# Adductor Tenotomy in the Management of Groin Pain in Athletes

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**Key words**
- tendinopathy
- groin pain
- athletes
- adductor tenotomy

## Abstract

This study evaluates the efficacy of adductor longus tenotomy in athletes with chronic tendinopathy refractory to conservative management. In a retrospective case series we report our experience with 109 male athletes who underwent unilateral adductor tenotomy during the period 2000–2005, all of whom responded to a detailed questionnaire. The criterion for tenotomy was chronic adductor origin pain which prevented training or playing (Level 4), limited training or playing (Level 3), or affected performance (Level 2) and which had failed to respond to conservative management including rest, rehabilitation and/or local steroid injection. Level 1 performance is classified as optimal performance with no pain. 99 of the 109 patients (91%) reported improvement. Best results were achieved in patients with maximum discomfort preoperatively (Level 4) with 32 of 38 (84%) patients returning to Level 1 performance. In conclusion, adductor tenotomy in athletes with severely incapacitating pain (Level 3/4) which fails to respond to conservative management offers the best opportunity of returning to competitive sport.

## Introduction

Chronic groin pain is a common problem in modern day sports accounting for up to 15% of all injuries [1,4,5]. While pelvic biomechanics play an important role, the pain is frequently multifactorial in origin [9,10]. The three most common causes are musculotendinous groin disruption (also known as 'Sportman's Hernia' or 'Gilmore's Groin'), 'osteitis pubis' and 'adductor tendinopathy' [4,5,9]. Other less common causes include nerve entrapment syndromes (ilio-inguinal and obturator), iliopsoas bursitis and hip joint pathology [1,9–12,15–17]. A combination of the above pathologies frequently co-exists, as dysfunction in one area may lead to abnormal shearing forces within the pelvis [6,7,9].

Adductor-related pain is probably the single commonest cause of sports-acquired groin pain and accounts for up to two thirds of all groin injuries [9,13]. The majority respond to rehabilitation programmes which involve strengthening and co-ordination exercises of the pelvic muscles. Local steroid injection of the adductor origin is frequently undertaken for persistent pain [17] and more recently dextrose prolotherapy in athletes with chronic groin pain has been advocated [18,19]. The optimal management of chronic adductor-related groin pain, resistant to the above treatments has not been elucidated. Surgical division of the adductor longus tendon origin has been described but to date only two series have been reported [2,3].

This present study seeks to describe the experience with adductor tenotomy for chronic groin pain confined to the adductor longus origin, refractory to conservative management, in young male amateur athletes, to discern the factors influencing outcome, and to formulate a coherent management strategy.

## Materials and Methods

Patients with groin pain over the age of 18 years who played Gaelic football and hurling, the national field sports of Ireland, were included in the study. These are amateur sports and consist of teams of 15-a-side. All the sports played are listed in **Table 1**. A total of 209 patients underwent tenotomy during the period 2000–2005, 100 of which had a bilateral procedure (18) or underwent tenotomy in conjunction with repair of musculotendinous groin disruption (82). 109

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**Table 1** Sports played.

| Sports played | n |
|---|---|
| Gaelic football alone | 48 |
| soccer alone | 19 |
| hurling alone | 15 |
| rugby alone | 1 |
| Gaelic football & hurling | 14 |
| Gaelic football and soccer | 7 |
| Gaelic football and rugby | 3 |
| Gaelic football/soccer/rugby | 2 |

patients underwent unilateral tenotomy alone and form the basis of this study. Mean patient age was 25.9 years (range 16–44 years). Mean follow-up was 26 months (range 12–33 months).

The diagnosis of adductor tendinopathy was based on the clinical findings of pain and tenderness at the adductor longus origin of greater than three months duration with a positive squeeze test. Magnetic Resonance Imaging (MRI) was reserved for those patients where coexistent pathologies such as osteitis pubis or hip joint pathology were suspected. Unilateral tenotomy alone was performed in those patients with pain confined to the adductor origin and was not performed if patients had coexistent osteitis pubis. A pre-operative questionnaire was completed by all athletes. Following surgery the post-operative questionnaire (▶ **Fig. 2**) was sent to a cohort of 109 patients at least 12 months post procedure. The questionnaire addressed patient age, nature of sports played, pain characteristics and outcome. The severity of chronic groin pain in athletes referred to our centre is classified as Levels 1–4. Level 1, optimum performance with no pain; Level 2, playing but with pain that compromises performance; Level 3, pain that necessitates missing training or matches and Level 4, no longer able to train or play.

Institutional review board approval was obtained. A set of de-identified patient data compliant with the Health Information Portability and Accountability Act (HIPAA) was compiled, and the de-identified data were tested for potential for re-identification. Using HIPAA "safe-harbour" method, this limited data set was converted into a de-identified data table. This study also meets the required ethical standards as outlined by Harriss and Atkinson [8].

## Surgical technique

The procedure of tenotomy was performed under general anaesthetic. With the hip flexed to 90° and in maximal abduction, the adductor longus tendon origin was divided just below the pelvic attachment with a subcutaneous puncture technique using a tenotomy knife. Haemostasis occasionally required extension of the puncture wound and the skin was closed with a single inverting 4/0 Maxon suture. Rehabilitation involved a basic 12-week programme with clear instructions to progress to the next stage only if comfortable. Patients were reviewed routinely 4–6 weeks post-operatively and as required thereafter.

An active 8-week rehabilitation programme (▶ **Fig. 1**) was commenced at 4 weeks.

Chronic Adductor Tendinopathy

Active Rehab Programme

Module I (first 2 weeks)

1 Static adduction against soccer ball placed between feet when lying supine; each adduction 30s, ten repetitions.
2 Static adduction against soccer ball placed between knees when lying supine; each adduction 30s, ten repetitions.
3 Abdominal sit-ups both in straightforward direction and in oblique direction; five series of ten repetitions.
4 Combined abdominal sit-up and hip flexion, starting from supine position and with soccer ball placed between knees (folding knife exercise); five series of ten repetitions.
5 Balance training on wobble board for 5 mins.
6 One-foot exercises on sliding board, with parallel feet as well as with 90° angle between feet; five sets of 1 min continuous work with each leg, and in both positions.

Module II (from this week; module II was done twice at each training session; 6 weeks)

1 Leg abduction and adduction exercises lying on side; five series of ten repetitions of each exercise.
2 Low-back extension exercises prone over end of couch; five series of ten repetitions.
3 One-leg weight-pulling abduction/adduction standing; five series of ten repetitions for each leg.
4 Abdominal sit-ups both in straightforward direction and in oblique direction; five series of ten repetitions.
5 One-leg co-ordination exercise flexing and extending knee and swinging arms in same rhythm (cross country skiing on one leg); five series of ten repetitions for each leg.
6 Training in sideways motion on a "Fitter"(rocking base curved on top and bottom; user stands on platform that rolls laterally on tracks on top of rocking base) for 5 mins.
7 Balance training on wobble board for 5 mins.
8 Skating movements on sliding board;five times 1 min continuous work.
9 No stretching adductors
10 Cycle or swimming ok

**Fig. 1** 8 week active rehabilitation programme.

Adductor Tendinopathy Questionnaire

Name _____

Age _____

Sex _____

Sport Played _____

Level of Sport Played _____

Duration of Discomfort _____

Level of Discomfort (Before surgery):

| Pain Level | Please tick ✓ |
|---|---|
| Level 1 – Optimum performance, no pain | |
| Level 2 – Playing but with pain that compromises performance | |
| Level 3 – Pain that necessitates missing training or matches | |
| Level 4 – No longer able to train or play due to pain | |

Level of Discomfort (After surgery):

| Pain Level | Please tick ✓ |
|---|---|
| Level 1 – Optimum performance, no pain | |
| Level 2 – Playing but with pain that compromises performance | |
| Level 3 – Pain that necessitates missing training or matches | |
| Level 4 – No longer able to train or play due to pain | |

**Fig. 2** Adductor tenotomy questionnaire.

## Results

In total, 109 male patients underwent unilateral adductor tenotomy for chronic adductor-related groin pain refractory to conservative management. The commonest modes of pain onset were acute on chronic (71:65%), sudden forced abduction

("splits") (22:20%) and gradual or insidious onset (16:15%). The mean duration of pain prior to tenotomy was 15 months (range 8–120 months).

**Table 2** outlines the level of discomfort prior to and following tenotomy. 32 of 38 patients (91%) with Level 4 incapacity prior to surgery returned to Level 1 at a mean of 15 weeks. The majority of patients (60) had Level 3 incapacity on presentation – of these 42 (70%) returned to Level 1 and 15 (25%) to Level 2. In total, 99 (91%) patients improved – with 80 (74%) returning to their pre-injury status. Of the 11 (10%) patients with Level 2 incapacity prior to surgery only 4 (4%) improved while 6 (6%) deteriorated post-operatively. These patients were reviewed on 1–5 occasions post-operatively. Eight of these patients subsequently had MRI scans – a coexistent pathology was not noted. Three were noted, clinically, to have an exaggerated reformation of the tendon. A segment of tendon was excised in two of these, one of whom returned to competitive sport. Ten patients (9%) reported no improvement (3:3%) or deterioration (7:6%) following the procedure.

104 (95%) of the 109 tenotomies had no complications. Two patients (1.8%) developed haemotomas which required evacuation. There were no wound infections. As stated above, three patients had tendon reformation.

**Table 2** Pre- and post-op pain severity levels.

| Pre-op | | Post-op | | | |
|---|---|---|---|---|---|
| | | Level 1 | Level 2 | Level 3 | Level 4 |
| **Level 4** | 38 | 32 | 6 | 0 | 0 |
| **Level 3** | 60 | 42 | 15 | 2 | 1 |
| **Level 2** | 11 | 4 | 1 | 5 | 1 |

**Table 3** Comparison of adductor tenotomy series.

| | Robertson et al. | Atkinson et al. |
|---|---|---|
| **year** | 2000–2005 | 2000–2007 |
| **unilateral** | 109 | 28 |
| **bilateral/GG** | 78 | 20 |
| **mean pain duration (months)** | 15 (range 8–25) | 16.7 (range 13–72) |
| **mean follow-up (months)** | 26 (range 12–33) | 36 (range 25–108) |
| **results** | | |
| **pre-op** | | |
| Level 1 | 0 | 0 |
| Level 2 | 11 | 23 |
| Level 3 | 60 | (6) |
| Level 4 | 38 | 19 |
| **post-op** | | |
| Level 1 | 74 | 26 |
| Level 2 | 21 | 8 |
| no improvement | 3 | 9 |
| deterioration | 7 | 0 |

## Discussion

Adductor-related pain is probably the single commonest cause of sports-acquired groin pain and accounts for up to two-thirds of all groin injuries [9,13]. A study of 137 consecutive soccer players with groin pain showed adductor-related pain to be the cause in 69% of subjects [9].

The majority of patients with adductor-related groin pain respond to conservative measures such as strengthening and coordination rehabilitation programmes. A randomised controlled trial published in 1999 reported that an active training programme aimed at improving strength and coordination of the pelvic muscles but avoiding stretching the adductors was successful in as many as 79% of patients [10].

The options are limited for those who do not respond to rehabilitation programmes. Entheseal cleft injection is reported to give relief for up to one year in some patients but, for those with pre-injection enthesopathy on MRI, symptoms return at a mean of five weeks [17]. Dextrose prolotherapy, which involves injecting dextrose directly into the adductor longus origin reportedly benefits patients with chronic adductor-related groin pain; two recent studies by the same author have reported that up to 92% of athletes returned to unrestricted activity after three injections [18,19]. These impressive results have not yet been reproduced by other authors.

Adductor tenotomy, therefore, represents the only other treatment option for those who fail to respond to conservative measures. Reported series are small and details of return to competitive sport are absent or disappointing [2,14]. In 1992, Akermark and Johannson [2] reported a series of 16 consecutive tenotomies in patients who failed to respond to conservative management. At a mean follow-up of 35 months, ten of the subjects had returned to full athletic activity, with five performing at a reduced level. More recently Atkinson et al. [3] reported a single centre experience of adductor tenotomy in 48 patients (28 unilateral), with a minimum follow-up of 25 months and concluded that the procedure, followed by a "milestone-driven" rehabilitation programme, provided good symptomatic and functional improvement – activity scores improved in 60% of patients, but not to pre-injury levels. 54% returned to their original level of activity, 27% to a lower level and 18% had no improvement.

We used an assessment of patients' ability to compete in their respective sports, which was similar to but not identical to that used by Atkinson [3]. We did not use the Tegner scoring system, as originally designed for knee disorders, because it does not take into account that some patients will participate at a higher level but with limitation. The Groin Disability Score does not incorporate return to sport.

While only 54% (26/48) of patients returned to optimal performance (Level 1) post-operatively in Atkinson's series, compared to 68% (74/109) in ours, the results from both series overall are quite similar. Details of outcome in patients undergoing unilateral tenotomy alone are absent in their series and perhaps patients undergoing bilateral tenotomy influenced outcome. Furthermore the majority of their patients were professional athletes and perhaps the level of performance required for such athletes differs from that required in our series, the vast majority of whom played amateur sport albeit at a very competitive level. They reported no improvement in 18% of patients compared to 9% in our series. Both series required a 'milestone-driven' rehabilitation programme post-operatively, which prohibited returning to competitive sport before ten weeks. The rehabilitation programme used in our series is similar to that prescribed as a first-line treatment for all our patients prior to consideration for surgery. A comparison of the the two series is summarised in **Table 3**.

We found no evidence of coexistent pelvic pathology in the six patients who deteriorated post operatively but perhaps the lower level of discomfort pre-operatively in this group (Level 2) influenced perception of outcome. As a result of this study,

tenotomy is no longer offered to patients unless they are incapacitated to the extent that they can no longer train or play (Levels 3 & 4).

In conclusion, this study is the largest accrued experience of adductor tenotomy in young male athletes. Patients severely incapacitated with adductor tendinopathy who fail to respond to conservative management should be considered for formal tenotomy.

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