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What is This?
Effectiveness of a Selective Partial Adductor Release for Chronic Adductor-Related Groin Pain in Professional Athletes

Ernest Schilders,*†‡ MD, FRCS, FFSEM, Alexandra Dimitrakopoulou,†‡ MD, Michael Cooke,§ MD, MBChB, Quamar Bismil,|| MBChB(Hons), MRCS, DipSEM, MFSEM, FRCS(Tr and Orth), and Carlton Cooke,† PGCE, PhD, FBASES

Investigation performed at The London Hip Arthroscopy Centre, The Wellington Hospital, London, United Kingdom

Background: Chronic adductor enthesopathy is a well-known cause of groin pain in athletes. Currently, percutaneous nonselective adductor tenotomies give mixed results and not always predictable outcomes.

Hypothesis: A selective partial adductor longus release as treatment for recalcitrant chronic adductor longus enthesopathy provides excellent pain relief with a prompt and consistent return to preinjury levels of sport.

Study Design: Case series; Level of evidence, 4.

Methods: All athletes were assessed in a standard way for adductor dysfunction. They received radiographs and a specifically designed magnetic resonance imaging groin study protocol. Only professional athletes who received a selective partial adductor release were included. Pain and functional improvement were assessed with the visual analog scale (VAS) pain score and time to return to sport.

Results: Forty-three professional athletes (39 soccer and 4 rugby) with chronic adductor-related groin pain were treated with a selective partial adductor release. The average follow-up time was 40.2 months (range, 25-72 months). Forty-two of 43 athletes returned to their preinjury level of sport after an average of 9.21 weeks (range, 4-24 weeks; SD, 4.68 weeks). The preoperative VAS score improved significantly (Wilcoxon signed-rank test, \( P < .001 \)) from 5.76 \( \pm \) 1.08 (range, 3-8) to 0.23 \( \pm \) 0.61 (range, 0-3) postoperatively.

Conclusion: A selective partial adductor longus release provides excellent pain relief for chronic adductor enthesopathy in professional athletes with a consistent high rate of return to the preinjury level of sport.

Keywords: adductor pain; groin strain athletes; partial adductor release; adductor longus

Adductor injuries are a common problem in professional soccer. In a large cohort study, they accounted for 23% of the muscle injuries, resulting in 14 days of absence from sports. Groin strains have the highest incidence in the age group between 22 to 30 years. In a squad of 25 players, the cumulative amount of absence due to muscle injury is 30 weeks per season. The reinjury rate after adductor muscle injuries (either acute or chronic) has been reported as high as 18%.

Previous injury and a history of reduced adductor muscle strength have been identified as risk factors for adductor muscle injuries. Soccer players with a previous groin injury are twice as likely to develop a new groin strain. Elite ice hockey players whose preseason adductor strength is 80% or less of the abductor strength have been identified as having 17 times a higher risk of suffering an adductor injury during the season. Amateur soccer players with weak adductors had 4 times as much risk for a new groin injury. Preseason strengthening has been effective in reducing the amount of adductor muscle injuries in hockey players during the season.

While lack of flexibility plays an important role in hamstring and quadriceps injuries in professional soccer players, it is not considered a risk factor for adductor injuries in ice hockey players. These findings can explain a less successful outcome with a rehabilitation program of massage and stretching in the treatment of chronic adductor injuries. Adductor strengthening is essential for the...
prevention and also for the nonoperative treatment of chronic adductor injuries. In a randomized control study of 68 athletes with long-standing adductor-related groin pain, it was demonstrated that a treatment program consisting of strengthening of adductors and pelvis-stabilizing muscles is more effective than a program consisting of local therapy and stretching. This strengthening program allowed 23 athletes (67%) to return to sports pain free after 8 to 12 weeks, compared with 4 athletes (11%) of the group receiving physical therapy without active training. The same group demonstrated that overall 79% returned to sport and that this effect was long lasting.

This, however, implies that for about 20% of the athletes, this type of treatment for long-standing adductor-related groin pain is not effective, and the challenge is to identify these athletes early after the onset of their symptoms. A staging system can therefore be helpful to avoid professional athletes losing a significant amount of the season.

Schilders et al reported on the role of enthesal pubic cleft injections and magnetic resonance imaging (MRI) in high-level athletes with adductor-related groin pain. Athletes with chronic adductor-related groin pain but with normal findings on MRI could expect at least 1 year of pain relief with an enthesal injection. On the other hand, when evidence of entheseopathy of the adductor longus was demonstrated on MRI, athletes had a recurrence of the symptoms at a mean of 5 weeks, and therefore, enthesal pubic cleft injection should only be employed as a diagnostic test or to provide short-term treatment.

Schilders et al also demonstrated that in recreational athletes, pubic cleft injections had a high success rate even in athletes with entheseopathy on MRI, emphasizing the importance of the level of the athlete when considering treatment. Percutaneous adductor tenotomies are a nonselective technique and have resulted in an inconsistent return to the preinjury level of sport. With a selective technique, the adductor tendon is identified via a small incision and released in the intended anatomic area followed by careful hemostasis.

The purpose of this study was to assess the outcomes and return to sport after a selective partial adductor longus release for long-standing adductor-related groin pain in a group of professional soccer and rugby players.

MATERIALS AND METHODS

The standard work-up consists of history taking and clinical examination according to the protocol of Schilders et al. All patients presenting to the clinic with groin pain were assessed in the same way, with the use of techniques for examination of the groin (Table 1), a standard hip examination, and plain anteroposterior and frog-leg or cross-table lateral radiographs of the pelvis. On the basis of our previous studies, all the participants in the study received an MRI scan using a specific groin study protocol. Imaging was performed using a previously described protocol and included short tau inversion recovery (STIR) coronal, T1-weighted axial oblique, and T1-weighted postintravenous gadolinium fat-suppressed axial oblique and sagittal sequences. Only patients treated with a partial adductor longus release for pure adductor longus dysfunction (ie, no clinical or radiographic evidence of a sports hernia or osteitis pubis) were included in this study (Table 2).

Professional soccer and rugby kickers were included in the study because of the similarities in injuries within kicking sports. The indication for a partial adductor longus release was chronic adductor longus dysfunction of more than 3 months that was not responsive to nonoperative treatment. This implies that they have had a period of active adductor treatment followed by a pubic cleft injection. Athletes typically experience adductor-related groin pain while sprinting, during side-to-side movements, or with long kicks. Clinically, there is pain over the proximal adductors and on resisted adduction. Patients with positive findings on the MRI scan groin study protocol were not subjected to an enthesal pubic injection after a failed trial of active adductor treatment except if short-term
treatment for the athlete had to be provided (eg, when a player was near to the end of the season). Athletes with an acute avulsion of the fibrocartilage of the adductor longus and/or clinical and radiographic features of femoroacetabular impingement (FAI) were excluded from the study.

All our data were prospectively collected with a minimum of 2-year follow-up. The side of injury was recorded together with the activity-related symptoms. The pain was categorized as either acute (beginning immediately after a discrete event) or gradual in onset. In addition, a 10-point pain visual analog scale (VAS) (0 defining no pain and 10 defining the worst possible pain) and the 4-point functional pain classification scale of Puffer and Zachazewski\textsuperscript{12} (Table 3) were used preoperatively and postoperatively. A key variable used to assess the efficacy of the procedure was the ability to return to professional sport at the same level postoperatively and the time required to do this. In addition to age, the presence of bilateral symptoms, duration of symptoms, and previous pubic cleft injections were assessed to establish if they could influence the return to sport postoperatively. It was also recorded if athletes had sports hernia surgery before or after the surgery. The study was a clinical audit and performed according to the guidelines of the National Research Ethics Service.

Surgical Technique

The procedure was performed under general anesthetic, and antibiotic prophylaxis was employed. The patient was positioned in a frog-leg position. A transverse incision was made below the scrotum. The fascia of the adductor longus was divided to identify the tendon, and a transverse incision was made 2 to 4 cm distal to the origin (Figure 1). Thus, the procedure involved a partial tenotomy, which was only performed on the superficial fibers, which are under relatively greater tensile loads. The wound was closed in layers after careful hemostasis. A compressive bandage was applied, and patients left the hospital either the same day or the next day. The compressive bandage was removed 2 days postoperatively and replaced by compression tights, which athletes were advised to wear until returning to sport.

Rehabilitation Schedule

The patients were provided with a standard rehabilitation program starting with an adductor stretching program immediately postoperatively. A closed chain adductor strengthening exercise program was initiated 2 days after the operation. Straight-line jogging was commenced after 7 to 10 days. When the closed chain adductor strengthening exercises could be carried out pain free, open chain adductor strengthening exercises were started. The open chain exercises were functional, addressing the requirements for the type of sports, for instance, kicking a ball in soccer or rugby. Hydrotherapy was encouraged and was started from the moment the wound was healed.

From 3 weeks onward, the pace of running was increased, and when the athlete was at 75% of maximum pace, side-to-side movements were introduced as well as ball work. A return to competition was then anticipated but was tailored to the individual athlete.

Statistical Analysis

Preoperative and postoperative VAS pain scores were compared using a nonparametric related-samples Wilcoxon signed-rank test, given that the postoperative scores were not normally distributed (Figure 2). Pearson product-moment correlation coefficients were used to assess the associations between the outcome variables of time to return to sport, age, and duration of symptoms. An independent t test was used to compare time to return to sport for unilateral and bilateral symptoms as well as to compare the athletes who had a pubic cleft injection and those who did not. Level of significance was set at \( P < .05 \) throughout.

RESULTS

Between November 2005 and October 2009, the senior author (E.S.) assessed 123 professional athletes with

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\begin{array}{|c|c|}
\hline
\text{Classification} & \text{Characteristics} \\
\hline
\text{Type 1} & \text{Pain after activity only} \\
\text{Type 2} & \text{Pain during activity, not restricting performance} \\
\text{Type 3} & \text{Pain during activity, restricting activity} \\
\text{Type 4} & \text{Chronic, unremitting pain} \\
\hline
\end{array}
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Figure 1. Partial selective adductor longus release (oblique sagittal view). An incision of the superficial fibers of the tendon is made distal to its origin (black arrows). Reprinted with permission from A. Dimitrakopoulou.
adductor dysfunction involved in kicking sports such as rugby and soccer. Eighty athletes were excluded: 42 with radiographic features of FAI, 24 with acute adductor longus fibrocartilage avulsions, 12 athletes with concomitant symptoms of sports groin and adductor dysfunction, and 2 patients with osteitis pubis. Forty-three professional athletes were treated consecutively with a selective partial adductor release by a single surgeon. The group consisted of 39 professional soccer players and 4 professional rugby players. Their ages ranged from 18 to 38 years (mean, 26.4; SD, 4.63 years). Forty-one athletes were right footed, and 2 were left footed. Ten athletes (23%) had bilateral symptoms and underwent a bilateral release, and 33 (77%) had unilateral symptoms and underwent a unilateral release. Postoperatively, no complications were reported such as hematomas. Within the group with unilateral symptoms, 19 athletes had adductor dysfunction on the left side and 14 on the right side. The average duration of symptoms was 9.37 months (range, 2-36 months), with 7 athletes (16.3%) experiencing an acute onset of symptoms and 36 (83.7%) experiencing a gradual onset of symptoms (see the Appendix, available in the online version of this article at http://ajs.sagepub.com/supplemental/). According to the classification scale of Puffer and Zachazewski,12 32 athletes (74.4%) had type 3 pain, and 11 had type 4 pain (25.6%). None of the patients had improvement of symptoms with warming up, 42 (97.6%) had pain with kicking, 42 had pain when sprinting, 41 had pain while jogging, and 42 had pain with side-to-side movements.

Twenty-nine (67.4%) of the athletes had abnormal enhancement of the adductor longus enthesis on the postgadolinium sequences. Sixteen patients received 1 enthesal pubic cleft injection before the surgery, and 1 patient received injections on 2 occasions.

The average follow-up time postoperatively was 40.2 ± 13.4 months (range, 25-72 months). Forty-two of 43 patients (97.6%) returned to the same level of sports after an average of 9.21 ± 4.68 weeks (range, 4-24 weeks) (Figure 3). The preoperative VAS pain score improved significantly (related-samples Wilcoxon signed-rank test, P < .001) from 5.76 ± 1.08 (range, 3-8) to 0.23 ± 0.61 (range, 0-3) postoperatively (Figure 2).

The return to sport was not influenced by age, duration of preoperative symptoms, a unilateral or bilateral procedure, or previous enthesal pubic cleft injections. There was not a higher incidence of adductor dysfunction on the dominant side. Ten athletes had a groin repair (6 bilateral) from which they had full recovery before being seen in our clinic, and 3 had a groin repair between 1 and 3.5 years postoperatively.

DISCUSSION

Treatment of chronic adductor enthesopathy resistant to nonoperative management in athletes has been challenging, and the results of surgical treatment have been mixed. Although with most techniques good pain relief was achieved, this did not necessarily result in a high return to the same level of sport. Most of the techniques were focused on a full tenotomy of the adductor longus either performed percutaneously or open.1,2,13

The concept of a limited adductor tenotomy to treat insertional tendinopathy was subsequently introduced,11 and with this technique, only the superficial fibers of the adductor longus tendon were divided about 2 to 4 cm away from the tendon insertion. Cadaveric studies have demonstrated that the tendon-to-muscle ratio of the adductor longus on the cross-section decreases from proximal to distal,17 and therefore, we believe that with a more distal release, a significant proportion of the cross-section of the adductor longus was preserved. The first author’s (E.S.) technique follows this concept with a more distal selective release of the adductor longus tendon. The technique is safe, and no complications have been reported.

Previous studies have reported on the outcomes of a full tenotomy of the adductor longus. Akerman and Johansson1 used an open adductor longus tenotomy on a small group of athletes participating in different sports. After surgery, 62.5% of the patients were pain free, while
37.5% reported an improvement of symptoms. A 20% strength deficit of the adductors was measured postoperatively. All but 1 of the athletes returned to the same sport, but only 63% returned to the same level. Atkinson et al reported a percutaneous adductor longus tenotomy on 48 athletes of mixed sports. The mean return to sports was 18.5 weeks, with only 54% returning to their preinjury activity levels and 8% unable to perform any athletic activities. Robertson et al reported on 109 athletes who underwent a percutaneous adductor tenotomy and reported a 68% return to their preinjury level.

Our study group consisted of a homogeneous group of athletes involved in kicking sports in which the majority were involved in soccer. It is the first study reporting on the clinical outcomes of this surgical technique in a group of professional athletes. All athletes returned to sports, and 98% returned to their preinjury level of sport and were still active at the same level at the latest follow-up.

In our study, 30% of athletes who underwent adductor surgery had sportsman’s groin repair during their sporting careers, which demonstrates the common association of sportsman’s groin and adductor dysfunction and emphasizes the need for an associated inguinal examination.

We acknowledge the limitations of the study, but the fact that the enrolled participants were professional athletes essentially predetermined the study’s methodology. Weaknesses of the study are therefore its retrospective nature and the lack of a validated groin outcome scoring system. The study would also have been improved with the addition of strength testing, but this was not possible with this sample.

Partial selective adductor longus release is a promising surgical technique that is safe and provides excellent pain relief and a high return to the preinjury level of sports in professional athletes. Further research is necessary to identify those professional athletes with adductor longus enthesisopathy at an early stage for whom a nonoperative treatment program will be unsuccessful. Health professionals remain under pressure to design the shortest, safest route to recovery for high-level athletes with chronic adductor-related groin pain.

REFERENCES


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