, we advanced the needle 1 cm farther into the cleft of the fibrocartilaginous disk. In each patient, disk entry simulated the puncture of soft cheese, similar to intervertebral disk puncture at diskography. After positioning the needle, we injected 1 mL of nonionic contrast material into the symphyseal cleft to confirm the needle's position, show the morphology of the disk, and potentially provoke symptoms (Fig. 4). A single anteroposterior radiograph recorded the appearance of the disk. Subsequently, an aqueous suspension composed of 20 mg of methylprednisolone acetate and 1 mL of 0.5% bupivacaine hydrochloride local anesthetic was injected into the cleft in patients with confirmed osteitis pubis.

Image Interpretation

Two experienced radiologists reviewed the images during a single session. Discrepancies between their interpretations were resolved by consensus.

Patient Follow-Up

Patients were mobilized immediately after the procedure and were discharged from the hospital the same day as the procedure. During office visits at 2 weeks, 3 months, and 6 months after the procedure, clinical symptoms were noted and symptom provocation was tested.

Results

The study population consisted of 14 men and two women. The mean patient age was 28.4 years (range, 20–41 years). Symmetric marginal sclerosis of the medial margins of the pubic bones was seen in 14 (87.5%) of the 16 patients (Fig. 5), marginal erosions were seen in nine patients (56.2%) (Fig. 5), and marginal osteophyte formation was seen in five patients (31.2%) (Fig. 6). Two pa-

tients had marked widening of the joint space and poorly defined cortical margins due to marginal erosions (Fig. 7). Two patients had evidence of joint disruption with malalignment of the pubic bones (Fig. 6).

Of the 10 patients who underwent scintigraphy, evidence of moderately increased uptake of isotope at the symphysis or in the parasymphyseal bones was seen in four patients and markedly increased uptake was seen in six patients (Fig. 8). Uptake was predominantly unilateral in one patient and was bilateral and symmetric in the remaining patients. Uptake consistent with adjacent adductor avulsion injury was identified unilaterally ($n = 3$) or bilaterally ($n = 1$) in four patients.

Of the remaining six patients, MR imaging findings included symmetric marrow edema ($n = 5$) (Fig. 3), asymmetric marrow edema ($n = 1$), posterior symphyseal disk extrusion ($n = 6$) (Fig. 2), superior symphyseal disk extrusion ($n = 2$), unilateral adductor avulsion ($n = 2$), and bilateral adductor avulsion ($n = 1$). None of the patients had fluid in the symphyseal cleft, and one patient had paraarticular fluid.

Simple puncture of the fibrocartilaginous disk caused groin pain before injection of the contrast material in 10 patients. Injection of contrast material resulted in groin pain in the remaining six patients. In 12 (75%) of the 16 patients, the contrast material revealed the loss of disk morphology by extending either above or below the symphyseal margins. In four patients, extravasation of contrast material to eroded bone defects along the lateral and inferior margins of the joint was seen. This finding was caused by the loss of disk

morphology and is associated with chronic avulsion of the adjacent adductor longus or gracilis muscles (Fig. 5). Two patients had evidence of lymphatic or venous intravasation thought to be caused by hypervascularity associated with severe inflammatory osteitis pubis (Fig. 6).

Fourteen (87.5%) of the 16 patients experienced immediate relief of some of the symptoms and were able to resume sporting activities 48 hr after the procedure. Of the remaining two patients, one patient had complete resolution of symptoms, with rest, at the 6-month follow-up. The second patient had continuing symptoms. At the office assessment 2 weeks after the procedure, 10 patients (62.5%) reported some persistent, significant pain relief. Two additional patients had no symptoms, but they had pain on provocation maneuvers at clinical examination. Both of these patients had similar findings at the 6-month follow-up. Of the remaining two patients, one had symptom resolution, with rest, at the 6-month follow-up.

At the office assessment 2 months after the procedure, five (31.2%) of the 16 patients were completely symptom-free. All five patients remained symptom-free at 6 months. One patient with joint disruption had continuing pain and was referred for assessment as a candidate for surgical fusion of the symphyseal joint. Another patient, a professional athlete, was relieved of symptoms for 2 weeks, which facilitated involvement in an important sporting event. This patient subsequently underwent two injections of bupivacaine only twice over a 6-month period. Each injection led to symptom relief of approximately 2 weeks' duration. Two of the remaining three patients were symptom-free 6 months after undergoing the procedure, resting, and conservative measures. In total, at 6 months, symptoms persisted in five patients, and two patients had symptoms on provocation maneuvers. However, for all patients, symptoms were less severe at the 6-month follow-up assessment than at initial presentation. During the same time period, four patients had symptom relief from resting and conservative measures that could not be attributed directly to the symphyseal cleft injection. Each of these patients resumed sporting activities once symptoms resolved. There were no procedure-related complications.

Discussion

The pubic symphysis is a joint containing a fibrocartilaginous disk lying between hyaline



Fig. 1.—22-year-old male athlete with osteitis pubis. Coronal T1-weighted MR image (TR/TE, 620/20) shows irregularity in joint surface and fatty replacement of paraarticular marrow (straight arrow). Note superior extrusion of fibrocartilaginous disk indenting bladder (curved arrow).

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Fig. 2.—26-year-old male soccer player with osteitis pubis. Axial T2-weighted MR image (TR/TE, 2000/80) shows para-articular marrow edema, joint surface irregularity, and posterior extrusion of the fibrocartilaginous disk (arrow).



Fig. 3.—32-year-old male football player with groin pain. Coronal turbo short tau inversion recovery MR image (TR/TE, 2000/20; inversion time, 160 msec) shows extensive parasymphyseal marrow edema that is consistent with osteitis pubis. Marginal osteophyte (arrow) can be seen indenting bladder.

cartilage on the medial borders of the pubic bones. A cavity likened to an intrasubstance rent may develop in the disk over time. The cavity is of unknown clinical significance. Ligaments span the joint on the anterior, posterior, and inferior aspects. These ligaments are reinforced inferiorly by the arcuate ligaments and anteriorly by the cruciate extension of the inguinal ligaments. Additional anterosuperior support is provided by the aponeurosis of the gracilis muscle, adductor longus and brevis muscles, and interdigitations of rectus muscle [3].

Osteitis pubis, or inflammation of the symphysis pubis, is a painful condition occurring as a result of either impaction trauma or primary inflammation. Trauma-related osteitis pubis accounts for most cases. During pregnancy, ligamentous laxity allows increased motion at the symphysis with associated impaction of articular surfaces. Multiparity allows repetitive insult with repeated distraction of articular surfaces, disruption of the symphyseal disk, and impaction of the hyaline cartilage overlying the articular surfaces. In a similar way, repeated strain and ligamentous stretching during sports may lead to symphyseal laxity with similar impaction of articular surfaces. Sports-related injury of the symphysis pubis is frequently associated with recurrent stretching and tearing of the stabilizing anterior ligaments and adductor muscles; therefore, osteitis pubis in these individuals is associated with periostitis and osseous re-

sorption or osteolysis along the symphyseal margin of the inferior pubic ramus [1]. Inflammatory osteitis pubis is uncommon and occurs because of enthesitis or inflammation with bone resorption and periostitis at the insertions of the pubic symphyseal ligaments. This form occurs specifically in patients with HLA B27-related spondyloarthropathy [4], but erosions have been identified in rheumatoid arthritis [5]. Occasionally, infection may seed the symphysis pubis and produce secondary inflammatory osteitis. This finding has been described in athletes, but it is mostly seen in elderly patients who have undergone bladder or prostate surgery. *Staphy-*

lococcus aureus is the most commonly implicated organism in spontaneous infection [6]. Aspiration of the symphyseal cleft enables the diagnosis of joint infection.

On conventional radiographs, osteitis pubis appears as a mild to severe bilateral subchondral irregularity with focal areas of demineralization. Subchondral cysts and erosions may be identified. A bone scan obtained after administration of an isotope often depicts a focal concentration of radionuclide that is parallel to the articular surfaces. This finding reflects the articular impaction and induced paraarticular sclerosis that are associated with osteoblastic activ-

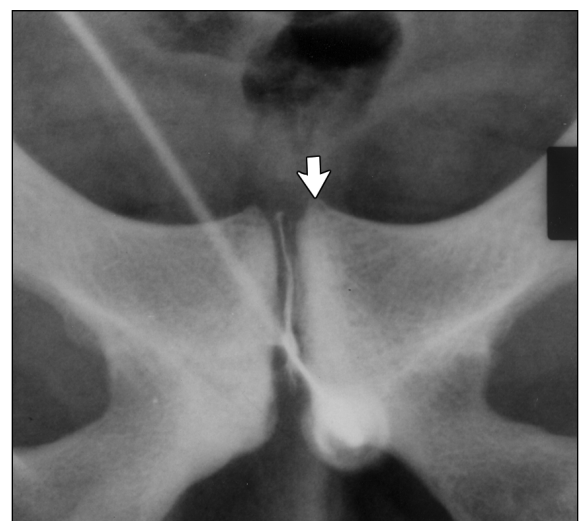


Fig. 4.—19-year-old male athlete with osteitis pubis. Anteroposterior radiograph shows normal findings after symphyseal cleft injection. Contrast material is confined to central cleft of fibrocartilaginous disk with no evidence of extrusion. Sclerosis and marginal osteophyte (arrow) are seen on medial margins of pubic bones.

ity. On radiographs, hypermobility or disruption of the joint may be elicited and revealed on flamingo views.

At MR imaging, the features of osteitis pubis range from alteration of the width of the joint space with articular surface irregularity to paraarticular marrow edema that may be diffuse, reflecting impaction forces

with subarticular microtrabecular trauma. Marrow changes follow a pattern that is similar to the changes seen in the vertebral endplates in patients with degenerative disease of the spine. Multiplanar imaging allows detection of articular surface stepoff in either the superoinferior or anteroposterior plane. In addition, extrusions of the symphyseal

disk, occurring most frequently posteriorly or superiorly, can be identified [3]. The significance of symphyseal disk extrusion is poorly understood because it can be asymptomatic, particularly in elderly patients in whom it is often an incidental finding at MR imaging. Fluid in the symphyseal cleft is uncommon and is mostly seen in patients with

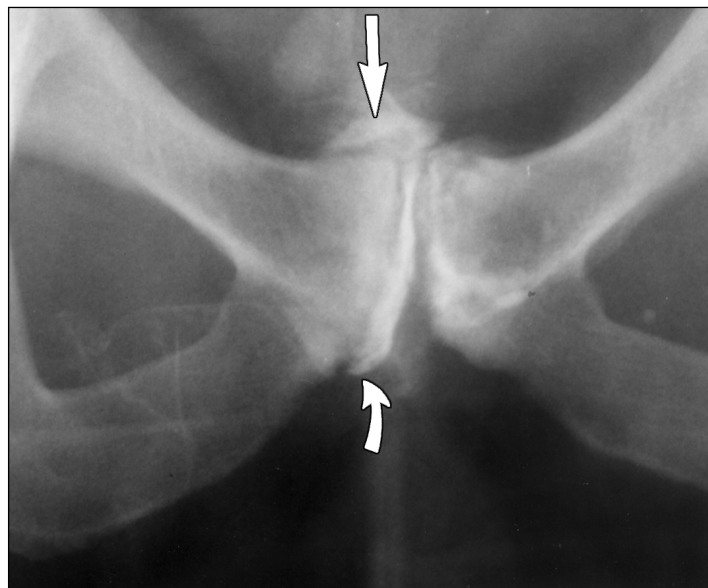


Fig. 5.—31-year-old male rugby player with groin pain. Symphysiogram shows extravasation of contrast material superiorly (*straight arrow*) and inferiorly that results from loss of disk morphology. Inferiorly, contrast material tracks into insertion of right gracilis muscle (*curved arrow*), indicating chronic avulsion injury at this site.

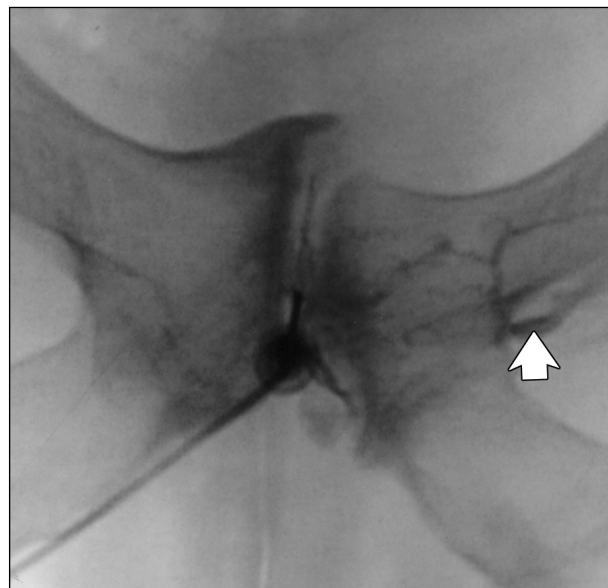


Fig. 6.—35-year-old male soccer player with severe groin pain. Digital radiograph obtained after symphyseal cleft injection shows considerable joint disruption with marginal osteophyte formation. Paraarticular venous intravasation (*arrow*) is visible. This finding is thought to relate to hypervascularity associated with inflammatory osteitis pubis.

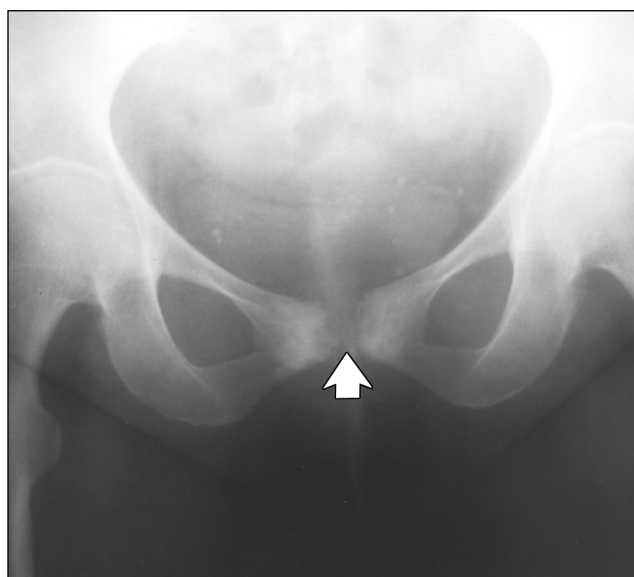


Fig. 7.—29-year-old male soccer player. Anteroposterior radiograph shows extensive erosive changes of osteitis pubis and widening of joint space (*arrow*).

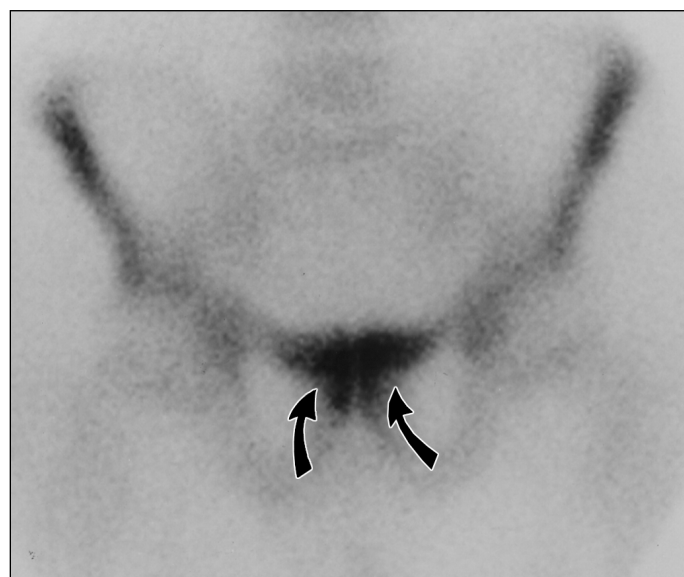


Fig. 8.—22-year-old man with osteitis pubis. ^{99m}Tc -methyl diphosphonate-enhanced scintigram shows markedly increased radionuclide uptake on medial margins of pubic bones (*arrows*).

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degenerative changes. However, when identified, the presence of fluid should raise suspicion for an underlying infection. MR imaging also has the potential to identify stress fractures, seen in the pubic rami in long-distance runners, or stress injuries to the sacrum that are associated with injury to the pubic symphysis [7].

Athletes may have multiple coexistent causes of groin pain. The prime differential diagnoses of pain in this group are muscular avulsion, groin hernia, nerve entrapment, and iliopsoas bursitis [8–10]. Symphyseal cleft injection can reveal that osteitis pubis is the cause of symptoms, similar to the use of discography in the lumbar spine to diagnose discogenic pain. This clinical information is important because a group of researchers found that when edema was seen in the pubic bones, indicating osteitis pubis or muscular avulsion, another cause of groin pain was always identified [7]. Some physicians have used symphyseal injection of steroid and local analgesic without imaging guidance as a diagnostic test to show symptom relief [11]. In some patients, puncturing the fibrocartilaginous disk can be technically difficult because the joint space is narrow. In addition, the symphyseal cleft is a small structure with a capacity of 1.0–1.5 mL of fluid, as shown in this study; therefore, the accuracy of the injection is important. Lack of imaging guidance may lead to a periarticular injection and to diagnostic inaccuracy because antiinflammatory and analgesic agents may act on an

adjacent muscle that is avulsed or may reduce neuralgia associated with an adjacent hernia or nerve entrapment.

The patient cohort in this study was skewed, consisting entirely of elite athletes. We cannot exclude the possibility of a placebo effect in the patients who received short-term symptom relief. For ethical reasons, study of the disk morphology of a control group of asymptomatic patients with radiographic changes indicative of osteitis pubis was not possible. Despite the use of imaging guidance and the injection of a low volume of material, minimal extrusion of contrast material and, hence, of steroid and local analgesic into the adjacent soft tissue occurred frequently. This may have added benefit in blocking the nerve supply to the joint, similar to the use of periarticular injection in lumbar facet joints, although excessive periarticular injection may lead to diagnostic inaccuracy as discussed earlier. Injection of a steroid and local analgesic may achieve a cure in self-limited osteitis pubis, but in patients with joint disruption this treatment is unlikely to offer long-term benefits. In patients with joint disruption, joint fusion with bone grafting and plating may be indicated if symptoms are chronic and severe [2]. Debate continues about whether this process is primarily an inflammatory process or a degenerative one, possibly related to joint instability [2]; hence, the role of corticosteroid injection in the treatment of patients with this condition is controversial [11]. However, in athletes, cleft

injection can enable an objective diagnosis and short-term symptom relief that facilitates involvement in sporting events.

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