# Arthroscopic treatment of chronic patellar tendinopathy in high-level athletes

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## Summary

**To present the results of arthroscopic treatment of patellar tendinopathy in high-level competition athletes.**

**Eleven high-level athletes presented chronic patellar tendinopathy which did not respond to long term conservative treatment. Average age of the patients was 24.8 ±3.4 years old. All patients received an arthroscopic procedure with osteoplasty of the distal patellar pole, debridement of the underlying Hoffa fat pad and of the degenerated areas of the proximal posterior patella tendon and cauterization of the visible neo-vessels. Mean duration of follow-up was 17.4±4 months.**

**Patients showed a major improvement in the Lysholm score from 49.9±5.2 to 92.5±7 and in the VISA P score from 41.2±5.2 to 86.8±14.9 on tenth post-operative week. All patients had returned to sports activities by the twelfth postoperative week.**

**Arthroscopic treatment of chronic patellar tendinopathy found to be a minimal invasive and safe technique which produced satisfactory results.**

*Key words: Hoffa fat impingement, patellar tendinopathy.*

## Introduction

Patellar tendinopathy shows an increasing prevalence probably due to both an increasing participation of the population in sports and the progress in the diagnostic approaches of the disease. The term "Jumper's knee" has been also introduced since 1973 by Blazina et al. to describe the condition, as it was early recognized to more commonly occur in sports where repetitive and vigorous jumping is required[1]. Patients are very often forced by severe symptoms to discontinue sports activities for prolonged time periods. Despite the initial approach of the disease as an "inflammatory tendinitis", it has been now widely accepted as a degenerative disease of the patellar tendon, suggesting the term "tendinopathy" as more appropriate to describe the condition[2].

A number of theories have been suggested for the pathogenesis of the anterior knee pain in patellar tendinopathy: inflammatory mechanism, painful collagen breakage, mechanical impingement of the fat pad and activation of the nociceptors of the patellar fat pad by the locally released biochemical irritants. Conservative treatment has been proposed as the first therapeutic approach, using rest, anti-inflammatory treatment, improvements in training techniques and athletic shoes, physiotherapy with stretching and eccentric strengthening exercises[3]. Most of the related studies luck evidence-based methods while better results have been reported mainly in early stages of the disease. Platelet rich plasma and sclerosing injections have been also shown beneficial but more investigation with randomized, prospective clinical trials is expected[4]. Low energy radial extracorporeal shock wave therapy, even in a single application has been recently suggested as a safe and effective method, showing better results than other conservative regimens; these promising results of shock wave treatment remain to be evidenced by further studies of prospective nature, longer follow-up and larger series[5]. Unfortunately a large proportion of elite athletes do not respond to conservative treatment and after a prolonged period of persisting symptoms surgical treatment is indicated[6, 7].

While traditional open treatment has been applied consistently, arthroscopic procedures have been more recently introduced promising similar or even better results than open methods, suggesting that they can better manage and more accurately target the painful areas of the proximal-posterior tendon fibers and of the infrapatellar fat pad[8-11]. Open surgical techniques include partial removal

of the diseased patellar tendon, opening of the peritendon, and removal or drilling of the patellar pole in order to treat patients unresponsive to non-operative treatment[1,12-14]. In introduction of arthroscopic procedures a number of surgeons proceeded in debridement of the patella tendon alone[8,15], while others described treating both the tendon and bone[9].
The purpose of our study was to present the intra-operative details and the results of arthroscopic treatment of distal patellar tendinopathy in high-level competition athletes.

## Materials and methods

This is a prospective study on eleven patients involved in high-level sports activities, who did not respond in conservative treatment for chronic patellar tendinopathy, and finally underwent surgical arthroscopic intervention. Eight patients were female and three were male. Seven of the patients were volley ball players competing in national and international level, three were soccer players of county level and one was a national level dancer. The mean age was 24.8 ±3.4 years old. Details of the patients are presented in Table 1.

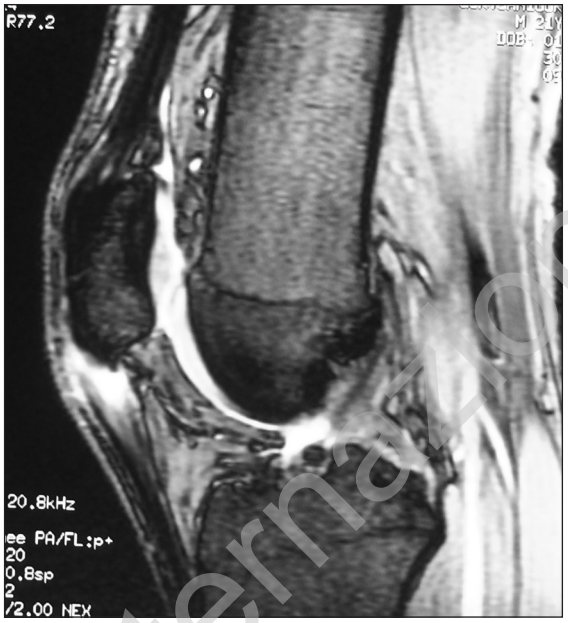


Figure 1. Saggital T2 MRI cut of a 21 years old volley-ball player, demonstrating an extended increased pathological signal at the most proximal patellar tendon, an adjacent patella bone marrow edema indicating impingement pathology and a protruded inferior patellar pole.

### Preoperative Findings

Diagnosis was based on history, subjective symptoms, clinical findings and imaging studies. X-rays were available in all cases, though the imaging criteria for the diagnosis were the MRI detection of proximal patellar tendinopathy (Fig. 1). All patients were classified as grade III of Blazina et al. proposed classification[1]. All patients satisfied inclusion criteria to have no other knee pathology (rheumatic or metabolic disease) and no history of severe injuries (osteochondral lesions, meniscus, cartilage, or ligament injuries). None of the patients was overweight.
All patients complained for anterior knee pain located in the most proximal part of the patellar tendon, which presented severe local tenderness. Knee effusion and anterior knee crepitation were present in three and four patients respectively. Pain was present during whole practice and symptoms prevented all patients to participate in their usual high-demanding sports activities. In five patients there was a previous history of successful conservative treatment of patellar tendinopathy on the contralateral side. The mean duration of the symptoms before the patients undergo surgical treatment was 13.5±6 months on average (Tab. 1).
Initial treatment was conservative in all cases, including a period of rest, NSAIDS for 8.55±1.57 weeks, physiotherapy regimens over the painful area, and a ten weeks protocol of stretching and strengthening program of the quadriceps, the hamstrings, and of the hip adductors and abductors. Kinesiotaping was additionally applied in all

Table 1. Patients' Data.

| Patient number | Gender | Age | Sport | Duration of symptoms preoperatively | Time-period between shockwave therapy and surgery |
|---|---|---|---|---|---|
| 1 | F | 20 | Volley ball | 13 months | - |
| 2 | F | 28 | Volley ball | 26 months | 8 months |
| 3 | F | 27 | Volley ball | 18 months | 9 months |
| 4 | F | 31 | Volley ball | 12 months | 3 months |
| 5 | M | 23 | Volley ball | 8 months | - |
| 6 | F | 25 | Volley ball | 9 months | - |
| 7 | F | 26 | Volley ball | 14 months | - |
| 8 | F | 22 | Dancer | 9 months | - |
| 9 | M | 20 | Soccer | 10 months | 4 months |
| 10 | F | 27 | Soccer | 8 months | 4 months |
| 11 | M | 24 | Soccer | 22 months | - |
| **Mean (SD)** | | **24.8±3.4** | | **13.5±6** | **5.6±2.7** |

patients. Eccentric quadriceps exercises were advised after initial temporary relief of the symptoms. A short period of three weeks average of return to sports activities without symptoms was achieved in four patients, who presented sound recurrence of the symptoms. In three patients a shoe insert was prescribed to compensate for a medium degree of foot pronation, with no significant improvement. Extracorporeal shockwave therapy was applied as a final conservative approach in five patients, resulting in no improvement in two patients and in temporary improvement in three patients, with recurrence of the symptoms after a mean period of five weeks of relief. Average time-period between shockwave therapy and surgical treatment was 5.6±2.7 months (Tab. 1). After failure of conservative treatment for at least six months and persistence of the symptoms, all patients were consulted for arthroscopic intervention. All patients received information about potential risks and benefits of the procedure. The same surgeon performed all arthroscopies following the same technique in every case.

**Surgery and Rehabilitation**

Surgical Technique: in all procedures a 4.0 mm and 30° high definition arthroscope, a 4.5 mm straight shaver blade, a 4.0 mm straight acromianizer type burr, and a 90° bipolar ablation probe were used. The patients were positioned in supine position. The first step was an arthroscopic inspection of the knee through regular medial and lateral portals to rule-out any other joint pathology. Tourniquet was activated after inspection of the joint to reduce ischemia duration and post-operative quadriceps atrophy. Low medial and lateral para-patellar portals in addition to a supero-lateral portal were used alternating as working or viewing portals, providing better evaluation and approach to the distal patellar pole and to the proximal-posterior patellar tendon. Initially the most proximal Hoffa fat pad was debrided, to both remove an anticipated painful structure and to visualize the most posterior fibers of the proximal tendon (Fig. 2). As a next step an osteoplasty of about 5 mm of the distal patellar pole was made using the

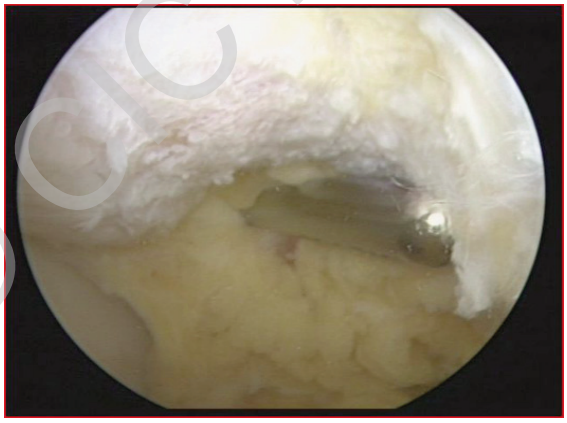

Figure 2. The most proximal Hoffa fat pad was debrided, to both remove an anticipated painful structure and to visualize the most posterior fibers of the proximal tendon. Low medial and lateral parapatellar portals are used alternating as viewing and working portals.

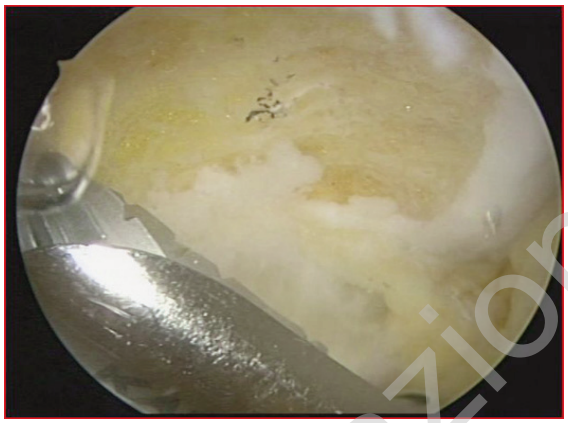

Figure 3. Osteoplasty of the distal patellar pole.

arthroscopic burr (Fig. 3). Debridement of degenerated tendon fibers and cauterization of any visible vascularization in the diseased tissue completed the procedure (Figs. 4 and 5). The procedure was not ultrasound-guided in any case. Intra-operative samples for histological studies have not been taken under a reproducible technique in all patients and no data have been taken under consideration in the current study.

Rehabilitation protocol: the knee was immobilized in ex-

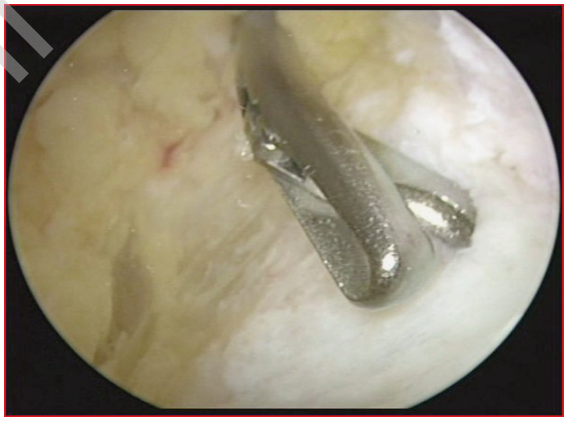

Figure 4. Debridement of degenerated tendon fibers.

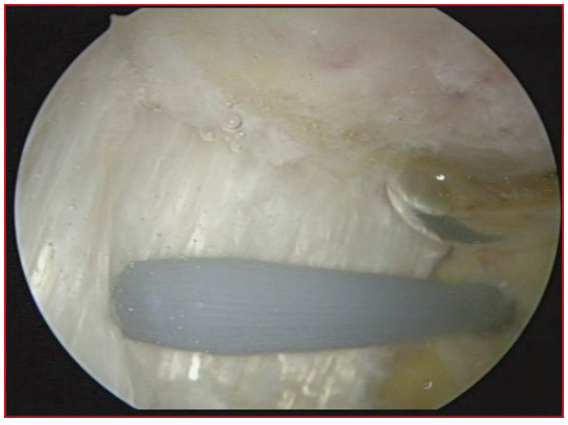

Figure 5. Cauterization of any visible vascularization.

tension in a functional cast for three weeks. The cast was unlocked only for passive range of motion exercises. Motion was gradually and partially restored until the fourth post-operative week. Isometric exercises applied on the 2nd post-operative week. Isotonic and kinetic chain exercises applied after the 4th post-operative week. Gradual full weight- bearing was allowed after the 3rd post-operative week, when the knee effusion was subsided and the quadriceps has regained sufficient strength. Gradual return to unrestricted competition was advised after the 8th post-operative week.

### Follow-up

Patients were scheduled to be evaluated clinically on 1, 3, 6, 9, 12, 18 and 24 postoperative month. No patients were lost at follow-up. The Tegner Lysholm knee scoring system and the Victorian Institute of Sport Assessment VISA-P score were both used for the assessment of the pre-operative condition and the post-operative outcome on the given time intervals [16]. The mean follow up time was 17.4±4 months (Tab. 2).

Post-operative magnetic resonance images (MRI) were not available for the following reasons: a) a new, post-operative MRI was not announced to the patients as a part of the study plan, and it was included in the study's design. b) Due to the short duration of the follow-up an expected pathological signal in the area of the biological repair process could misinterpret the imaging findings.

## Results

We proceeded in statistical analysis of the small sample size of the eleven patients despite the fact that according to a power analysis a greater sample size would be required in order to establish a statistical significance with a = 0.05 and power = 0.9, considering that this is a prospective study and a small number of patients is predictable. The significance level was p\0.05. The statistical package SPSS v.20.0 for Windows was used for the analysis.

Patients showed a major improvement in the mean Lysholm score from 49.9±5.2 to 92.5±7 (p=0.3) and in the mean VISA-P score from 41.2±5.2 to 86.8±14.9 (p=0.07) on tenth post-operative week (Tab. 2), which was proved a critical time-point for the relief of the symptoms and was constantly added in post-operative assessment. All patients had returned to their previous high-level sports activities by the twelfth postoperative week. Ten patients discontinued medications, shoe inserts and kinesiotaping while practicing, as they did not feel any need for additional therapy. There were no post-operative complications. At the end of the follow-up nine of the patients (81.2%) were satisfied that they were able to compete without limitations at their former competing level. Two of the patients despite being able to participate in unrestricted high-level competition, complained for occasional recurrences of mild knee pain and effusion during and after vigorous sports activities. As post-operative magnetic resonance images were not available, correlations between outcome scores and imaging findings could not be provided.

## Discussion

The mean finding of the present study is that arthroscopic treatment of chronic proximal patellar tendinopathy found to be a safe option with high satisfaction rates and fast recovery in young athletes who did not respond in conservative treatment.

There is still a controversy about the possible advantages of arthroscopic versus open techniques in the surgical treatment of chronic patellar tendinopathy. Both arthroscopic and open treatment have been recently suggested as effective, with a trend of better outcomes with the arthroscopic techniques[8,10]. Recently published studies report that arthroscopic treatment gave satisfactory results (mean 92.4%) and high rates of returning to sports activities (mean 84.2%) comparable to open techniques (87.2% and 76.6% respectively)[9,10,17,18]. Lack of prospective randomised controlled trials limit the significance of the related studies. Traditional open techniques con-

Table 2. Follow-up and Outcome scores.

| Patient number | Follow up (months) | Preoperative Lyscholm score | Postoperative Lyscholm score (10th week) | Preoperative VISA P score | Postoperative VISA P score (10th week) |
|---|---|---|---|---|---|
| 1 | 19 | 49 | 99 | 41 | 88 |
| 2 | 21 | 52 | 100 | 44 | 99 |
| 3 | 10 | 49 | 81 | 40 | 66 |
| 4 | 18 | 42 | 81 | 32 | 59 |
| 5 | 15 | 55 | 91 | 46 | 96 |
| 6 | 20 | 60 | 94 | 48 | 96 |
| 7 | 24 | 53 | 100 | 45 | 99 |
| 8 | 19 | 45 | 95 | 42 | 93 |
| 9 | 18 | 49 | 86 | 40 | 68 |
| 10 | 13 | 51 | 96 | 43 | 96 |
| 11 | 14 | 44 | 95 | 32 | 95 |
| **Mean (SD)** | **17.4±4** | **49.9±5.2** | **92.5±7** | **41.2±5.2** | **86.8±14.9** |

stantly include removal of the degenerated tendon tissue and drilling at the inferior patellar pole, while partial removal of a protruded inferior patellar pole and opening of the peritendon are occasionally indicated[12,14]. Arthroscopic techniques describe partial removal of the degenerated tissue of the most posterior and proximal degenerated tendon fibers, partial removal of the posteriorly positioned Hoffa fat pad, osteoplasty of the distal patellar pole and cauterization of the local neo-vascularization[9,10,17, 18]. Arthroscopic treatment in addition to its minimally invasive nature, looks as a very attractive approach to the proposed multifactorial model of the etiopathogenesis of the disease's symptoms, which involves tendon's collagen tissue breakdown[19], increased neovascularity and neo-innervation in the painful degenerated proximal tendon tissue areas[20,21], development of sensitive nociceptors in the infrapatellar fat body[22] and impingement of the proximal tendon and the Hoffa fat pad on the inferior pole of the patella[23]. The above mentioned painful structures might approached in a more easy, atraumatic and reliable manner during arthroscopy.

The current study presents the advantages of a prospective study: an homogenous group of patients (young age, high-level athletes, same grade of tendinopathy, absence of obvious predisposing intrinsic factors, same protocols for post-operative rehabilitation and for outcome assessment). The surgical technique was applied by a similar manner to all patients (arthroscopic portals and instrumentation), by the same surgeon. A standard surgical technique with the sequence described above was used to all patients. The results were quite satisfactory with the 81.2% of the patients being able to return to the previous level of sports activities, which is in agreement with other related studies.

Limitations of the study are the short to mid-term follow-up, the lack of post-operative MRIs and consequently the lack of correlation between imaging findings and outcomes, and especially the small number of the patients which produces weak statistical significance. Limitation if the surgical technique was the lack of a colored Doppler-guided technique, to demonstrate the neo-vascularization and other anatomic characteristics of the patellar tendon. Future prospective randomised controlled studies are expected to provide more reliable statistical results on the arthroscopic treatment of the chronic proximal posterior patellar tendinopathy. Development and availability of guided-assisted techniques is also expected to improve the accuracy of the arthroscopic techniques. Progression in the knowledge of the mechanical and biochemical etiologic factors of the condition is expected to offer new advances in both conservatice and surgical therapeutic approaches.

According to our results all patients demonstrated significant improvement by the tenth post-operative week. All patients had returned to their previous level of sports activities by the twelfth postoperative week. The results might contribute in the theory of the multiple causes of pain which are located in the proximal posterior tendon fiber, in the infrapatellar fat pad and of the possible tissue impingement under the distal patellar pole. Although two of the patients presented recurrences of mild pain and knee effusion, they constantly showed a significant improvement and they were able to participate in high-level competition, even through difficulties. Indefinable etiologic causes and subjective reasons which differ from person to person may lead to recurrence of symptoms and patients' disappointment.

Chronic proximal patella tendinopathy is a very common entity in the specific population of high-demanding athletes. Although initial conservative treatment offers pain relief in many cases symptoms may persist and recurrence rate seems to be high. When surgical treatment is indicated, open and arthroscopic methods have been both suggested as effective methods. Arthroscopic treatment found in our study to be a minimal invasive and safe technique, possibly producing satisfactory results with fast recovery rates which is critical for the expectations of high-level athletes.

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