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Letter to the Editor Regarding Our Article "Properties of Biologic Scaffolds and Their Response to Mesenchymal Stem Cells"

To the Editor:

We are writing in regard to our article "Properties of Biologic Scaffolds and Their Response to Mesenchymal Stem Cells" published in the March 2014 issue of *Arthroscopy*.¹ Throughout the article, we refer to the 2 collagen scaffolds tested as being "highly and non-cross-linked." These terms were meant to describe the histologic structure of the scaffold; they were not meant to indicate anything else, such as the chemical processes by which some biologic scaffolds are manufactured.² In our study the porcine collagen scaffold has a loose fibrous infrastructure compared with the human dermal scaffold that is more tightly packed.

We have received feedback from clinicians that this nomenclature could be misleading, and this was not our intent. The purpose of our study was to accurately report the response of mesenchymal stem cells to different biologic scaffolds and not compare the structure of the grafts. Our only intent in using this terminology was as a way to differentiate between grafts.

Furthermore, in the "Discussion" section, "Flexigraft" was written in error; it should have said "Arthroflex." We apologize if there has been any confusion about this terminology, and we sincerely hope that we have cleared up any misunderstandings.

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Regarding "Intraoperative Hoffa Fracture During Primary ACL Reconstruction: Can Hamstring Graft and Tunnel Diameter Be Too Large?"

To the Editor:

I read with interest the case report by Werner and Miller¹ in the May 2014 issue of *Arthroscopy*. As the patient in the case report, I appreciate the publication and hope that increased awareness of the importance of tailoring graft size to the size of the patient will result in more nuanced surgical repair plans to prevent similar adverse events.

However, as the patient in question, I would like to correct one significant detail regarding the outcome of the case. The authors wrote that "knee stability one year postoperatively remained excellent and she had returned to full activities." This statement is inaccurate because 15 months postoperatively, I am unable to run or participate in activities that involve significant valgus or varus stresses to the knee. Simple activities such as descending stairs remain painful. I am motivated to correct this statement so as to further emphasize the goal of the article: urging more individualized approaches to graft size selection in ACL repairs to hopefully further prevent future similar complications. There is limited research on the correlation between graft size and patient gender and BMI.^{2,3} While recent studies have suggested lower overall failure rates with grafts of greater than 8 mm, it may be prudent to avoid generalization when treating patients at either end of the spectrum.

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Author's Reply

Thank you for the opportunity to respond to this letter. We appreciate and are sensitive to the concerns of the patient expressed in her letter. We also share her interest in avoiding the complication described in our case report in the future. We apologize that we mischaracterized her outcome to note that "she had returned to full activities" and appreciate that she has taken the time and effort to point that out. In fact, we have recently initiated a formal evaluation of functional and strength testing after ACL reconstruction at our university, and this patient showed major quadriceps deficits when she was tested (after the article was published). Interestingly, the majority of patients we have tested so far have also shown quadriceps deficits, and we are becoming increasingly aware that this should be an area of increased focus in rehabilitation after ACL reconstruction. This patient's rehabilitation has been slowed by delayed union necessitating prolonged weight-bearing precautions and pain, but she continues to work on quadriceps strengthening, and it is our sincere hope that she will indeed return to full activities in the near future.

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Graft Size Affects Graft Tension

To the Editor:

The recent review by Kirwan et al.¹ entitled "Initial graft tension and the effect on postoperative patient functional outcomes in anterior cruciate ligament

reconstruction" has drawn our attention. First, we would like to compliment the authors on systematically assessing the literature to determine whether a particular initial graft tension results in a superior functional outcome of the knee after anterior cruciate ligament reconstruction (ACLR). Although initial graft tension has been proved to significantly contribute to the optimal functional outcome, there is a great variability in the amount of tension applied by surgeons during ACLR.¹ That is why we very much appreciate the investigation and interest of Kirwan et al. in assessing the optimal initial graft tension applied during ACLR.

A high initial tension of the graft may result in limited knee motion, tissue damage, and graft failure, whereas a lack of tension may lead to instability.¹ Other important factors influencing clinical outcome after ACLR described by Kirwan et al.¹ are graft choice, fixation technique, tunnel motion and placement, graft biologics, and postoperative rehabilitation. Unfortunately, they did not search for the effect of graft size on the optimal initial graft tension.

In ACLR, especially when using hamstring tendons, large variations in the diameters of harvested ACL grafts are measured. We are unaware of any human, animal, or cadaveric trials that have evaluated the influence of graft diameter on the optimal initial tension and physical outcome after ACLR. A computer-based experiment indicated that even small changes in graft size resulted in large variation in joint stability of the knee and soft-tissue stresses.² Whether this impact of graft size affects clinical outcome is unknown. Hooke's law ($F = kx$) calculates the force (F) needed to stretch a structure by some distance (x), which is affected by a structure-dependent constant factor (k). This constant factor is directly proportional to the cross-sectional area of a structure.³ According to this law, a 6-mm-thick graft requires a different amount of traction than a 10-mm graft to obtain similar tension of the reconstructed ACL. Therefore we believe that graft size is another factor that is of importance to the outcome of ACLR and that graft diameter should be accounted for when assessing the optimal initial tension applied during graft fixation.

To our surprise, none of the studies included in the systematic review accounted for graft size. Furthermore, we could not find any trials that specifically assessed the impact of graft size on the optimal initial tension. In our opinion, the conclusion of the review by Kirwan et al.¹ of a trend toward an optimal initial graft tension of 78.5 to 90 N could not be drawn without any knowledge of the potential impact of the size of the graft. Therefore more research is required assessing the relation between graft size and initial graft tension and their combined effect on the outcome after ACLR. This will lead to a more optimal tension, which is hypothesized to positively affect