Ultrasound-guided Corticosteroid Injection for the Treatment of Athletic Pubalgia: A Series of 12 Cases

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Abstract

Surgical treatment for athletic pubalgia is the standard of care, however, it poses risks. This study investigated the use of ultrasound-guided corticosteroid injections as an alternative treatment. Twelve consecutive patients underwent injections into the area of degeneration in the rectus abdominis and/or adductor longus aponeurosis. The Western Ontario and McMaster Universities (WOMAC) scores were used to evaluate treatment effectiveness. The average WOMAC score was 90.9. With a mean follow up of 8.7 months (range, 6–19 months), eight of the 12 patients reported complete symptom resolution. In conclusion, corticosteroid injections alleviate pain in patients with athletic pubalgia and provide an alternative to surgery.

Keywords

athletic pubalgia; sports hernia; ultrasound-guided injection

Introduction

Groin pain is a common symptom among athletes [1]. It may result from a variety of etiologies such as muscle strain, osteitis pubis, acetabular labral tears, pubic ramus or femoral neck stress fractures, rectus tendinopathy, adductor syndromes, snapping hip syndrome, hernias, sacroiliitis, apophysitis, visceral pelvic pathology, intrinsic hip pathology, referred pain, and athletic pubalgia [1,2]. Athletic pubalgia, also known as “sportsman’s hernia” or “core muscle injury,” is a complex injury involving the abdominal and pelvic musculature that affects athletes participating in sports requiring trunk hyperextension and thigh hyper-abduction (e.g., soccer, American football, ice hockey.
hurdling, running, and skiing) [3–6]. Athletic pubalgia is the primary diagnosis in 39—50% of athletes with groin pain [2,7]. The etiology of athletic pubalgia is related to chronic wear or overuse when the adductor muscles generate greater forces than the lower abdominal muscles [4,8—10]. This results in occult hernia of the internal inguinal ring without a clinically recognizable hernia, and leads to chronic groin pain [7,8,11]. Pathologic findings in athletic pubalgia are varied and include attenuation of the transversalis fascia, conjoined tendon or rectus abdominis muscle, avulsion of the internal oblique muscle fibers at the pubic tubercle, and tearing of the internal oblique musculature or abnormalities in the external oblique muscle [1,5,6,8,10,12–14]. Patients with athletic pubalgia typically present with activity-related groin pain that resolves with rest [1,8,10,12,13]. The pain is usually unilateral, but can be bilateral, and typically manifests as tenderness over the symphysis pubis, pubic tubercle, and/or midinguinal region with possible radiation into the adductor region, perineum, or testicular area [1]. Some patients recollect a specific inciting injury, although they typically report an insidious onset of pain associated with activities such as running, kicking, and cutting [2,5,6,8,13–15]. Despite research into advanced imaging studies for the diagnosis of athletic pubalgia such as magnetic resonance imaging (MRI) [1] and ultrasound [16], no diagnostic modality has demonstrated sufficient sensitivity and/or specificity to become a gold standard treatment [1]. A diagnosis is consequently determined clinically with adjunctive studies used to rule out other possible etiologies of groin pain [1].

As with most causes of groin pain, the treatment of athletic pubalgia begins with a trial of physical therapy [12,17]. Physical therapy and rehabilitation protocols focus on core strengthening exercises that aim to balance the opposing forces of the abdominal musculature and the hip adductors [10,12,18]. In general, 6–8 weeks of physical therapy is employed with anti-inflammatory medications, rest, and deep-tissue massage [1]. Athletic pubalgia unfortunately rarely responds to such conservative treatment and often requires more invasive management [8,19]. Surgical repair has consequently historically been advocated when conservative measures fail to alleviate the pain. Treatment can be open surgery or laparoscopic surgery and patients can expect to return to play within 6 weeks to 6 months [1]. Surgical repair has good results [13], but does have the inherent risks of surgery and associated cost [12].

The use of corticosteroid injections in the treatment of athletes with other myoaponeurotic injuries [20,21] has recently been reported to reduce pain and return an athlete to preinjury activity. We hypothesized that ultrasound (U/S)-guided corticosteroid injections could alleviate pain and improve function in patients with athletic pubalgia. Because of the potential morbidity and prolonged return to sports-related activity associated with surgical treatment of athletic pubalgia, corticosteroid injections may present a minimally invasive and effective alternative treatment option.

Materials and methods

Patient cohort

The institutional review board approved the study. Thereafter, 12 consecutive patients diagnosed with athletic pubalgia at a single academic medical center provided written, informed consent between September 2009 and November 2010. They were treated with
U/S-guided corticosteroid injections. Diagnosis was based on clinical symptoms and MRI findings, as previously described by Farber et al [1]. All patients underwent an initial MRI before providing consent for the procedure. In this study, the average age of patients was 31 years (range, 16–63 years), and there were 10 males and two females (Table 1). All 12 patients underwent targeted ultrasound of their painful groin, which revealed a partial thickness tear or complete tear around the insertion site of the rectus abdominis and/or the adductor longus tendons. In all 12 patients, the MRI findings were consistent with the ultrasound findings, and confirmed the diagnosis.

Technical procedure and sonographic technique

At our institution, we used sonography to provide guidance for the steroid–anesthetic mixture injection. Scans were performed using a 12–5 MHz linear transducer and an iU22 scanner (Philips Healthcare, Bothell, WA, USA). Patients were placed in the supine position with the scan plane corresponding to the anatomic transverse oblique plane. The transducer was placed along the anterior margin of the symphysis pubis on the side of patient pain. The rectus abdominis–adductor longus aponeurotic area of injury was identified. Under direct sonographic visualization and with the patient’s thigh flexed, abducted, and externally rotated, a freehand technique was used to introduce the needle into the area of degeneration or fraying of the rectus abdominis and/or adductor longus aponeurosis using a transverse oblique approach (Fig. 1). A pure transverse position was not used because this may have pierced the inguinal contents medially. Skin anesthesia was obtained with injection of 1 mL of 1% lidocaine through a 22-gauge, 3.5-inch spinal needle using a sterile technique. The same needle was then advanced under direct sonographic guidance into the tear area. The needle tip was placed away from the femoral neurovascular bundle and the contents of the inguinal canal. A therapeutic steroid–anesthetic mixture was then delivered under real-time observation. Filling the tear with the echogenic steroid and anesthetic mixture was the determining factor for a successful injection (Fig. 2).

Injection materials

Once the 22-gauge spinal needle was in the correct position, the therapeutic mixture was injected. The anesthetic–corticosteroid mixture was 1 mL of triamcinolone (Kenalog, 40 mg/mL; Apothecon, Bristol–Myers Squibb Co., Princeton, NJ, USA), and 0.5 mL of 0.5% bupivacaine (Sensorcaine; AstraZeneca Pharmaceuticals, Wilmington, DE, USA).

Outcome measures

The same fellowship-trained musculoskeletal radiologist, who had more than 10 years of experience, performed all injections. Patients were followed for an average of 8.7 months (range, 6–19 months). To evaluate treatment effectiveness, all 12 patients completed the WOMAC (Western Ontario and McMaster Universities) hip score questionnaire at the initial follow up at 4–6 weeks postintervention [22,23]. The WOMAC is a validated questionnaire that assesses pain, stiffness, and physical function, based on a 0-point to 100-point scale. We chose the WOMAC questionnaire as the primary outcome measurement because it has previously been used to evaluate outcomes after arthroscopic hip surgery for femoroacetabular impingement [24] and hip labral tears [25].
**Results**

All 12 patients completed the questionnaire and were included in the data analysis. Of these 12 patients, eight patients reported no current symptoms and achieved WOMAC scores of 100. The remaining four patients reported an average score of 72.8. Specific diagnoses among these four patients included one unilateral adductor longus strain and three adductor longus with ipsilateral rectus abdominis strains. The overall average WOMAC score among all 12 patients was 90.9. When queried, all patients returned to their preinjury activity level and participated in sports such as biking, swimming, and running. At the last known follow up, none of the patients in this study underwent laparoscopic or open surgery to treat their athletic pubalgia.

**Discussion**

This study is the first to evaluate outcomes after U/S-guided corticosteroid injection for the treatment of athletic pubalgia. The gold standard treatment for athletic pubalgia is surgery. In general, open and laparoscopic surgical repair involves augmentation (often with polypropylene mesh) of the posterior inguinal wall by reattaching the rectus abdominis, conjoined tendon, or transversalis fascia to the symphysis pubis and the inguinal ligaments [1,12]. When adductor pathology is suspected, an adductor tenotomy may be performed with fractional lengthening in patients with contracted or overdeveloped adductor muscle [1]. Results of surgical treatment are generally good with athletes returning to their respective sports within 6 weeks to 6 months [1]. For instance, in a study by Larson et al [18], 24 (89%) of 27 patients who underwent surgery for isolated athletic pubalgia returned to unrestricted sporting activity. In a study by Kuikka et al [26], which investigated the use of surgery for athletic pubalgia, 87% of patients returned to play at the same level as before surgery and six patients required occasional pain medications for groin pain 2 years postoperatively. Paajenen et al [27] compared operative (e.g., laparoscopic mesh placement) treatment with nonoperative treatments such as corticosteroid injections for athletic pubalgia; at the 3-month follow up, 90% of the operative group had returned to sports activities, whereas only 27% of the nonoperative group had returned to sports activities and 23% of the nonoperative group eventually elected for surgical intervention because of persistent groin pain. Despite the positive results with surgical management, surgical procedures are not without risk. For instance, surgical repair of the inguinal wall with an adductor tenotomy may have a deleterious effect on an athlete’s contractile muscle tissue, result in short- and long-term morbidity, and thereby affect an athlete’s physical ability and functional status [1,11,28].

A less invasive alternative to open surgical repair is the minimal repair technique introduced by Muschaweck et al [29]. This procedure, which is performed through a small inguinal incision under local anesthesia, eradicates groin pain by stabilizing the posterior wall of the inguinal canal without enlarging the defect and decompressing the genital branch of the genitofemoral nerve [30]. The reported advantages include less tissue trauma, lower risk of severe complications, no insertion of prosthetic mesh, and an equivalent or faster recovery [29,30]. Outcomes after the minimal repair technique are good with 76% of patients resuming their preinjury sports activity level by a median of 18.5 days [29,30].
Previous studies evaluating the use of U/S-guided steroid injections for other myoaponeurotic pathologies have demonstrated good results. For instance, Stevens et al [31] reported on U/S-guided steroid injections for internal oblique muscle strains in professional baseball pitchers and found all three patients continued to pitch in the major leagues and returned to pitching at full speed within 3 weeks of injury. In our case series, eight (67%) of 12 patients achieved an ideal outcome with a WOMAC score of 100. The remaining four patients had an average score of 72.8. Among all 12 patients, the overall average WOMAC score was 90.9. These findings reflect encouraging results associated with U/S-guided injections, which is comparable to the results with surgical intervention but without the associated risks. In addition, there may be a role for U/S-guided corticosteroid injections as an “in-season” treatment. This may help athletes finish a season, at which time they could pursue surgery if symptoms return. This could reduce absences from practices and games.

One limitation of this case series is its small sample size. A larger cohort would increase the ability to detect a treatment effect. In addition, WOMAC scores have previously been used to evaluate outcomes after arthroscopic hip surgery for femoroacetabular impingement [24] and hip labral tears [25]; therefore, we acknowledge that it is not a validated outcome score for athletic pubalgia. Future studies should be conducted to determine whether different outcome measures are more reliable in patients with athletic pubalgia. In addition, because it is a case series, this study had no control arm. Future studies should therefore be conducted to compare the use of U/S-guided corticosteroid injections with a placebo or with other conservative modalities such as physical therapy. Furthermore, postprocedure imaging was not performed. Future studies may seek to determine whether particular imaging features are correlated with a patient’s clinical course and can predict a patient’s response to an injection. This study only evaluated one dose of corticosteroid (triamcinolone, 40 mg). Future studies should be conducted to evaluate whether the dose or concentration of the injection affects outcomes. Furthermore, in an effort to identify differences between patients with good responses and moderate responses, no significant differences were detected with regards to the patients’ clinical characteristics, ultrasound imaging findings, or pathology. It is possible that including a great number of patients may detect factors that are predictive of a good response. The present study was too underpowered to detect these differences.

In conclusion, this study suggests that U/S-guided corticosteroid injection is a viable treatment option for patients with athletic pubalgia and should be considered before surgical intervention.

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Fig. 1.
The illustration shows the technique for ultrasound-guided injection into the right common adductor–rectus abdominis (RA) aponeurosis and the adductor longus (AL) tendon origin. The needle is inserted in a transverse oblique (i.e., caudal–cervical) direction along the plane of the transducer (i.e., in-plane approach) with the needle tip pointing towards the pubic body. The red arrow indicates the needle trajectory.
Fig. 2.
A 29-year-old male with right groin pain and a postinjection Western Ontario and McMaster Universities (WOMAC) score of 100. (A) The axial proton-density fat-suppressed magnetic resonance image demonstrates a tear of the right adductor longus aponeurosis (arrow) from the pubic body (star) with retraction and hematoma formation (calipers). The left adductor aponeurotic attachment (curved arrow) is normal. (B) The transverse grayscale ultrasound image of the same patient shows an adductor tear (arrow) with retraction from the pubic body (star) and a hypoechoic hematoma (calipers). (C) The transverse grayscale image shows the needle (curved arrows) injecting the corticosteroid into the tear at the pubic body attachment (star). The echogenic steroid and anesthetic mixture fills the tear and hematoma (arrows).
### Table 1
The patients’ demographics and the location of pathology for the adductor longus and/or rectus abdominis partial thickness or complete tears.

| Patient no. | Age (y) | Sex (M/F) | Location of pathology |
|-------------|---------|-----------|-----------------------|
| 1           | 37      | M         | Left AL               |
| 2           | 31      | M         | Right RA and AL       |
| 3           | 21      | M         | Left RA               |
| 4           | 25      | M         | Left AL               |
| 5           | 29      | M         | Right AL              |
| 6           | 20      | M         | Right RA and AL       |
| 7           | 19      | M         | Left and right AL     |
| 8           | 63      | F         | Left AL               |
| 9           | 41      | M         | Right AL              |
| 10          | 23      | F         | Left AL               |
| 11          | 50      | M         | Left AL               |
| 12          | 16      | M         | Left and right AL     |

AL = adductor longus; RA = rectus abdominis.