

- anterior cruciate ligament reconstruction. *Knee Surg Sports Traumatol Arthrosc* 2008;16:935-947.
4. Kuroda R, Kurosaka M, Yoshiya S, Mizuno K. Localization of growth factors in the reconstructed anterior cruciate ligament: Immunohistological study in dog. *Knee Surg Sports Traumatol Arthrosc* 2000;8:120-126.
 5. Rodeo SA, Arnocky SD, Torzilli PA, Hidaka C, Warren RF. Tendon-healing in a bone tunnel. A biomechanical and histological study in the dog. *J Bone Joint Surg Am* 1993;75:1795-1803.
 6. Goradia VK, Rochat MC, Grana WA, Rohrer MD, Prasad HS. Tendon-to-bone healing of a semitendinosus tendon autograft used for ACL reconstruction in a sheep model. *Am J Knee Surg* 2000;13:143-152.
 7. Arai Y, Hara K, Takahashi T, et al. Evaluation of the vascular status of autogenous hamstring tendon grafts after anterior cruciate ligament reconstruction in humans using magnetic resonance angiography. *Knee Surg Sports Traumatol Arthrosc* 2008;16:342-347.

Author's Reply

We thank Drs. Vogrin, Rozman, and Haspl for their letter referring to our article published in the December 2008 issue of *Arthroscopy*. Clearly, their analysis reflects an important interest regarding the topic. Nevertheless, we believe that some of the statements on which their critique is based have to be carefully examined. Specifically, it would be somewhat risky to affirm that "a complete integration of the graft with the surrounding bone occurs as early as 12 weeks." Although it is true that a lot of information can be found when doing a thorough search of the literature for different animal models, including the studies of Kohno et al.¹ in rabbits and Kuroda et al.² in dogs, as Vogrin et al. referenced in their letter, mentioning periods of fewer than 3 months, it does not seem reasonable to extrapolate the results obtained too categorically. The literature review carried out by Ekdahl et al.,³ mentioned by Vogrin et al., only mentions 2 articles, both of which are case reports of humans with reference to integration periods of fewer than 3 months. It is worth emphasizing that in our study, magnetic resonance imaging changes between the third and sixth month existed and that at 6 months, there was a variable percentage of immature grafts according to the observed parameters. Therefore it seems reasonable to think that the graft healing process takes more time in humans than in animals.

We agree with the statement of Vogrin et al. that the absence of an interface should be a sign of major graft integration, and we considered it so in our study. Regarding the evaluation of angiogenesis with magnetic resonance angiography, the study mentioned by Vogrin et al. reported progression of revascularization of between 9 and 22 months, showing important changes in this period.⁴ This confirms that there are subsequent variations with long pe-

riods of time whose interpretation makes it even more complex to affirm the sensibility of using this method as an instrument to measure early graft healing.

Understanding the spirit of the critique of Vogrin et al., we sincerely hope that on the basis of the open discussion hereby established, new studies can be designed that may clarify the numerous unresolved questions that still exist regarding this topic.

Mario Orrego, M.D.
Catalina Larrain, M.D.
Department of Traumatology
Hospital Militar de Santiago
Universidad de Los Andes
Santiago, Chile

References

1. Kohno T, Ishibashi Y, Tsuda E, Kusumi T, Tanaka M, Toh S. Immunohistochemical demonstration of growth factors at the tendon-bone interface in anterior cruciate ligament reconstruction using a rabbit model. *J Orthop Sci* 2007;12:67-73.
2. Kuroda R, Kurosaka M, Yoshiya S, Mizuno K. Localization of growth factors in the reconstructed anterior cruciate ligament: Immunohistological study in dog. *Knee Surg Sports Traumatol Arthrosc* 2000;8:120-126.
3. Ekdahl M, Wang JHC, Ronga M, Fu FH. Graft healing in anterior cruciate ligament reconstruction. *Knee Surg Sports Traumatol Arthrosc* 2008;16:935-947.
4. Arai Y, Hara K, Takahashi T, et al. Evaluation of the vascular status of autogenous hamstring tendon grafts after anterior cruciate ligament reconstruction in humans using magnetic resonance angiography. *Knee Surg Sports Traumatol Arthrosc* 2008;16:342-347.