USE OF ALLOGRAFT IN LIGAMENTAR RECONSTRUCTION OF KNEE

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ABSTRACT

Introduction: The use of allograft is a matter of huge interest for orthopaedic surgeons, due to the supposed advantages with its use, like decreased surgical time, larger grafts and no donator site morbidity. Objectives: The aim of this article was to review our experience with the use of allografts on ligament reconstruction. We present the technique applied for graft harvest, preparation and storage, as well as the indications for allograft use and the type of procedure in which it was applied. Methods: We revised the records of 46 patients. Results: We used 09 patellar tendons, 09 anterior tibial tendons, 08 calcaneal tendons, 06 quadriceptal tendons and 01 fibular tendon, mainly for multiple ligamentar reconstructions and ACL reviews. Conclusion: The use of allograft seems to be an interesting option for ligamentar reconstruction.

Keywords: *Knee.Transplantation homologous. Anterior cruciate ligament. Tendon injuries.*

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INTRODUCTION

Ligament reconstructions involve replacing an injured ligament by a tendinous graft peroperativelly removed from the patient (autograft) or extracted from a human cadaver (allograft) submitted to sterilization and storage in tissue libraries after removal.[1]

This process requires more careful attention, aiming to assure a pathogen-free graft.

The tissue sterilization method is difficult and controversial; techniques are based on the use of ethylene oxide or gamma rays. The previous has been used for over 40 years as gas, showing a high toxicity level. As a result, regulatory authorities established minimum residual levels after sterilization process. The use of gamma rays, in turn, requires care, since high irradiation levels can damage biomechanical properties of tissues; after using it, nucleic acid is changed, releasing free radicals, leading to dysfunction and destruction of microorganisms present on tissues.

Investigating a donor for infections is crucial for a graft processing and storage: mandatorily, HIV, hepatitis B and C, syphilis, HTLV tests, among others, must be made. Even so, contamination may occur as a result of a hidden donor infection, *postmortem* tissue proliferation of gastrointestinal bacteria or peroperative contamination.

After sterilization, storage methods are based on deep freezing, as employed in our service, at temperatures ranging from -80°C to -196°C.[2]

The use of allograft was first reported in 1881 *apud* Vangsness[2]; obviously, at that time, the pros and contras to its use were unknown, and, also, little was known then about tissue sterilization processes, as we know them today. It was not before the 1950's that the first tissue libraries appeared, providing support to storage and for planning the materials that could be used in future reconstruction surgeries.

According to data by the American Association of Orthopaedics, about 95 thousand anterior cruciate ligament (ACL) injuries are treated each year in the USA by means of ligament reconstruction.[1] ACL injuries occur when a movement is suddenly stopped with a sudden change of direction, particularly in sports activities, or when the knee is too extended, being more frequent among women.[3]

The use of allografts in ligament reconstruction has increased in the last decade: only in the United States, the number of procedures has doubled during that period[1], with studies showing results comparable to the use of autografts.[2]

The most frequent indication for allografting is multiple ligament reconstructions, thereby reducing surgical times and morbidity associated to the procedure. Among the most commonly employed tissues, the following must be outlined: calcaneous tendon, patellar tendon (BTB), fascia lata, anterior and posterior tibial tendon, and long fibular tendon.[4] (Figure 1)

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Study conducted at the Institute of Orthopaedics and Traumatology, HC/FMUSP
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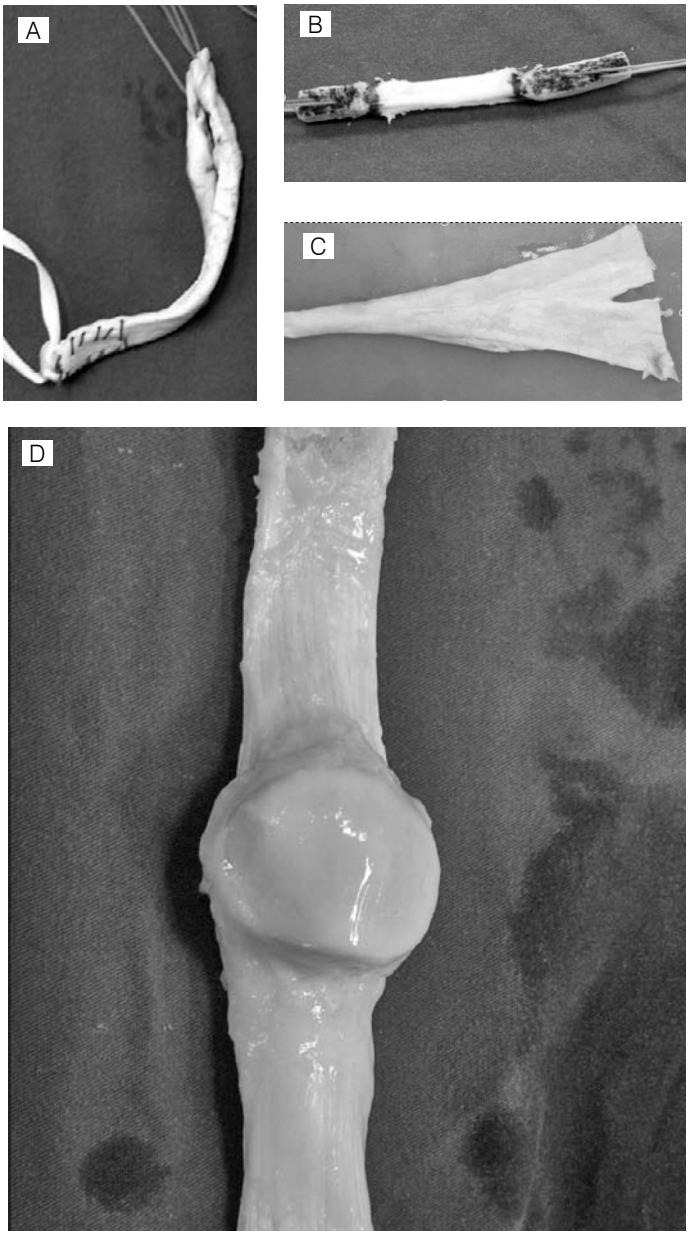

Figure 1 – *(A) Anterior tibial allograft; (B) Patellar ligament allograft; (C) Calcaneus tendon allograft; (D) Extensor mechanism allograft*

Advantages of the use of allografts include: reduced surgical time, smaller incisions, availability of extensive grafts, absence of morbidity at donor site, and lower incidence of arthrofibrosis.[2]
But some disadvantages do exist, such as: tissue incorporation failure, longer graft incorporation time, enlarged bone tunnel[5], and, mainly, risk of contamination by viral and bacterial diseases.[6]
All tendinous grafts - allografts or autografts - follow a timeline for tissue integration, starting with tissue necrosis, revascularization, cell reproliferation and remodeling.[7] After an autogenous implant, fibroblasts growth is seen during the first two months, with tissue maturation being observed after 10 months. On the other hand, allograft incorporation has been shown to occur slowly, both in humans and in animals.[8] The process is significantly affected by the tissue sterilization and storage method, because these act on its biological incorporation properties.[9,10]
The risk of viral diseases being transmitted after an appropriate selection of the donor is about 1 : 1 500 000, which is favorably comparable to the risk of transmission in blood transfusions, which is 1: 600 000.[11]
The objective of this study was to assess how allografts are being used for ligament reconstructions in our service.

MATERIALS AND METHODS

This investigation was a retrospective evaluation of 46 patients submitted to ligament reconstructions between 1999 and 2007 using tissues supplied by our Tissue Library as graft source for performing a surgical procedure.
The retrospective analysis involved a review of the medical files, through which we have documented the procedure, the diagnosis at the time of surgery, as well as the kind of surgical procedure performed and which tissue was employed on each patient.

RESULTS

Thirty-four male patients and 12 female patients were reviewed, the 46 operated cases were followed up on an outpatient basis, with follow-up time ranging from 10 months to 9 years (mean: 3.1 years). (Figure 2)
The following grafts were employed:- Patellar tendon: 30 units.- Anterior tibial tendon: 9 units.- Calcaneus tendon: 8 units.- Quadriceptal tendon: 6 units.- Fibular tendon: 1 unit. (Figure 3)

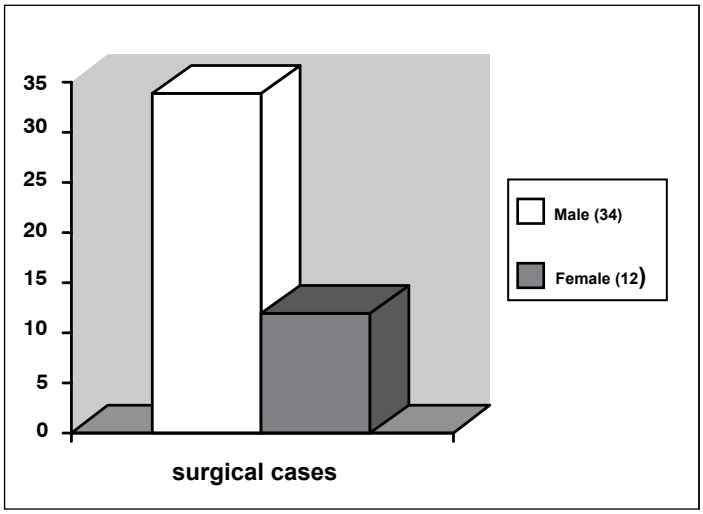

Figure 2 – *Number of performed procedures, distributed by gender*

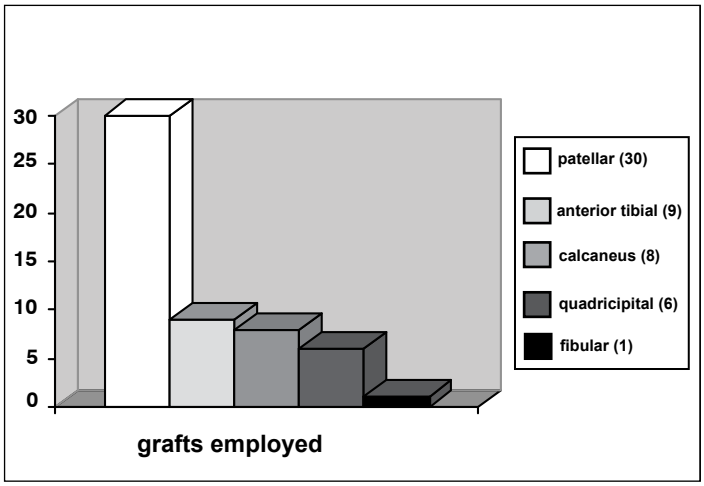

Figure 3 – *Kinds of grafts used in reconstructions*

Indications for allografting were the following:
– Multiple ligament reconstructions: 20 patients (Figure 4) - 12 patellar tendon units, 4 anterior tibial tendon units, 7 calcaneus tendon units, 5 quadriceptal tendon units, and 1 fibular tendon unit were used. (Figure 5)
– ACL reconstruction review: 14 patients - 8 patellar tendon units, 4 anterior tibial tendon units, 1 calcaneus tendon unit, and 1 quadriceptal tendon unit were used. (Figure 6)
– Standalone reconstruction of the posterior cruciate ligament (PCL): 10 patients - 8 patellar tendon units, 1 anterior tibial tendon unit, and 1 fibular tendon unit were used. (Figure 7)

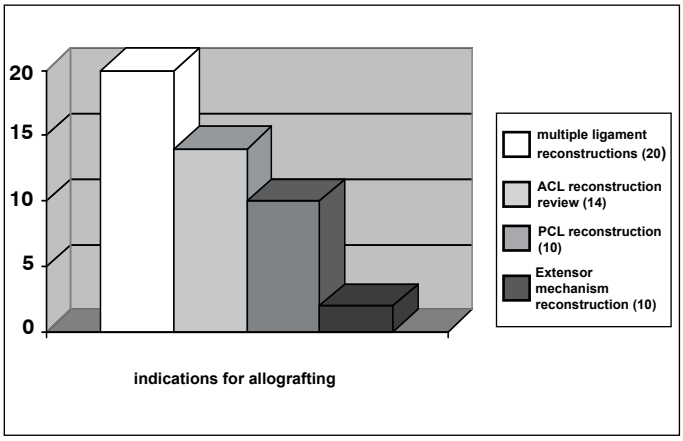

Figure 4 – *Procedures performed with the use of allografts*

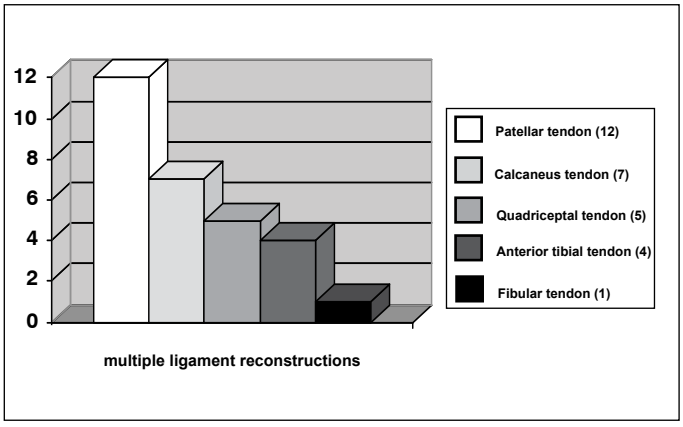

Figure 5 – *Kinds of grafts used in multiple ligament reconstructions*

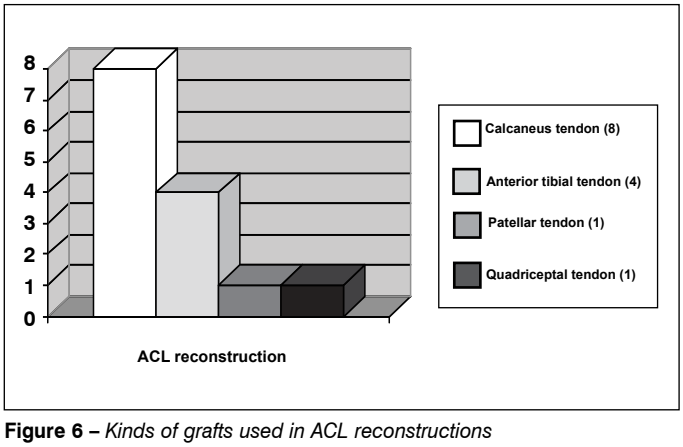

Figure 6 – *Kinds of grafts used in ACL reconstructions*

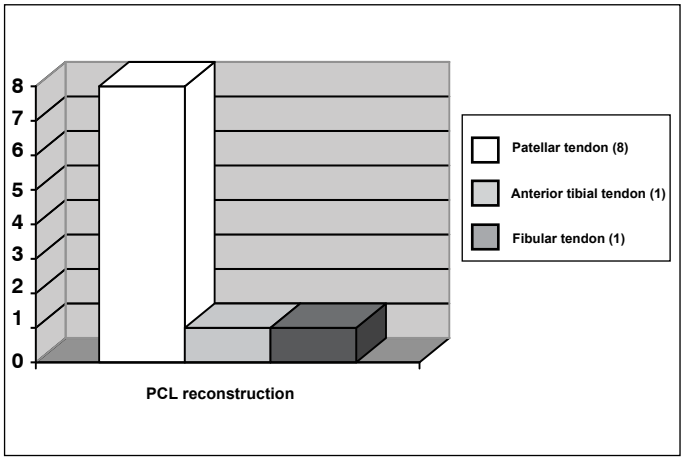

Figure 7 – *Kinds of grafts used in PCL reconstructions*

– Extensor mechanism reconstruction: 2 patients - 2 patellar tendon units were used. (Figure 8)

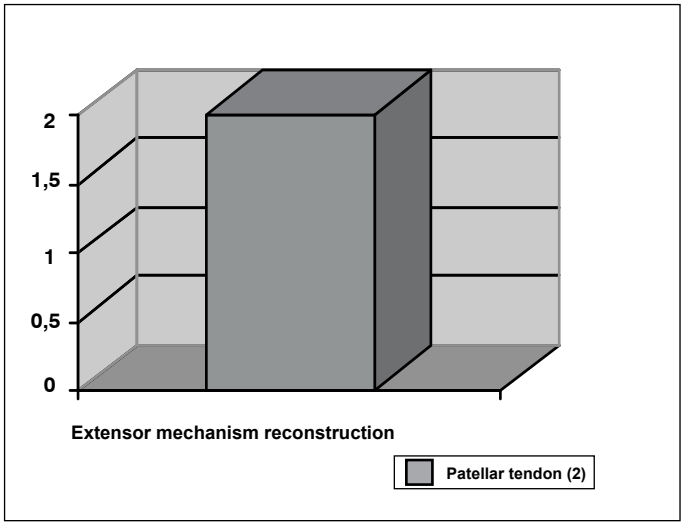

Figure 8 – *The only kind of allograft used on extensor mechanism reconstruction: patellar tendon*

DISCUSSION

The use of tissues sourced by cadavers and stored on tissue libraries is an alternative for multiple ligament reconstructions, because it provides an appropriate source of grafts, without the morbidity usually associated to the removal of multiple autografts.[12] In the posterior cruciate ligament reconstruction associated to posterolateral cantus reconstruction, in the ACL reconstruction associated to medial collateral ligament reconstruction, the use of allografts has been shown to provide good results.[13-16] In our service, the main indication for allografting was multiple ligament reconstructions.
In ACL reconstruction review surgeries, the use of allografts is a good alternative, since it avoids the morbidity associated to the removal of further tissue on the injured side or, eventually, the need of removing tissue on the non-injured side. Results of ACL reconstruction reviews with allografting have been shown to be comparable to the use of autologous grafts.[17]
Viral and bacterial infection associated to the use of allografts is a very rare event. [18] The risk of bacterial infection transmission

through platelet concentration transfusion is 1:2172.[19] The overall postoperative infection rate reported by nosocomial infection control centers in the United States ranges from 0.6% to 2%.

To date, we have found no viral transmission case. The bacterial infection rate among patients submitted to surgical procedures with the use of allografts is within our general incidence for nosocomial infection.[20]

CONCLUSION

The use of allografts is a safe alternative, certainly providing less morbidity to surgical procedures, and must be considered particularly in multiple ligament reconstruction surgeries and reviews.

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