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Case Report

# Operative Treatment of Acute-On-Chronic Partial Adductor Longus Tendon Rupture - MRI and Hip Strength Follow-Up: A Case Report

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**Abstract**

**Aim:** Adductor muscle strains are common injuries in contact related sports such as ice hockey and football. Most of these injuries are treated conservative with good results. However, there is no consensus on the best treatment of partial ruptures of the adductor longus tendon among athletes as non-operative and operative therapies seems both provide good results. Non-operative therapy rests on physiotherapy and operative treatment on tenotomy. MRI is an effective tool for grading the injury and is widely used for the initial diagnostics of an adductor longus injury.

**Methods:** A31-year old professional ice hockey player sustained a partial rupture of the adductor longus tendon which did not heal by physiotherapy. Surgery was undertaken 20 weeks after primary injury, and 16 weeks later he returned to play (RTP) successfully with no relapse during 52 weeks of follow-up. He was followed up with a series of MRI and hip strength tests during recovery from non-operative and operative treatment. MRI showed that conservative means did not provide healing, while tenotomy was curative. The strength of hip adduction of the injured side returned to the same level as the contra lateral side after surgery.

**Conclusions:** There may be clear benefits of tenotomy to treat partial ruptures of the adductor longus tendon, especially if non-operative treatment is insufficient and RTP is threatened. MRI and hip strength assessments may provide valuable information during the rehabilitation of the partial acute-on-chronic rupture of the adductor longus tendon.

## ABBREVIATIONS

MRI: Magnetic Resonance Imaging; PT: Physiotherapy; RTP: Return to Play

## INTRODUCTION

Ice hockey players experience non-contact induced adductor longus muscle and tendon injuries associated with the training drills characteristic of this type of sports [1]. In addition, contact injuries are also common. The rate of groin injuries is higher during the preseason compared to the postseason, and the National Hockey League has recorded an overall rate of 3.2 strains per 1000 player-game exposures [2,3]. The typical mechanism of contact-related injuries to the adductor longus is acute forced abduction which causes excessive stretch to the tendon. The grading of adductor longus muscle injuries is from a sprain or partial rupture to complete tear of the muscle tendon or avulsion from symphysis insertion [4].

Adductor longus injuries can be diagnosed with sonography and magnetic resonance imaging (MRI) [5,6]. Of these methods, MRI seems to be superior for evaluation of the severity of the injury [7]. MRI can identify tendinopathy of the adductor longus tendon and pre-existing scar tissue in the affected area [8]. Athletes with a history of groin injury are at a higher risk for a acute tendon injury later [9, 10].

Adductor longus tendon tears may be treated with physiotherapy (PT) and surgery [11,12]. Partial tears are primarily treated non-operatively while complete avulsion injuries are treated operatively, but some studies have reported that non-operative treatment may be superior to operative treatment also of muscle ruptures [13]. The consensus for treating these type of injuries seems to be lacking while the results vary from the previous reports on the effect of non-operative or surgery treatments for acute-on-chronic injury of the adductor longusmuscle and MRI follow-up with return-to-play (RTP)

[12,13]. In the present case, there was also full recovery of hip strength after operative treatment after failure of non-operative treatment.

This case supports the concept that an operative approach is an appropriate treatment for athletes who fail RTP after intensive PT rehabilitation for acute-on-chronic injuries. MRI could be used for deciding on the best form of treatment, when an athlete with a tendon injury does not seem to be recovering as expected.

## CASE PRESENTATION

The characteristics of the athlete are shown in Table (1). The player was injured in a player-on-player contact where his right leg was forcefully abducted, extended and externally rotated, as the opposing player pushed him from behind. The player felt sharp immediate pain in his right groin. He could play to the end of the game while tolerating the pain. The player had previously MRI documented tendinopathy in this same tendon of the right adductor longus muscle. There were no previous operations to the affected groin.

Five days after the injury, the player was referred to an orthopedic consultant. At clinical examination, the player felt sharp palpation pain in the proximal insertion site of the adductor longus tendon. Resisted adduction induced the same sharp pain as it did after the initial injury. Clinically, there was no hematoma or palpable gap. Primary MRI (3T, Philips Healthcare, Best, and Netherlands) revealed acute grade 2/3 rupture in the tendon of the adductor longus muscle near the symphysis insertion (Figure 1). This MRI also showed chronic tendinopathy and a secondary cleft sign in the insertion site adductor longus.

Directly after the diagnosis, conservative treatment was instituted. The player started instructed PT and rehabilitation was controlled by the team's physiotherapist who is specialized in therapeutic treatments of groin injuries of ice hockey players. PT was provided daily and started with a passive limited range of motions of the injured side. The rehabilitation program increased in load step-by-step [14]. The player did not seem to progress after 10 weeks of physiotherapy (Table 2). He tried to compete but was unable to perform because of sharp groin pain mainly while skating. Since non-operative treatment thus had failed, the player was referred to a second opinion orthopedic consultant and was scheduled at season's end for operation at post-injury week 20. Pre-operatively the player could not participate in full game activity due to sharp groin pain during skating. The palpable pain was still evident at the injured tendon area. At the operation, there were visible scarring at the site of partially healed rupture. A transverse tenotomy was done to the affected adductor longus tendon approximately 4 cm distal to the origin of the tendon (Figure 2). Adhesions around the tendon were freed as well. The tenotomized distal head of the adductor longus tendon was then secured by loose absorbable sutures to prevent excessive retraction. After the operation, the patient was mobilized with weight bearing as tolerated. The wound healed without infection or hematoma.

Postoperative physiotherapy started at week 2 and was individually planned from passive to active and resisted movements followed by the physiotherapist. The athlete had medical evaluations at postoperative 2, 6 and 12 weeks. The rehabilitation was conducted steadily without any haste due to the chronic tendinopathy of the injured tendon. The strengths and mobilization were registered during the rehabilitation (Table 3). The first postoperative strength test was conducted only in week 16 to avoid overloading of the operated area. No subsequent injury or residual symptoms occurred in the area of operation during the 1-year postoperative follow-up.

**Table 1:** Characteristics of the subject.

| | |
|---|---|
| Age (years) | 31 |
| Weight (kg) | 88.0 |
| Height (m) | 1.82 |
| Body Mass Index (kg/m$^2$) | 26.6 |
| Dominant-side | Left handed |
| Years of athletic career | 13 |

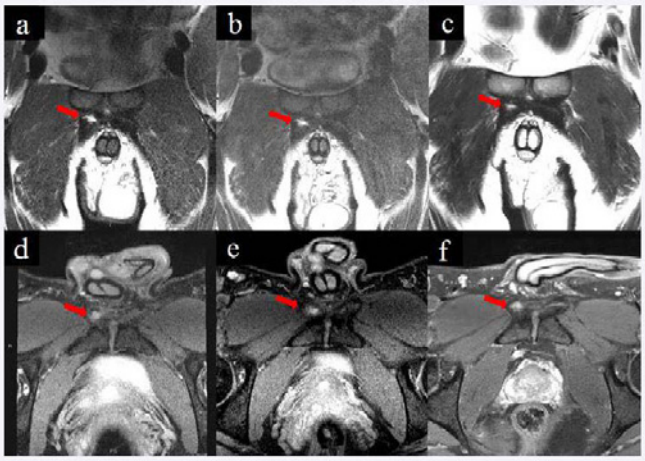


**Figure 1** T2-weighted coronal MR-images (a, b, c) and corresponding axial and proton density fat saturated images (d, e, f) at the level of long adductor insertion gradus 2/3 partial tear: Immediately following trauma (arrows in the images a and d); conservative treatment at 4 months (arrows in the images b and e); after operative treatment at 1 year (c, f). The size of the lesion is practically unchanged it is just slightly more demarcated on later images (b, c, e, f).

**Table 2:** Weekly Return-To-Play follow-up (conducted by the team's physiotherapist) after injury following non-operative and operative treatments. Surgery was performed 20 weeks after the injury.

| Non-operative treatment | Week | Operative treatment | Week (after injury) |
|---|---|---|---|
| Walking | 0 | Walking | 2 (+20) |
| Bicycle | 1 | Bicycle | 2 (+20) |
| Jogging | 2 | Jogging | 4 (+20) |
| Running | 4 | Running | 10 (+20) |
| Skating | 7 | Skating | 10 (+20) |
| Fast paced direction changes | 9 (with pain) | Fast paced direction changes (no pain) | 12 (+20) |
| Full contact | 10 (with pain) | Full contact (no pain) | 14 (+20) |
| Full game | 10 (with pain) | Full game (no pain) | 16 (+20) |

For the assessment of clinical recovery (Table 2), we used repeated self-reported activity level assessment (modified by the principles of Tyler TF & Nicholas SJ, 14),MRI (Figure 1,Figure 2) and measurement of hip muscle strength (HCB100K200, KERN & SOHN GmbH, Ballingen, Germany) after both non-operative and operative treatment (Table 3, Figure 1, Figure 2). The self-reported activity level consisted ofa questionnaire on the activities the player was able to perform without pain and with full level. The player was encouraged to note any adverse events during rehabilitation to allow for necessary changes in the physiotherapy program. Clinical examination was conducted during weeks 0, 6 and 16 after injury and weeks 2, 6, 16 and 52 after the operation. There was no hematoma nor clinical detachment or retraction of the tendon by clinical examination. Strength testing was performed by a trained physiotherapist (Table 3). The patient was educated for testing and did not perform through pain. MRI was carried out for the primary diagnosis and used to follow-up tendon healing during non-operative and after operative treatment (Figure 1, Figure 2).

## DISCUSSION

The main goal of surgical treatment of adductor longus tendon injuries is for the subject to regain full adductor longus strength and freedom from pain. After a groin injury, the player could miss the entire season in the rehabilitation process regardless of whether a non-operative or operative intervention is used. Therefore, it is crucial to identify the patients who benefit from early operative treatment. The present case shows how operative treatment may benefit an athlete when non-operative treatment has been unsuccessful. We also recorded lower body strengths to see whether (partial) tenotomy of the adductor longus muscle tendon affects the muscle strengths of the hip joint. The hip strengths were the same as on the non-injured side 16weekspostoperatively, a similar finding reported after surgical treatment of complete avulsion of the adductor longus [11]. Operative treatment is an option for treating adductor muscle injuries, especially when the injury is becoming chronic [15]. The athlete reported here had a history of tendinopathy in the injured adductor longus muscle tendon. Tendinopathy is apparently a risk factor for acute tendon tears [10]. Tendinopathy can be treated operatively by removal of scar tissue and by tenotomy of the adductor longus muscle [16]. The procedure may be compromised by infections and hematoma [12]. MRI is an established method for diagnosing groin injuries [8,17-19]. In the study by Schlegel et al. (2009) the recovery of 14 NFL players with avulsion of adductor longus tendon treated non-operatively was followed [13]. MRI showed edema and architectural disturbance in the injured muscle which evolves to heterogenic scar tissue formation with no edema [13, 19]. In the present case, the player sustained an acute adductor longus injury upon tendinopathy of the adductor longus muscle as a result from previous chronic injury, probably due to a long career – 13 years – as an ice hockey player. During follow-up and conservative treatment, the injured area of adductor longus tendon did not heal. After surgery, the MRI showed new tissue formation in the injured area; there were no adverse effects after operative treatment seen in MRI 1 year

**Table 3:** Hip strengths (kg) after injury with non-operative treatment including instructed PT and operative treatment (tenotomy) in weeks 6 and 16. Surgery was performed 20 weeks after the injury.

| **Non-operative treatment** | **Hip strengths (kg)** | |
|---|---|---|
| **Week 6 after injury** | **injured side** | **contralateral side** |
| Hip flexion | 40.1 | 37.6 |
| Hip extension | 92.8 | 84.9 |
| Hip abduction | 29.1 | 34.9 |
| Hip adduction | 8.1 | 14.8 |
| **Week 16 after injury** | **injured side** | **contralateral side** |
| Hip flexion | 39.7 | 49.8 |
| Hip extension | 75.7 | 88.2 |
| Hip abduction | 33.9 | 28.4 |
| Hip adduction | 14.5 | 28.4 |
| **Operative treatment** | | |
| **Week 6** | **injured side** | **contralateral side** |
| Hip flexion | 27.7 | 28.8 |
| Hip extension | 90.4 | 84.5 |
| Hip abduction | 26.6 | 30.0 |
| Hip adduction | - | 29.1 |
| **Week 16 (RTP)** | **injured side** | **contralateral side** |
| Hip flexion | 61.1 | 54.1 |
| Hip extension | 104.6 | 100.4 |
| Hip abduction | 36.1 | 34.6 |
| Hip adduction | 30.4 | 30.1 |

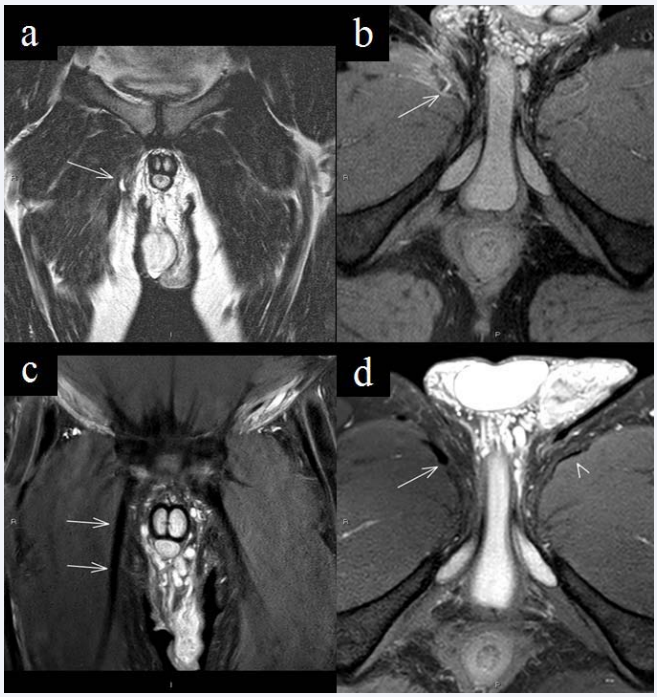


**Figure 2** A transverse tenotomy was made on the right affected adductor longus tendon approximately 4 cm distal to the origin of the tendon (arrows, images a and b). The tenotomy had healed completely at the 1-year postoperative MRI (arrows, images c, d). Only a minor thickening of the tendon (arrow, d) is seen when comparing to the unaffected left side (arrowhead, d).

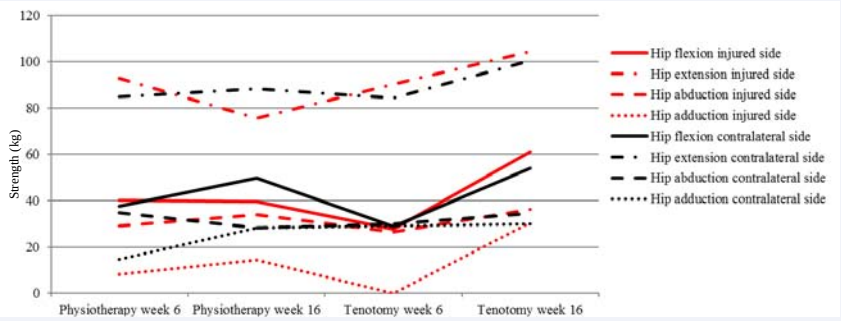


**Figure 3** Changes in hip strengths (kg) during physiotherapy rehabilitation alone and after operative treatment + physiotherapy in the injured (red lines) and contralateral side (black lines). Surgery was performed at week 20 of treatment by physiotherapy alone.

after operation. These observations emphasize that there may be substantial benefits of tenotomy in the treatment of acute-on-chronic partial ruptures of the adductor longus tendon, even in the presence of chronic tendinopathy. Also, MRI showed that the site of the tenotomy healed completely. The imbalance between the hip muscles strengths – mainly abduction and adduction – seems to be at least partially the cause for adductor longus injuries [3]. The player did not have preseason adductor muscles strength assessment. Because this information was lacking, we used the contra lateral side for reference. In the first strength testing session after injury (Table 3), the injured side was clearly weaker and this weakness did not subside even by week 16 on PT. The player had also weakness in the abduction forces of the hip by week 6 post injury which did resolve by week 16 preoperatively. This regained abduction strength could be due to the intensive physiotherapy. Although adductor longus tenotomy may decrease the adductor musculature strengths [20], the present patient had a clear performance upgrade by week 16 after the operation. Postoperatively, this test result was equal to the adduction strength of contra lateral side and two times higher than before the operation. Ultimately he was able to return to the same competitive level as before the injury without recurrent symptoms or sensations of muscle weakness.

## CONCLUSION

This report shows that after failed conservative treatment, a player with acute-on-chronic abductor longus injuries may benefit from operative treatment to the extent that they recover fully and are able to return to the pre-injury level of competitive sports. After tenotomy, the player was symptom-free and did not exhibit weakness in hip adduction. The successful outcome was corroborated by MRI and hip strength testing. In future, MRI might be used even more in the postoperative follow-up together with the strength tests for the evaluation of the timing of athlete's safe RTP.

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