

## Post-traumatic ossifications of the rectus femoris: Arthroscopic treatment and clinical outcome after 2 years



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### ABSTRACT

Injuries of the rectus femoris tendon origin could result in a chronic tendinopathy, leading to groin pain and loss of function.

Conservative treatment with analgesics and physical therapy is the gold standard, but in some cases excessive bone formation after avulsion injuries, can lead to a post-traumatic heterotopic ossification (PHO) and may benefit from surgical removal.

**Methods:** Outcome was evaluated in 16 top soccer players (age 24–43 years) affected by calcification of the proximal rectus who underwent arthroscopic excision (6–12 and 24 months). X-ray and 3D CT was collected for all patients. Hip disability and Osteoarthritis Outcome Score, Oxford Hip Score, Modified Harris Hip Score, together with visual analog scales (VAS) for pain, sport activity level (SAL), and activities of daily living (ADL) were used to evaluate clinical outcome.

**Technical procedure:** after central compartment examination and treatment was accomplished, attention was focused to the ossification of the rectus femoris. A complete exposure of the ossification was achieved; when possible attention was taken in detaching the minimum amount of fibers of the direct head of the rectus femoris from its insertion site. During the entire procedure, both dynamic direct visualization and fluoroscopic evaluation of the amount of resection were performed.

**Results:** Clinical outcome was excellent; the percentage of return to pre-injury level sport was 68.75% (11 athletes), with significant statistical improvement of MHHS, OHS and all 3 VAS subscales in all patients at 2 years follow-up.

**Conclusion:** Arthroscopic removal using conventional hip arthroscopic portals represent both effective and safe procedure to adequately treat post-traumatic ossification of the rectus femoris.

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### Introduction

Post-traumatic heterotopic ossification (PHO) of the rectus femoris can be very disabling in athletes, with most injuries occurring at the myotendinous junction. Most of these injuries can be successfully managed with conservative treatment. Hip arthroscopic surgical techniques around the hip joint have become very common, addressing peritrochanteric disorders, deep gluteal syndrome, and hamstring tendon tear. [1,7,11,23,29]. The focus of this retrospective case-series study is to evaluate longer-term results from our previous study of the arthroscopic approach to treat PHO of the rectus femoris [31].

### Materials and Methods

Sixteen consecutive male patients presented to Our institution between September 2009 and July 2015 for chronic (>6 months) pain and impaired function of the hip, unresponsive to non-steroidal anti-inflammatory drugs (NSAIDs) and physical therapy. All patients were soccer players. None had a history of previous hip issues or

other significant recorded trauma. Patients complained of pain at the anterior aspect of the hip, limited hip extension. A standard radiograph showed a PHO close to the superior aspect of the acetabulum. (Figs. 1 and 2 ) A computed tomography scan was performed in all patients, which confirmed the presence of a calcification of the direct head of the rectus femoris. Patients were therefore indicated for arthroscopic excision of the PTO.

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**Fig. 1 and 2.** Image showing ossification of the rectus femoris. Post-op x-ray showing complete excision of the PHO.

### Statistical Analysis

Preoperative and postoperative values were expressed as median and 95% CI, and were compared using the Wilcoxon paired samples test. The level of statistical significance was set at  $p < 0.050$ . Data analyses were performed using STATA v.11 (StataCorp, College Station, TX).

### Outcome Evaluation

To evaluate the outcome, pre- and postoperative (6,12 and 24 months) standardized hip rating scores were used: the Hip disability and Osteoarthritis Outcome Score (HOOS) [25] Oxford Hip Score (OHS) [9], and modified Harris Hip Score (mHHS)[]. Moreover, visual analog scales (VASs) were used for pain, sport activity level (SAL), and activities of daily living (ADL), expressed as a subjective value between 0 and 100 (100 = pre-injury sport level, 0 = inability to play sport) (Table 1).

### Surgical Technique

A standard fracture table was used with the patient in a supine position [4]. The operative limb was placed with the hip in slight abduction and internal rotation. The contralateral limb was positioned in extension and neutral rotation, with the foot in a support applying a counterbalancing traction. Countertraction, lateralized toward the operative hip, was placed in the perineal region. Two standard portals were used. Using the 70° arthroscope, the anterolateral portal (ALP) was performed. The ALP provides a complete view of the central compartment for the treatment of possible associated intra-articular pathologies. Once inside the hip joint with the camera through the ALP, the mid-anterior portal was created via direct visualization. An arthroscopic knife (Samurai blade; Stryker) was introduced to perform an interportal capsulotomy parallel to the labrum. Coagulation of bleeding vessels was achieved with a radiofrequency device (Smith & Nephew). The central compartment was addressed first.

**Table 1**  
Pre- and Postoperative Pain and Function Scores<sup>a</sup>

Measure	Preoperative (Mean ± SD)	Postoperative		P Value	
		6 Months (Mean ± SD)	12 Months (Mean ± SD)	24 Months Mean ± SD)	Preoperative vs 24 Months
HOOS	44.4 ± 24.0	77.7 ± 7.2	91.1 ± 8.0	90.1 ± 8.0	<.05
mHHS	70.8 ± 6.0	86.9 ± 9.3	96.9 ± 4.4	97.9 ± 4.4	<.05
OHS	37.5 ± 5.0	40.2 ± 2.1	46.5 ± 0.8	47.5 ± 0.8	<.05
VAS					
Pain	4.3 ± 1.1	2.3 ± 1.1	0.2 ± 0.4	<0.2 ± 0.4	<.05
ADL	71.6 ± 14.6	80	98.3 ± 3.7	98.4 ± 3.5	<.05
SAL	18.3 ± 26.0	71.6 ± 6	91.6 ± 8.9	90.4 ± 8.4	<.05

<sup>a</sup> ADL, activities of daily living; HOOS, Hip disability and Osteoarthritis Outcome Score; mHHS, modified Harris Hip Score; NS, not significant; OHS, Oxford Hip Score; SAL, sport activity level; VAS, visual analog scale.

Concomitant lesions (labral tear, chondral lesion, impingement) were evaluated and eventually treated. After central compartment examination and treatment was completed, the traction was removed and attention was focused to the calcification of the rectus femoris. A shaver was used to clear all soft tissue from the overhanging acetabulum and to better delimit the plane between the acetabular rim and the calcification. Using an extra-long, 5.5-mm full-radius shaver and a radiofrequency device, complete exposure of the calcification was achieved (Fig. 3). When possible, care was taken in detaching the minimum amount of fibers of the direct head of the rectus femoris from its insertion site. Using the image intensifier as a guide, the calcification was removed using a 5.5-mm bur (Figs. 4–6). During the entire procedure, both dynamic direct visualization and fluoroscopic evaluation of the amount of resection were performed. Patients were discharged the day after the procedure. Weight-bearing was permitted as tolerated, but the extension of the hip was forbidden for 3 weeks to avoid excessive elongation of the rectus femoris tendon. To avoid recurrence, a course of celecoxib was prescribed (200 mg/d for 4 weeks).

## Results

The average age of the patients was 26,6 years (range, 24–43 years). The mean time from symptoms to surgery was 10.2 months. After surgery, all patients reported satisfactory outcomes, with 11 of 18 patients rating their return to sport level as high as pre-injury ( $P < .05$ ), and the remaining 6 returned at a percentage above 80% according to the SAL score at a mean of 8 weeks (range, 4–9 weeks) from surgery. Seventeen of 18 patients ranked their ability to carry on daily activities as 100%. The minimum follow-up was 24 months. The mean time to sport activity return was 42.8 days. Comparing pre- with postoperative values at 2 year from surgery, the statistical analysis showed significant improvement for HOOS (mean,  $90.1 \pm 8$ ), OHS (mean,  $47.5 \pm 0.8$ ), mHHS (mean,  $97.9 \pm 4.4$ ), and the VAS for pain (mean,  $0.2 \pm 0.4$ ), ADL (mean,  $98.4 \pm 3.5$ ), and SAL (mean,  $90.4 \pm 8.4$ ) from pre- to postoperative ( $P < .05$ ).

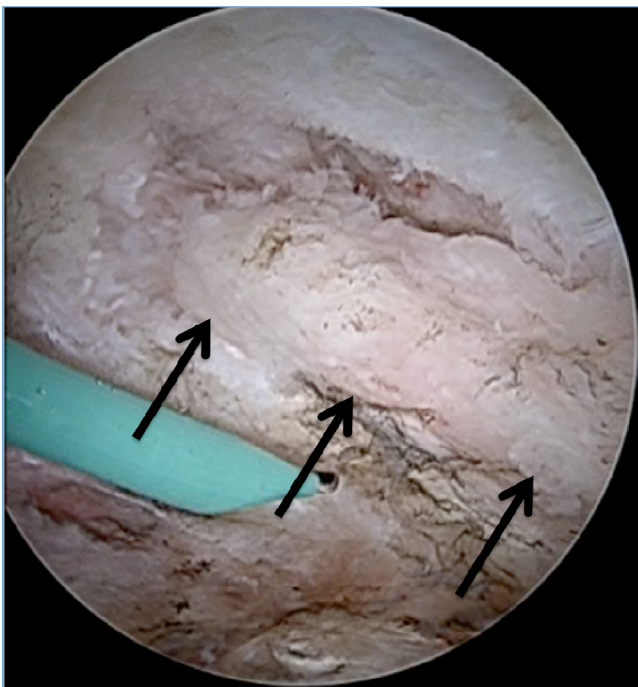


Fig. 3. Complete exposure of the post-traumatic Heterotopic ossification of the rectus femoris.

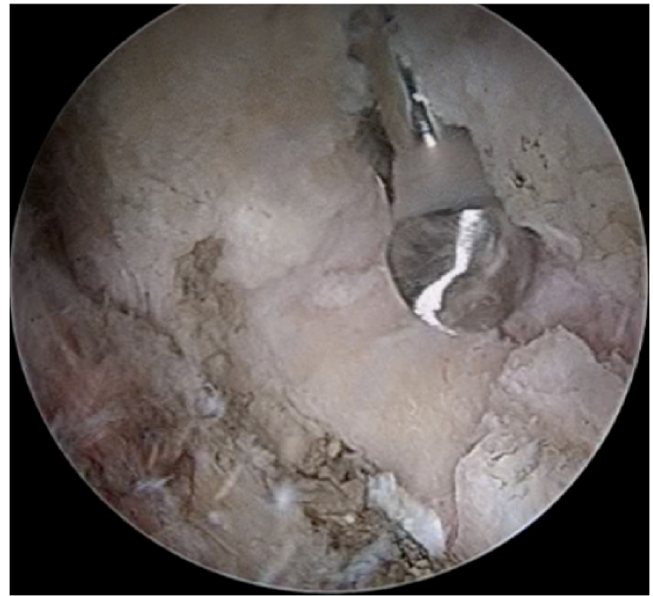


Fig. 4. Arthroscopic views during rectus femoris ossification removal.

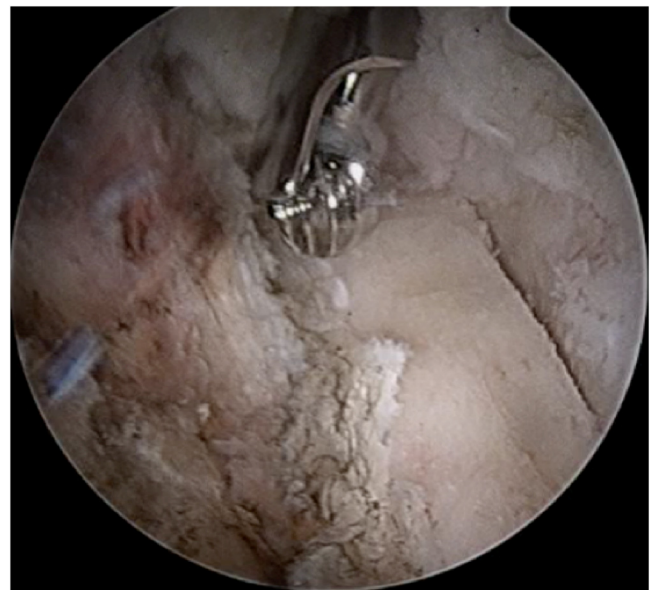


Fig. 5. Arthroscopic views during rectus femoris ossification removal.

## Discussion

A PHO of the rectus femoris tendon is a rare condition, most affecting athletes, that can cause hip pain and impairment [12]. Other possible causes of hip pain coming from rectus femoris origin include os acetabuli, avulsion fractures, and myositis ossificans [17,29]. Generally, a calcific deposit within the tendon of the rectus femoris can be visualized on radiograph as a formation usually parallel to the long axis of the femur (see Figure 1 Fig. 1). Various etiopathogenetic hypotheses have been proposed, such as consequence of a previous injury [30]. Local stress necrosis [6] has been suggested as the first step for the deposition of calcium salts, either directly or through fatty acid and soap intermediaries. A more recent theory proposed the role of local hypoxia as a cause secondary to either mechanical or vascular



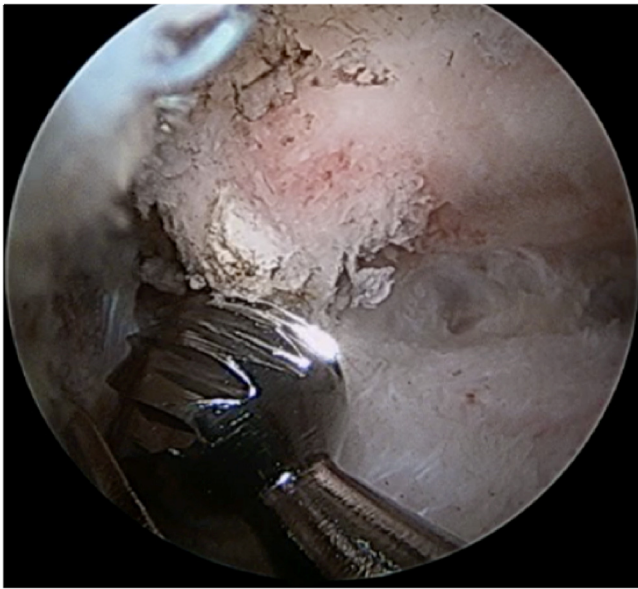


Fig. 6. Arthroscopic views during rectus femoris ossification removal.

factors [29]. In this series, 2 cases presented the tendon calcification together with a labral tear. A relatively recent paper described a new pathological entity, the hip anterosuperior labral tear with avulsion of rectus femoris (HALTAR) [19].

Traditional treatment for calcific tendinitis of rectus femoris included oral NSAIDs [18,27], and previously, radiotherapy [21]. All the treatment options give the possibility of recovery from symptoms. In refractory cases or when a large bone formation occurs (ie, traumatic injuries), a surgical excision of the calcification may be necessary, traditionally performed through an anterior approach [3]. Hip arthroscopy has given the opportunity to reduce tissue damage and have a faster recovery. In addition, it allows concomitant intra- and extra-articular disorders such as a femoro-acetabular impingement to be addressed.

This is to our knowledge the largest published series of rectus femoris tendon calcification in top amateur athletes (soccer players) to date with a follow up of at least 24 months. El-Husseiny et al. [12] reported 1 case of arthroscopic excision of heterotopic calcification in a chronic rectus femoris origin injury. The patient was pain-free and able to return to full training within 8 weeks. Peng et al. [26] reported on 3 patients (age range, 38–55 years) affected by a calcific tendinitis of the rectus femoris tendon addressed using arthroscopic excision. At 9-month follow-up, all 3 patients were pain-free and had recovered full function. A recent study showed a good clinical outcome using the endoscopic approach to remove the ossification. We think this is a valid surgical option in cases where a central compartment evaluation is not necessary, although no data are evaluable to compare it with a traditional trans-capsular approach in terms of time recovery, complications or recurrence rate [7].

Limitations of the study include the small number of patients and the fact that it was a retrospective study. No complications were reported during the follow-up period, patients needed a short hospitalization (1 night) and immediately started rehabilitation. As a minimally invasive surgery, the main advantages of hip arthroscopy are minimal damage to the soft tissues surrounding the hip area and rapid recovery [13]. In addition, it provides the opportunity to address concomitant lesions, such as labral tear, femoro-acetabular impingement, and cartilage lesions [2,13].

## Conclusion

Post-traumatic ossification of the rectus femoris is associated with sports involving powerful and repetitive hip movement through full the range of motion. The arthroscopic approach can be considered a feasible and effective option, with few risks for the patients, rapid recovery, and improved results at long-term follow-up.

## Conflict of interest

The authors whose names are listed immediately below certify that they have NO affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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