



## Case Report

# Pre-tibial synovial cyst after reconstruction of the anterior cruciate ligament: case report<sup>☆,☆☆</sup>



Luís Eduardo Pedigoni Bulisani<sup>a,b,\*</sup>, Erickson Bulisani<sup>a,b</sup>

<sup>a</sup> Brazilian Society of Knee Surgery (SBCJ), São Paulo, SP, Brazil

<sup>b</sup> Unimed Jundiaí, Jundiaí, SP, Brazil

### ARTICLE INFO

#### Article history:

Received 24 July 2013

Accepted 6 August 2013

Available online 18 October 2014

#### Keywords:

Anterior cruciate ligament  
Postoperative complications  
Synovial cyst  
Bone screw

### ABSTRACT

Arthroscopic reconstruction of the anterior cruciate ligament has been modernized through new surgical techniques and new materials. When tibial fixation is performed using an absorbable screw, complications may occur, such as formation of a pre-tibial cyst. The case described here is about a patient who presented an anteromedial synovial cyst in his right knee, three years after having undergone ACL reconstruction. The patient did not present any pain nor any complaints other than a mass that progressively increased in size, worsened after physical activities. Imaging examinations were requested: simple radiography of the knee and magnetic resonance. Anteromedial imaging of the knee showed a mass with well-delimited borders and internal fluid content, suggestive of a synovial cyst, with communication with the joint cavity through the tibial tunnel, without presenting enlargement or absorption of the bone tunnel. The cyst was surgically resected and the tibial tunnel occlusion was performed using a bone plug. The diagnosis of a synovial cyst was subsequently confirmed through the results from the anatomopathological examination. The patient presented good clinical evolution, with disappearance of the symptoms and a return to physical activities.

© 2014 Sociedade Brasileira de Ortopedia e Traumatologia. Published by Elsevier Editora Ltda. All rights reserved.

### Cisto sinovial pré-tibial após reconstrução do LCA – Relato de caso

#### RESUMO

A reconstrução do ligamento cruzado anterior (LCA) por via artroscópica vem sendo modernizada por novas técnicas cirúrgicas e novos materiais. Quando feita a fixação tibial com parafuso absorvível podem ocorrer complicações, como a formação de um cisto pré-tibial. O caso em questão é de um paciente que apresentou um cisto sinovial anteromedial em joelho direito três anos após ter sido submetido a reconstrução do LCA. O paciente não apresentava dor ou outras queixas, apenas massa de aumento progressivo, com piora após

#### Palavras-chave:

Ligamento cruzado anterior  
Complicações pós-operatórias  
Cisto sinovial  
Parafuso ósseo

\* Please cite this article as: Bulisani LEP, Bulisani E. Cisto sinovial pré-tibial após reconstrução do LCA – Relato de caso. Rev Bras Ortop. 2014;49:671-674.

☆☆ Work developed at the Unimed Hospital, Jundiaí, São Paulo, Brazil.

\* Corresponding author.

E-mail: [eduardobulisani@hotmail.com](mailto:eduardobulisani@hotmail.com) (L.E.P. Bulisani).

<http://dx.doi.org/10.1016/j.rboe.2014.10.002>

2255-4971/© 2014 Sociedade Brasileira de Ortopedia e Traumatologia. Published by Elsevier Editora Ltda. All rights reserved.

atividades físicas. Foram solicitados exames de imagem: radiografias simples do joelho que não apresentavam alterações; e ressonância magnética com imagem anteromedial em joelho sugestiva de cisto sinovial. Apresentava bordas bem delimitadas e conteúdo líquido interno, com comunicação com a cavidade articular através do túnel tibial, sem apresentar alargamento ou absorção do túnel ósseo. Foram feitas ressecção cirúrgica do cisto e oclusão do túnel tibial com tampão ósseo, com posterior confirmação do diagnóstico de cisto sinovial após resultado do exame anatomopatológico. O paciente apresentou boa evolução clínica, com desaparecimento dos sintomas e retorno às atividades físicas.

© 2014 Sociedade Brasileira de Ortopedia e Traumatologia. Publicado por Elsevier Editora Ltda. Todos os direitos reservados.

## Introduction

Over recent decades, reconstruction of the anterior cruciate ligament (ACL) by means of arthroscopic techniques has become a standard surgical treatment for knee surgeons, since it results in greater relief of postoperative pain and improvement of knee stability and range of motion. With evolution of the surgical techniques and materials used, graft fixation in its femoral and tibial tunnels has become more secure, such that easy slackening of the reconstructed ligament is avoided. Among these materials are absorbable screws, which are very frequently used. However, with this advance, new complications such as the emergence of pre-tibial synovial cysts have arisen. The etiology of these cysts remains to be clarified.<sup>1,2</sup>

The present case report had the aim of demonstrating a possible relationship between use of absorbable screws (used for tibial fixation of the ACL graft) and subsequent formation of a pre-tibial synovial cyst.

## Case report

The patient was a 43-year-old white man with a history of ACL reconstruction in the right knee in 2009. He returned to the consultation office in January 2013 with a complaint of a palpable mass in this knee that was progressively increasing in size.

The patient reported that this condition had started around three years after the surgery (i.e. six months before coming for the consultation) and, since then, it had presented progressive increases in size, with worsening after physical effort. He said that he had not suffered and new injuries or sprains and he did not present any pain or other complaints.

Physical examination showed increased volume in the anterior region of the knee, above the surgical scar relating to harvesting of grafts from the semitendinosus and gracilis tendons. There was a rounded mass of approximate diameter 3 cm, which was compressible and had rubbery consistency (Figs. 1 and 2). There were no signs or symptoms of joint instability or alterations to the range of motion.

Knee radiographs were requested, and these demonstrated that the tibial and femoral tunnels did not differ in diameter from what was constructed at the time of the surgery. There was an Endobutton in the lateral femoral cortical bone and there were no other alterations or bone images. For better



**Fig. 1 – Appearance at physical examination, with increased volume in the anterior region of the knee.**

elucidation of the diagnosis, magnetic resonance imaging of the right knee was requested. This showed an anteromedial cyst in the knee with well delimited borders, which contained fluid and was suggestive of a synovial cyst (Fig. 3). The image depicting fluid continued through the bone tunnel to the joint cavity, which demonstrated communication between the synovial cyst and the joint. The tibial tunnel did not present any widening or bone absorption and the absorbable screw could not be seen. The anterior cruciate neoligament did not present any alterations.

The patient was treated surgically with excision of the cyst, which was sent for anatomopathological analysis. The tibial tunnel was also closed by means of a bone plug. This bone material was harvested from the anterior cortical bone of the proximal tibia and was placed so as to occlude the opening of the tibial tunnel and thus avoid possible recurrence of the



**Fig. 2 – Location above the surgical scar.**

synovial cyst. The physical examination performed with the patient under anesthesia did not show any signs of anterior instability.

Six months after this operation, the patient did not present any abnormalities on inspection of the knee, or any changes to its range of motion, and he had returned to his physical activities.

The absorbable screw that had been used for graft fixation in 2009 was made of hydroxyapatite with poly-L-lactic acid (PLLA). The anatomopathological result was a synovial cyst

and no presence of any inflammatory reaction or remnants of the material of the absorbable screw were observed.

## Discussion

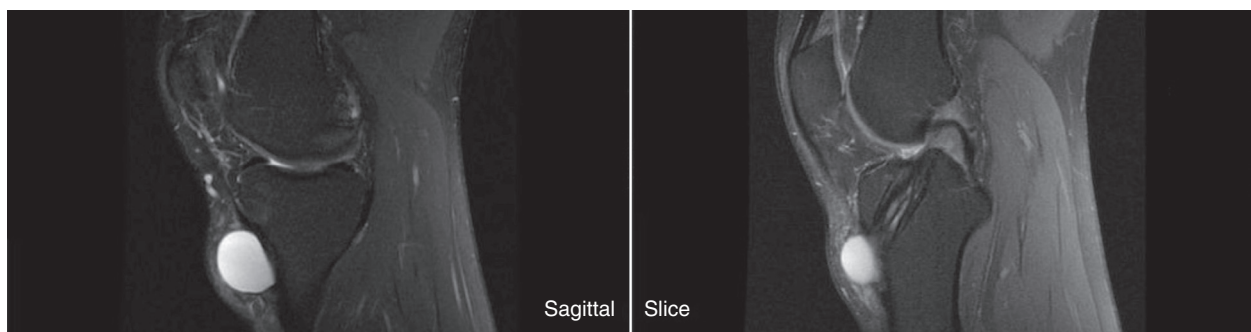
Even with evolution of arthroscopic ACL reconstruction, several complications may occur, going from the time of graft harvesting to late-stage postoperative issues. Tibial fixation using a bioabsorbable fixation screw may evolve with certain complications, and one of these comprises formation of a pre-tibial cyst.<sup>1-3</sup>

When the cyst forms, there is a communication canal between it and the joint, called a pedicle. It is through this pedicle that extravasation of the synovial fluid into the cyst takes place. As the cyst grows in size, it causes compression of the surrounding tissues. The cyst itself does not hurt: the pain results from this compression or irritation of the tissues around it.<sup>4</sup> In the case of the present patient, the only complaint was esthetic, because of the progressively increasing mass.

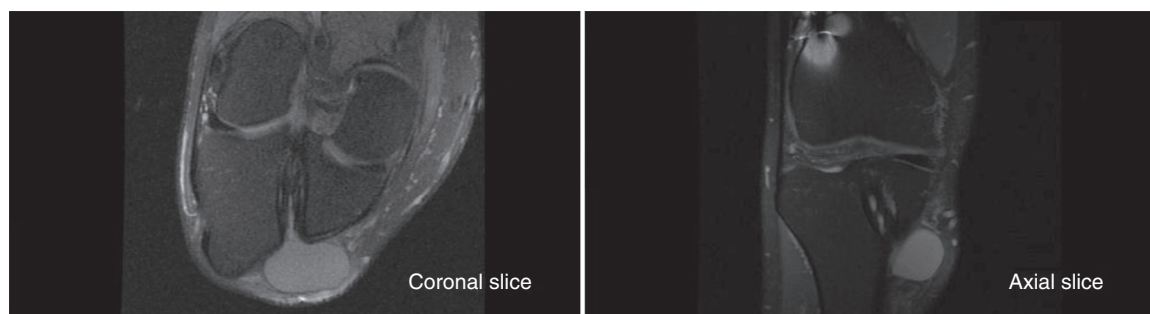
The few previous reports on formation of pre-tibial cysts after ACL reconstruction have described several types of grafts and fixation techniques, which makes it difficult to establish the etiology. Cyst formation occurs on average 3-4 years after the surgical treatment.<sup>5</sup> Some of the etiological explanations proposed have implicated leakage of the synovial fluid through the tibial tunnel,<sup>6,7</sup> which could be caused by a tunnel with a difference in diameter in relation to the graft,<sup>5</sup> eccentric positioning of the tendon in the bone tunnel,<sup>7</sup> intraosseous necrosis of the tendon,<sup>6,8</sup> breakage of the absorbable screw<sup>3</sup> and instability through micromovements of the tendon, which would lead to increased tunnel diameter.<sup>3,5,6</sup>

Several bioabsorbable screw materials are available: PLLA, poly-D-lactic acid (PDLA), poly-DL-lactic acid (PDLA) and polyglycolic acid (PGA). These materials go through five stages of degradation: hydration, depolymerization, loss of integrity of the mass, absorption and elimination.<sup>9</sup> During the degradation, once the screw has been hydrolyzed, it fragments and may release acid hydrolysis products that are harmful to the surrounding tissue. Therefore, the composition of the screw material will probably have an effect on its degradation and absorption rates, which may be related to development of a cyst caused by an inflammatory reaction to a foreign body.<sup>3,7</sup>

Another cause of cyst formation is probably related to incomplete incorporation of the tendon graft material inside



**Fig. 3 – Magnetic resonance imaging (sagittal slice) showing anteromedial image in the knee with well delimited borders and fluid content, suggestive of a synovial cyst.**



**Fig. 4 – Magnetic resonance imaging (coronal and axial slices) showing continuity of the fluid content through the bone tunnel to the joint cavity, thus demonstrating communication between the synovial cyst and the joint.**

the bone tunnel. This lack of full integration of the graft in the bone tunnel leads to formation of a pedicle and subsequently to a synovial cyst. This has been correlated with use of grafts from flexor tendons (semitendinosus and gracilis), which do not have a bone block that consolidates and occludes the tunnel and may cause cyst formation.<sup>5</sup>

However, the pedicle from the cyst needs to be differentiated from accumulations in the bone tunnels, which are a common finding in magnetic resonance imaging during the first year after ACL reconstruction using grafts from flexor tendons. These accumulations generally disappear over time: they do not evolve to cyst formation or lead to tunnel expansion and they are not associated with clinical instability. Sanders et al.<sup>2</sup> reported such accumulations in seven of their eight patients over a postoperative period of 18 months, without cyst formation in any of them. Furthermore, many screws are cannulated and therefore communication between the joint and the pre-tibial area probably exists for some months to years after the operation, but in most cases no cyst develops.<sup>2,3</sup> For this reason, it has been reported that the type of material of the bioabsorbable screw may have some role in cyst formation.<sup>1</sup>

Given the number of ACL reconstructions performed using bioabsorbable screws and the rarity of symptomatic cysts, there may be some relationship with the patients who develop such cysts. Although the use of absorbable materials seems to be well tolerated, without any inflammatory response either experimentally or clinically, these patients may have greater sensitivity to such materials or to particles of a given size during absorption of these materials. The factors that predispose toward development of a sterile inflammatory reaction remain obscure. Future research should continue to delineate the effects of biomaterials in terms of screw degradation and cyst formation rates. Pre-tibial cysts should be considered to be a possible complication of ACL reconstruction when tibial fixation is accomplished using bioabsorbable screws and flexor tendons. According to the literature, patients followed up after cyst removal have presented good evolution with disappearance of symptoms.<sup>1</sup>

In the case of our patient, magnetic resonance imaging showed a communication between the joint and the area of the cyst, which may explain its formation (Fig. 4). However, the etiology of the cyst remains uncertain and it may have occurred through incomplete healing of the graft from the flexor tendons or through a foreign body reaction

with the screw material. There was no tunnel enlargement, bone absorption or sign of instability that could provide a correlation between micromovements and presence of communication from the cyst to the joint. After resection of the cyst, the patient evolved over a six-month period without any clinical complaints and with disappearance of the symptoms and return to physical activities.

### Conflicts of interest

The authors declare no conflicts of interest.

### REFERENCES

1. Lomnas GG, Cassilly RT, Remotti F, Levine WN. Is the etiology of pretibial cyst formation after absorbable interference screw use related to a foreign body reaction? *Clin Orthop Relat Res.* 2011;(469):1082-8.
2. Sanders TG, Tall MA, Mulloy JP, Leis HT. Fluid collections in the osseous tunnel during the first year after anterior cruciate ligament repair using an autologous hamstring graft: natural history and clinical correlation. *J Comput Assist Tomogr.* 2002;26(4):617-21.
3. Tsuda E, Ishibashi Y, Tazawa K, Sato H, Kusumi T, Toh S. Pretibial cyst formation after anterior cruciate ligament reconstruction with a hamstring tendon autograft. *Arthroscopy.* 2006;22(6):691.e1-6.
4. Feldmann DD, Fanelli GC. Development of a synovial cyst following anterior cruciate ligament reconstruction. *Arthroscopy.* 2001;17(2):200-2.
5. Simonian PT, Wickiewicz TL, O'Brien SJ, Dines JS, Schatz JA, Warren RF. Pretibial cyst formation after anterior cruciate ligament surgery with soft tissue autografts. *Arthroscopy.* 1998;14(2):215-20.
6. Victoroff BN, Paulos L, Beck C, Goodfellow DB. Subcutaneous pretibial cyst formation associated with anterior cruciate ligament allografts: a report of four cases and literature review. *Arthroscopy.* 1995;11(4):486-94.
7. Weiler A, Hoffmann RF, Stahelin AC, Helling HJ, Sudkamp NP. Biodegradable implants in sports medicine: the biological base. *Arthroscopy.* 2000;16(3):305-21.
8. Williams RJ. *Controversies in knee surgery.* New York: Oxford University Press, Inc.; 2004.
9. Radford MJ, Noakes J, Read J, Wood DG. The natural history of a bioabsorbable interference screw used for anterior cruciate ligament reconstruction with a 4-strand hamstring technique. *Arthroscopy.* 2005;21(6):707-10.