



## Original Article

# Anatomical reference point for harvesting a flexor graft during arthroscopic reconstruction of the anterior cruciate ligament<sup>☆</sup>



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## ABSTRACT

**Objectives:** To evaluate the prevalence of a vascular network adjacent to the insertion of the pes anserinus, so that it could be used as an anatomical reference point to facilitate harvesting flexor grafts for arthroscopic reconstruction of the anterior cruciate ligament (ACL).

**Methods:** Thirty patients with ACL tears who were going to undergo ACL reconstruction using the tendons of the semitendinosus and gracilis muscles as grafts were selected randomly. During the harvesting of these tendons, the presence or absence of this anatomical reference point was noted.

**Results:** All the patients presented a vascular network of greater or lesser diameter.

**Conclusion:** The vascular network seems to be a good reference point during harvesting of the tendons of the semitendinosus and gracilis muscles, for facilitating graft harvesting.

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## Referência anatômica para retirada de enxerto de flexores na reconstrução artroscópica do ligamento cruzado anterior

## RESUMO

**Objetivos:** Avaliar a prevalência da trama vascular adjacente à inserção da pata de ganso, para que possa ser usada como referência anatômica para facilitar a retirada de enxerto dos flexores na reconstrução artroscópica do ligamento cruzado anterior (LCA).

**Métodos:** Foram selecionados de forma aleatória 30 pacientes com rotura do LCA, os quais foram submetidos à reconstrução do LCA tendo como enxerto os tendões do semitendíneo

## Palavras-chave:

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(ST) e grácil (G). Durante a retirada dos tendões do ST e G, foi observada a presença ou ausência da referência anatômica.

**Resultados:** Todos os pacientes apresentaram trama vascular em menor ou maior diâmetro.

**Conclusão:** O uso da trama vascular durante retirada dos tendões do ST e G parece ser uma boa referência anatômica para facilitar a retirada do enxerto.

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## Introduction

Arthroscopic reconstruction surgery on the anterior cruciate ligament (ACL) has become one of the commonest procedures within orthopedics today.

One of the steps within this procedure consists of choosing the graft. The semitendinosus and gracilis flexor tendons (ST and G) have become a very common graft option used in reconstructing the ACL. In comparison with grafts from the patellar tendon, use of the ST and G enable harvesting with a small incision and cause less pain at the donor site and less dysfunction of the extensor mechanism, but with similar long-term clinical results.<sup>1</sup>

Use of autologous grafts from the ST and G, in relation to heterologous grafts, presents the following benefits: lower risk of failure, absence of risk of disease transmission and rapid incorporation of the graft. On the other hand, harvesting of this type of graft has some potential complications, such as: difficulty in appropriately identifying the tendons; nerve injury; dehiscence of the wound; amputation of the graft and inadequate length; and cosmetically disagreeable anterior scar on the knee.<sup>2</sup>

The aim of the present study was to evaluate the prevalence of vascular trauma adjacent to the insertion of the pes anserinus (PA), in order to use this as an anatomical reference point and to facilitate graft harvesting from the flexors in arthroscopic reconstruction of the ACL.

## Materials and methods

Thirty patients with ACL injuries were selected non-probabilistically and consecutively. The following were taken as inclusion criteria for this study: the patients needed to present ACL injuries without associated injuries (except possibly meniscal injuries); there were no age restrictions, and the mean age was 30.7 years (range: 16–52); there were no restrictions on sex, and there were 23 men (76.67%) and seven women (23.33%); and there were no restrictions on side, and there were 21 injuries (70%) in the right knee and nine (30%) in the left knee. Patients who presented associated injuries or anatomical deformities or previous surgery in the knee affected were excluded from the study.

All the patients were operated by the knee surgery group of the Romeu Krause Institute of Traumatology and Orthopedics, between January and December 2013.

This project was approved by the Institution's Research Ethics Committee, in accordance with Resolution 196/96 of

the National Health Council (Guidelines and Rules Regulating Research Involving Human Beings). Each patient was informed about the aims of the study and was asked to sign a free and informed consent statement. If the patient was considered to be incapable of doing this, a close relative was asked to do it.

## Anatomical considerations

The pes anserinus is the common insertion point, on the anteromedial face of the tibia, of the tendons of the semitendinosus, gracilis and sartorius muscles.<sup>3</sup>

The tendons used as grafts were the semitendinosus and gracilis. Although these are separate structures proximally, they converge towards their anterior insertion in the tibia. The insertion of the gracilis is above that of the semitendinosus. The pes anserinus is located around 19mm (mean value, between 10 and 25 mm) distally and 22.5 mm (mean value, between 13 and 30 mm) medially to the apex of the anterior tuberosity of the tibia.<sup>4</sup>

The insertion of the pes anserinus is surrounded by a vascular arch for which the blood supply comes from the three main arteries of the knee: (1) medial inferior genicular artery (superficial and deep branches); (2) lateral inferior genicular artery; and (3) anterior tibial recurrent artery<sup>5</sup> (Fig. 1).

## Surgical technique

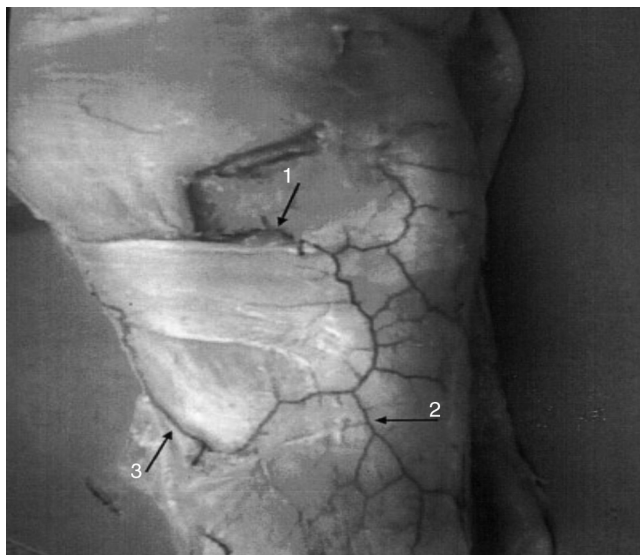
All the patients operated arthroscopically for ACL reconstruction using ST and G grafts underwent emptying of the limb by means of elevation and ischemia using an Esmarch band and pneumatic tourniquet at a pressure of 300 mmHg, independent of the diameter of the thigh or the mean arterial pressure.

In all cases, the vascular network of the insertion of the pes anserinus was identified and used as a reference point for harvesting the graft, in accordance with the technique described above.

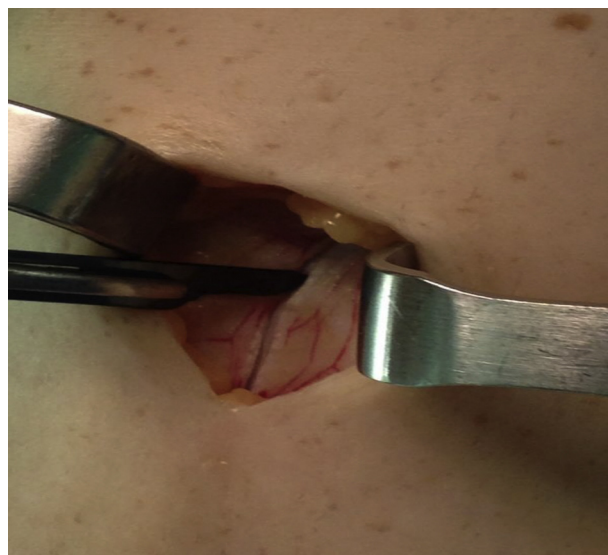
To harvest the graft from the ST and G, an anteromedial access of around 2 cm was made in the tibia, starting 2 cm distally and 2 cm medially to the apex of the anterior tuberosity of the tibia.

After sectioning the skin and subcutaneous tissue, the vascular arch adjacent to the insertion of the pes anserinus was identified (Fig. 2).

Following this, an incision was made using a no. 15 scalpel blade into the path of the vascular arch (Fig. 3). The detachment of the pes anserinus from the periosteum was then



**Fig. 1** – Anatomical specimen from the knee of a fresh cadaver in which the femoral artery was catheterized and received administration of a gelatinous solution of India ink, which showed the vascular arch that surrounds the insertion of the pes anserinus. Arrows show the tributaries of the vascular arch: (1) medial inferior genicular artery (superficial and deep branches); (2) lateral inferior genicular artery; (3) anterior tibial recurrent artery.<sup>5</sup>



**Fig. 3** – Incision in the pes anserinus, which follows the path of the vascular arch.

noted (Fig. 4). The ST and G tendons were then identified and distinguished (Fig. 5).

### Results

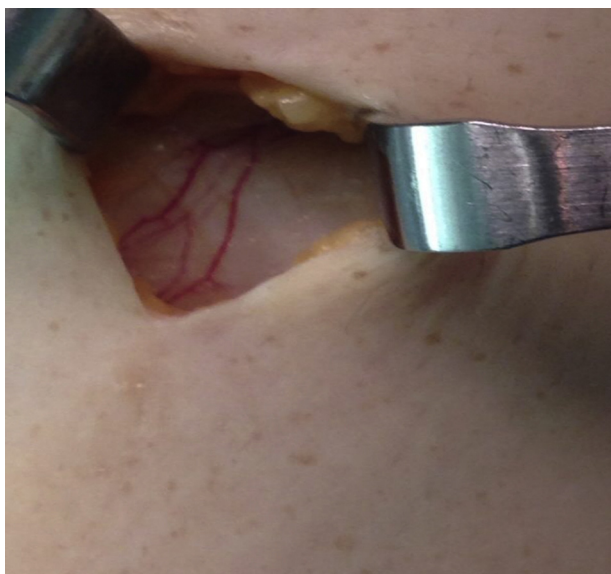
Out of the 30 patients who underwent the procedure of arthroscopic reconstruction of the ACL involving use of the tendons

of the flexor muscles (ST and G), all of them presented the vascular arch with a greater or smaller diameter.

### Discussion

The procedures for ligament reconstruction are well disseminated within orthopedics, and particularly those of the knee. To reconstruct the ACL, surgeons have a range of possibilities for choosing the graft. These include allografts, for those who have access to tissue banks; grafts from the quadriceps and patellar tendons; and, over the last few years, grafts from the semitendinosus and gracilis tendons.

In parallel with use of the ST and G tendons, various complications relating to their harvesting have arisen. Among these, the following can be highlighted: injury to the tibial



**Fig. 2** – Presence of the vascular arch adjacent to the insertion of the pes anserinus.



**Fig. 4** – Pes anserinus totally detached from its insertion.



**Fig. 5 – Identification of the semitendinosus and gracilis tendons.**

collateral ligament; erroneous harvesting of the sartorius muscle; prolonged duration of the operation due to difficulty in isolating and extracting the ST and G tendons<sup>6</sup>; injury to the infrapatellar branch of the saphenous nerve<sup>7</sup>; and even healing problems at the incision that is made for harvesting the grafts.<sup>8</sup>

These complications can be explained partly by the lack of reports in the literature, particularly with regard to the techniques for graft harvesting, from an anatomical reference point that would guide and facilitate their harvesting.

In the present study, the prevalence of a vascular network in the form of an arch, adjacent to the insertion of the pes anserinus, was analyzed. A 100% association between this vascular arch and the area of incision for graft harvesting was seen, which favored easier harvesting without complications, in accordance with the technique described here.

## Conclusion

Given the prevalence and ease of identification of the vascular network of the pes anserinus, this is a useful and reproducible anatomical reference point for harvesting grafts from the semitendinosus and gracilis tendons.

## Conflicts of interest

The authors declare no conflicts of interest.

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