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QUESTION

DO YOU REHAB YOUR PATELLAR TENDON AUTOGRAFT AND ALLOGRAFT PATIENTS DIFFERENTLY?

John-Paul H. Rue, MD, LCDR, MC, USN, and Brian J. Cole, MD, MBA

No, the rehabilitation is the same regardless of whether I use patellar tendon autograft or allograft. Many of my patients report less pain initially with allograft reconstruction, but this usually resolves within the first few weeks and after that there is no appreciable difference between the 2 graft sources. This has been validated by several authors who have reported no significant difference in long-term outcomes between anterior cruciate ligament (ACL) reconstructions with patellar tendon autografts and allografts using similar accelerated rehabilitation protocols.^{1,2}

The current sterilization techniques for bone-patellar tendon-bone (BTB) allograft tissue are aseptic harvesting, cryopreservation, and gamma radiation with low-dose radiation of less than 3.0 Mrad.³ These techniques have been shown to be the most effective methods of producing a sterile ACL graft and maximizing structural integrity while minimizing disease transmission and are significant improvements over previous methods of sterilization, which often compromised the structural integrity of the allografts.⁴

The initial graft tensile strength of BTB autograft is 2977 N (Newtons) with a stiffness of 620 N/mm.⁵ The strength and stiffness are similar for BTB autografts and allografts that have been sterilized using the previously mentioned techniques.⁶ We use interference screws for both the femoral and tibial fixation in a similar fashion for both graft choices. This fixation provides bone-to-bone healing in approximately 6 weeks for autografts. Longer bone-to-bone healing rates of greater than 6 months have been reported due to slower incorporation in allografts.^{6,7} There is no evidence that this delay in bone-to-bone healing has any detrimental effect on the strength of the allograft reconstruction.

Both autograft and allograft tissues (Figures 22-1 and 22-2) undergo a process of ligamentization, and both initially decrease in strength and then subsequently undergo gradual increases in strength. This entire revascularization process typically occurs over a 5-month period. By 6 months, both grafts resemble normally oriented connective tissue,

Figure 22-1. BTB autograft.

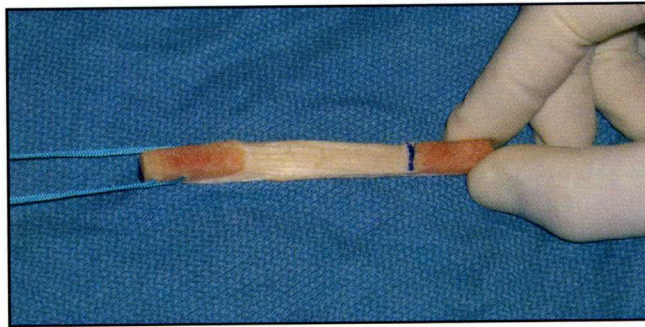


Figure 22-2. BTB allograft.



and histological studies have shown no difference in allograft and autograft BTB grafts at 1 year.⁸ Because allograft and autograft BTB grafts are similar in their structural and mechanical properties, we believe it is reasonable to follow the same postoperative rehabilitation protocols for either graft choice.⁹

My rehabilitation protocol is focused on achieving several goals. These are progressive weight bearing, restoration of motion with emphasis on full extension, quadriceps strengthening, control of inflammation, and restoration of normal gait. Because the grafts are similar in their structural and mechanical properties (Table 22-1), the goals of rehabilitation and how we achieve them are the same regardless of whether the patient has a BTB allograft or autograft. As mentioned previously, many of my patients who have allograft ACL reconstructions may experience less pain than their autograft counterparts. In fact, a subset of this population may attempt to exceed the biologic properties of the allograft because of the minimum amount of pain that they experience. I have found that when properly educated about these time-dependent properties, these patients will slow down their rehabilitation accordingly.

Disclaimer

The views expressed in this article are those of the author and do not necessarily reflect the official policy or position of the Department of the Navy, Department of Defense, nor the United States Government.

Table 22-1

Comparison of Bone-Patellar Tendon-Bone Autograft and Allograft

<i>Graft</i>	<i>Bone-to-Bone Fixation?</i>	<i>Timing of Bone-to-Bone Healing</i>	<i>Duration of Revascularization and Ligamentization</i>
Bone-patellar tendon-bone autograft	Yes	6 to 10 weeks	5 to 6 months
Bone-patellar tendon-bone allograft	Yes	Up to 1 year	5 to 6 months

References

1. Harner C, Olson E, Irrgang J, Silverstein S, Fu F, Silbey M. Allograft versus autograft anterior cruciate ligament reconstruction: 3- to 5-year outcome. *Clin Orthop Relat Res.* 1996;324:134-144.
2. Shelton W, Papendick L, Dukes A. Autograft versus allograft anterior cruciate ligament reconstruction. *Arthroscopy.* 1997;13:446-449.
3. West R, Harner C. Graft selection in anterior cruciate ligament reconstruction. *J Am Acad Orthop Surg.* 2005; 13:197-207.
4. Vangsness C, Garcia I, Mills C, Kainer M, Roberts M, Moore T. Allograft transplantation in the knee: tissue regulation, procurement, processing, and sterilization. *Am J Sports Med.* 2003;31:474-481.
5. Noyes F, Butler D, Grood E, Zernicke R, Hefzy M. Biomechanical analysis of human ligament grafts used in knee-ligament repairs and reconstructions. *J Bone Joint Surg Am.* 1984;66:344-352.
6. Markolf K, Burchfield D, Shapiro M, Cha C, Finerman G, Slauterbeck J. Biomechanical consequences of replacement of the anterior cruciate ligament with a patellar ligament allograft: II. Forces in the graft compared with forces in the intact ligament. *J Bone Joint Surg Am.* 1996;78:1728-1734.
7. Arnoczky S. Biology of ACL reconstructions. What happens to the graft? *Instr Course Lect.* 1996;45:229-233.
8. Arnoczky S, Warren R, Ashlock M. Replacement of the anterior cruciate ligament using a patellar tendon allograft. An experimental study. *J Bone Joint Surg Am.* 1986;68:376-385.
9. Cole B. ACL patellar tendon allograft/autograft reconstruction rehabilitation program. Available at: <http://www.cartilagedoc.org>. Accessed October 1, 2006.