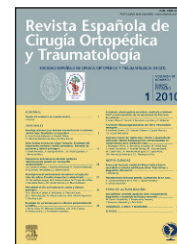


## Revista Española de Cirugía Ortopédica y Traumatología

www.elsevier.es/rot



### ORIGINAL ARTICLE

## Update on Anterior Cruciate Ligament Reconstruction in Spain. Survey Using an Electronic Questionnaire

X. Pelfort<sup>a,\*</sup>, R. Torres<sup>a</sup>, G. Vilà<sup>a</sup>, J.C. Monllau<sup>b</sup>, J. Leal<sup>a</sup>, P. Hinarejos<sup>a</sup> and L.I. Puig<sup>a</sup>

<sup>a</sup> Parc de Salut Mar-Esperança, Knee Unit, Universitat Autònoma de Barcelona, Barcelona, Spain

<sup>b</sup> Hospital de la Santa Creu i Sant Pau, Universitat Autònoma de Barcelona, Barcelona, Spain

Received April 6, 2010; accepted June 2, 2010

#### KEYWORDS

Anterior cruciate ligament;  
Trans tibial;  
Patellar tendon;  
Survey

#### Abstract

**Objective:** The aim of this study was to know what were the preferences of the Spanish surgeons about different aspects of anterior cruciate ligament (ACL) reconstruction.

**Material and methods:** In February 2009, 910 surveys regarding some technical aspects of ACL reconstruction was mailed to surgeons who perform this kind of surgery in Spain. The survey had 8 questions: number of ACL reconstructions per year, two clinical cases, what kind of graft was preferred, the use of simple or double bundle reconstruction, the time and the amount of tension to apply to the hamstrings during ACL reconstruction and finally, some aspects about the creation of the femoral tunnel.

**Results:** A total of 102 responses were received. Most of them (66%) had between 5-20 years of experience. A 60.3% of them performed between 10-50 procedures per year. The first choice graft in both clinical cases was autologous hamstring tendons (62% and 64%). The trans tibial technique (71.8%) and the single bundle technique (79.1%) were preferred.

**Discussion:** The management of the ACL injuries remains unclear. Like in other countries with available ACL registries, autologous hamstrings have increased their use for ACL reconstruction. However, there is not consensus in some aspects of the technique.

**Conclusion:** The preferred technique for ACL reconstruction in this group was the trans tibial technique with single bundle and using autologous hamstring tendons.

© 2010 SECOT. Published by Elsevier España, S.L. All rights reserved.

\* Corresponding author.

E-mail address: 92858@parcdesalutmar.cat (X. Pelfort).

**PALABRAS CLAVE**

Ligamento cruzado anterior;  
Isquiotibiales;  
Tendón rotuliano;  
Encuesta

## Situación actual de la reconstrucción del ligamento cruzado anterior en nuestro país. Encuesta mediante formato electrónico

**Resumen**

**Objetivo:** Conocer cuáles son las preferencias de los cirujanos de nuestro país en referencia a algunos aspectos técnicos y epidemiológicos de la reconstrucción del ligamento cruzado anterior (LCA).

**Material y método:** Durante el mes de febrero del 2009, se realizó una encuesta mediante el envío de 910 correos electrónicos a cirujanos de nuestro país que realizan de forma habitual reconstrucciones del LCA. Constaba de 8 preguntas en relación a los años de experiencia, número de reconstrucciones realizadas, técnica de elección en 2 casos clínicos ejemplo, tipo de injerto preferido, técnica con fascículo simple o doble, fuerza y tiempo de pretensado en el caso de los isquiotibiales y técnica de realización del túnel femoral.

**Resultados:** Se obtuvo respuesta de 102 cirujanos. Un 66% de ellos tenían una experiencia entre 5-20 años. El 60,3% de ellos realizaba entre 10-50 reconstrucciones de LCA por año. El injerto de primera elección para los 2 casos clínicos propuestos fueron los tendones isquiotibiales con un 62-64%. Asimismo, predominaron las técnicas con fascículo simple (79,1%) y transtibial (71,8%).

**Discusión:** El tratamiento de las lesiones de LCA sigue siendo controvertido. Parece que como ha sucedido en otros países que disponen de sistemas de registro adecuados, la técnica de reconstrucción con isquiotibiales ha aumentado su popularidad. No obstante, sigue existiendo una gran falta de consenso en algunos aspectos importantes de la técnica.

**Conclusiones:** La técnica de reconstrucción con isquiotibiales, fascículo simple y transtibial fue la predominante en esta muestra.

© 2010 SECOT. Publicado por Elsevier España, S.L. Todos los derechos reservados.

## Introduction

Reconstruction of the anterior cruciate ligament (ACL) has undergone remarkable modifications in recent years, as well as a substantial increase in the number of procedures being performed. In the United States, more than 100,000 ACLs are reconstructed every year<sup>1</sup> and Danish registries record an incidence rate of 38 cases per 100,000 inhabitants (91/100,000 between 15-39 years of age).<sup>2</sup> Some of the issues constantly being reviewed have to do with aspects of the surgical technique, the grafts used for the reconstruction and the most appropriate implants for primary plasty fixation. In all honesty, the graft and the system of fixation that provide the best clinical or functional outcomes remain unknown. In general, the possibilities are so diverse that the vast number of variables that must be factored in (surgeon preferences, the surgeon's experience, patient requirement, choice of graft, fixation systems, RHB protocol, etc.) make it difficult to design suitable randomized studies. We currently do not have a State registry that enables us to know the number of ACL reconstructions that are being performed, as well as the most widely used techniques.

The objective of our work was to gain greater insight into the current trend in Spain with respect to the aspects of ACL reconstruction we consider to be the most controversial and to that end we drafted an 8 question survey using an e survey. The working hypothesis was that there had been a shift in graft preferences in favour of the use of the ischiotibial tendon.

## Material and methods

The survey consisted of 8 short questions we felt could be answered in less than 5 minutes and that are detailed below:

**Surgeons' experience.** Surgeons were asked how many years of experience they had in performing ACL reconstructions (<5, 5-10, 10-20, or >20 years).

**Number of procedures.** Each surgeon gave an approximate number of ACL reconstructions he/ she performed each year (<10, 10-50, 50-100, or >100).

**Case 1.** A case report of an ACL injury in a 29-year-old male patient who regularly practised sports. They were asked about their first choice for plasty: autologous patellar tendon, autologous ischiotibial, or allograft.

**Case 2.** A case report of an ACL injury in a 52-year-old female patient who occasionally practised sports. Again, they were asked about their first choice for plasty: autologous patellar tendon, autologous ischiotibial, or allograft.

**Number of bundles.** Each surgeon responded as to whether they generally use the reconstruction technique with a single or double bundle.

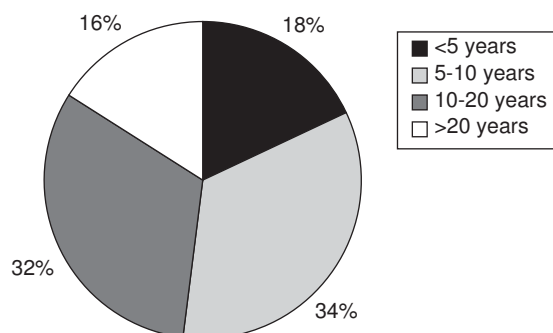
**Pre-stressing time.** In the case of the surgeons who used the ischiotibial tendon, they were asked how many minutes of plasty pre-stressing prior to implanting it and proceeding to bone fixation (<5, 5-10, >10 or until it was implanted).

**Pre-stressing force.** Furthermore, in the case of the ischiotibial tendon, surgeons were also asked about the

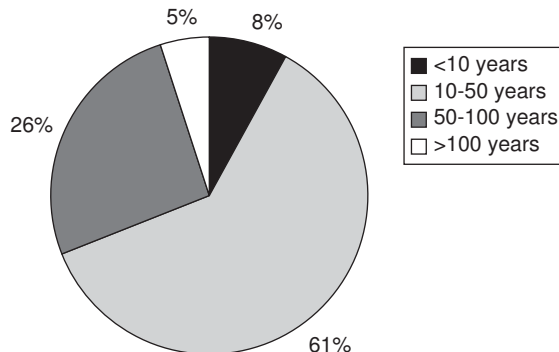
force in kPa used for pre-stressing (>5, 5-10, 10-20, or >20 kPa).

**Femoral tunnel.** Surgeons were asked about the technique used to create the femoral tunnel, contemplating 2 groups we believe account for the majority (the single tunnel or transtibial technique, double tunnel technique or from the anterior-internal portal), and a third option defined as "other" (for instance, outside-in femoral tunnel).

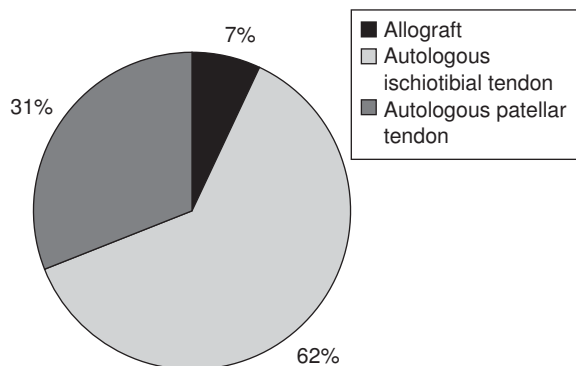
The survey was sent out by e-mail. The e-mail addresses were obtained from the website of the Spanish Arthroscopy Association (AEA in its Spanish acronym), from works published in recent years in the Spanish Journal of Orthopaedic Surgery and Traumatology, as well as in other



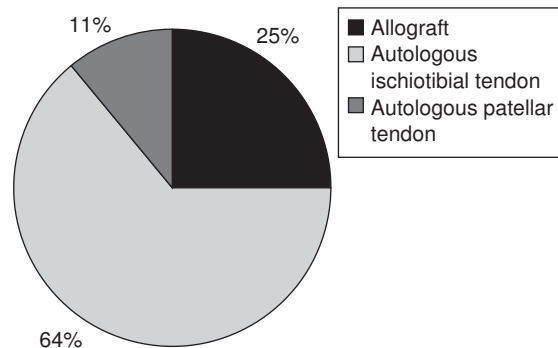
**Figure 1** Years of surgeons' experience.



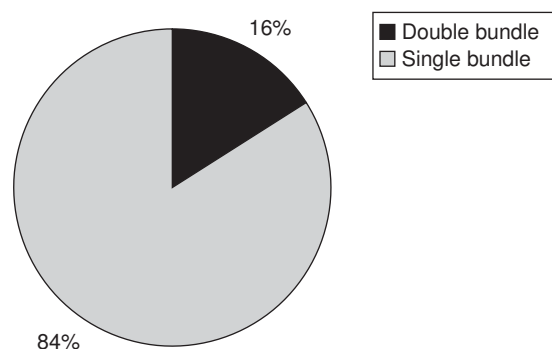
**Figure 2** Number of procedures per year.



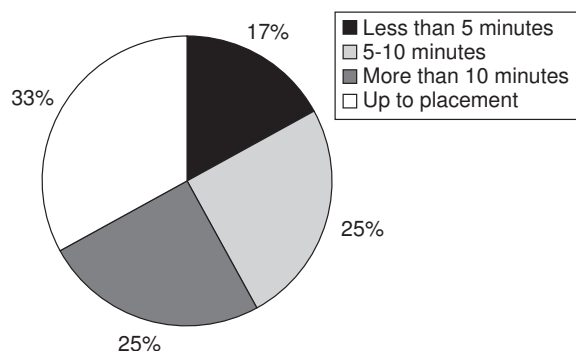
**Figure 3** Case 1 (29-year male patient, regular athlete).



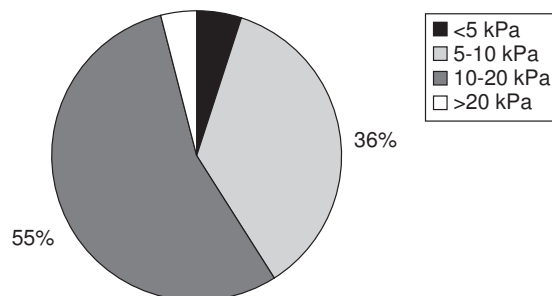
**Figure 4** Case 2 (52-year old female patient, occasional athlete).



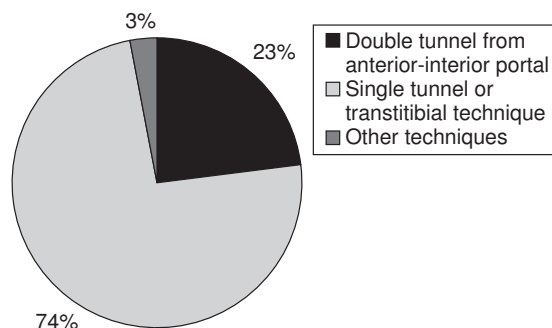
**Figure 5** Number of bundles.



**Figure 6** Pre-stressing time.



**Figure 7** Pre-stressing force.



**Figure 8** Femoral tunnel.

national journals, in which the lead author's e-mail address is listed, and finally, with the collaboration of many surgeons who not only answered the survey, but also added more e mail addresses to our database. Finally, 910 surveys were sent out. The statistical study was carried out using the SPSS statistical software programme and  $\chi^2$  tests or Fisher's exact test were applied, as appropriate.

## Results

We received a response from 102 surgeons. The answers obtained are summarized in figures 1-8. Some 66% of the surgeons had between 5 and 20 years of experience in treating ACL lesions. Sixty per cent of them performed between 10 and 50 reconstructions every year and only 5% carried out more than 100. Sixty-two per cent chose the ischiotibial plasty for the ACL reconstruction in the case of the 29-year old male athlete and 64% also chose it to treat the 52-year old female patient who practised sports occasionally. In 84% of the cases, a single bundle technique was used. The duration of pre-stressing of the ischiotibial graft presented the highest degree of disparity, although 91% of the surgeons surveyed pre-stressed applying between 5-20 kp of force. Insofar as the femoral tunnel is concerned, 74% of the surgeons created the tunnel by means of the transtibial technique.

## Discussion

One of the main limitations of works carried out in the form of a survey is the response rate achieved, such that one of the aims of this work consisted of disseminating the survey to the greatest number of surgeons possible. In this case, 910 surveys were e mailed out; of these, 102 responses were received. This represents a response rate of 11.2%. Nevertheless, there are certain issues that must be taken into account. More than 600 surveys were e-mailed to the default addresses created by the AEA for its members and that are freely accessed through this association's website. However, in many cases, the members don't make regular use of this e-mail address. If we leave aside this group of unanswered e-mails, there was a 30.7% response rate. Duquin et al., in a survey conducted regarding ACL reconstruction to members of the *American Orthopaedic*

*Society for Sports Medicine (AOSSM)* attained a response rate of 57%.<sup>3</sup> It is likely that the scant culture that exists in our setting with respect to the value of surveys has had a bearing on the result.

With respect to the type of plasty used as first choice, the percentage of ischiotibial graft use was constant and was greater than the use of patellar tendon in the 2 clinical cases proposed (62 and 64% respectively). Nevertheless, a decrease was seen in the use of autologous patellar tendon (from 31 to 11%) in the example of the 52-year old patient, at the expense of an increased use of allograft (from 7 to 25%). One possible interpretation is that it was done in these cases to avoid the morbidity of harvesting the plasty and/ or for cosmetic reasons. The percentages obtained were similar to those seen in some previously published series. Lind et al., after reviewing the Danish registry between 2005 and 2007, obtained 71% of primary reconstructions with ischiotibial grafts versus 21% with patellar tendon.<sup>2</sup> Duquin et al., in their work published in 2006 with a North American population, obtained a rate of 32% use of ischiotibial grafts, 46% patellar tendon, and 22% allografts.<sup>3</sup> However, they observed a growing trend in the proportion of ischiotibial plasties and declining trend in the use of patellar tendon in comparison to preceding years.

With respect to the number of bundles used, the single bundle technique was the clear favourite at 84% and the femoral tunnel was performed in 74% of the cases with the conventional transtibial technique. In these cases, it is difficult to compare outcomes, since most of the literature reviewed presents clinical series and comparative or experimental works using different techniques, which in no case enable us to assess which ones are predominant.<sup>4-13</sup>

As regards the force and time of pre-stressing for the ischiotibial grafts, 91% of the surgeons applied between 5 and 20 kp although there was absolute variability with respect to the duration of pre-stressing. Arneja et al. in their review of the literature dealing with ACL plasty pre-stressing, conclude that in the case of the ischiotibial tendons, no specific regimen can be recommended given the paucity of appropriate randomized works.<sup>14</sup> The results obtained in this sample confirm this lack of consensus. Nevertheless, there are different references in the literature about the need to create registries of ACL reconstructions that can shed light on the most prevalent techniques and their outcomes.<sup>2,15-18</sup>

In conclusion, on the basis of the results obtained in this sample, the ACL reconstruction technique with autologous ischiotibial tendons, with a single bundle, and using the transtibial reconstruction technique can be considered to be the leading pattern at present in our setting.

## Conflict of interests

The authors state that they have no conflict of interests.

## Acknowledgements

To Sergi Mojal, member of the Methodological Advisory Service in Biomedical Research at the Municipal Institute of

Medical Research (IMIM in its Spanish acronym), for his help in designing the survey and the statistical analysis performed.

## References

1. Fu F, Christel P, Miller MD, Johnson DL. Graft selection for anterior cruciate ligament reconstruction. *Instr Course Lect*. 2009;58:337-54.
2. Lind M, Menhert F, Pedersen A. The first results from the Danish reconstruction registry: epidemiologic and 2 year follow-up results from 5818 knee ligament reconstructions. *Knee Surg Sports Traumatol Arthrosc*. 2009;17:117-24.
3. Duquin TR, Wind WM, Fineberg MS, Smolinski RJ, Buyea CM. Current trends in anterior cruciate ligament reconstruction. *J Knee Surg*. 2009;1:7-12.
4. Aglietti P, Giron F, Losco M, Cuomo P, Ciardullo A, Mondanelli N. Comparison between single-bundle and double-bundle anterior cruciate ligament (ACL) reconstruction. *Am J Sports Med*. 2010;38:25-34.
5. Bignozzi S, Zaffagnini S, Lopomo N, Fu FH, Irrgang JJ, Marcacci M. Clinical relevance of static and dynamic tests after anatomic double-bundle ACL reconstruction. *Knee Surg Sports Traumatol Arthrosc*. 2010;18:37-42.
6. Sastre S, Popescu D, Núñez M, Pomes J, Tomas X, Peidro L. Double-bundle versus single-bundle ACL reconstruction using the horizontal femoral position: a prospective, randomized study. *Knee Surg Sports Traumatol Arthrosc*. 2010;18:32-6.
7. Ho JY, Gardiner A, Shah V, Steiner ME. Equal kinematics between central anatomic single-bundle and double-bundle anterior cruciate ligament reconstructions. *Arthroscopy*. 2009;25:464-72.
8. Nikolaou VS, Efsthopoulos N, Sourlas I, Plichou A, Papachristou G. Anatomic double-bundle versus single-bundle ACL reconstruction: a comparative biomechanical study in rabbits. *Knee Surg Sports Traumatol Arthrosc*. 2009;17:895-906.
9. Toritsuka Y, Amano H, Kuwano M, Iwai T, Mae T, Ohzono K, et al. Outcome of double-bundle ACL reconstruction using hamstring tendons. *Knee Surg Sports Traumatol Arthrosc*. 2009;17:456-63.
10. Bedi A, Raphael B, Maderazo A, Pavlov H, Williams RJ. Transtibial versus anteromedial portal drilling for anterior cruciate ligament reconstruction: a cadaveric study of femoral tunnel length and obliquity. *Arthroscopy*. 2010;26:342-50.
11. Inoue M, Tokuyasu S, Kuwahara S, Yasohima N, Kasahara Y, Kondo E, et al. Tunnel location in transparent 3-dimensional CT in anatomic double-bundle anterior cruciate ligament reconstruction with the transtibial tunnel technique. *Knee Surg Sports Traumatol Arthrosc*. 2009. (Epub ahead of print)
12. Gelber PE, Reina F, Torres R, Pelfort X, Tey M, Monllau JC. Anatomic single-bundle anterior cruciate ligament reconstruction from the anteromedial portal: Evaluation of transverse femoral fixation in a cadaveric model. *Arthroscopy*. 2010. [in press]
13. Alentorn-Geli E, Lajara F, Samitier G, Cugat R. The transtibial versus the anteromedial portal technique in the arthroscopic bone-patellar tendon-bone anterior cruciate ligament reconstruction. *Knee Surg Sports Traumatol Arthrosc*. 2009;10.
14. Arneja S, McConkey MO, Mulpuri K, Chin P, Gilbert MK, Pegan WD, et al. Graft tensioning in anterior cruciate ligament reconstruction: a systematic review of randomized controlled trials. *Arthroscopy*. 2009;25:200-7.
15. Eriksson E. A European ACL register. *Knee Surg Sports Traumatol Arthrosc*. 2006;14:309.
16. Maffulli N. A European ACL register. *Knee Surg Sports Traumatol Arthrosc*. 2007;15:685.
17. Granan LP, Bahr R, Steindal K, Furnes O, Engebretsen L. Development of a national cruciate ligament surgery registry: the Norwegian National Knee Ligament Registry. *Am J Sports Med*. 2008;36:308-15.
18. Granan LP, Forssblad M, Lind M, Engebretsen L. The Scandinavian ACL registries 2004-2007: baseline epidemiology. *Acta Orthop*. 2009;80:563-7.