Does fibrin clot really enhance graft healing after double-bundle ACL reconstruction in a caprine model?

Graft healing following anterior cruciate ligament (ACL) reconstruction is a complex process characterized by phases of healing that lead to ACL remodelling. Our hypothesis is that fibrin clot addition to ACL reconstruction will result in advanced graft remodelling and healing when compared to a control group at 12 weeks as observed by histology, immunohistochemistry and magnetic resonance imaging (MRI).

Eleven Spanish Boar goats underwent double-bundle ACL reconstruction: 8 were analysed and 3 were excluded. Group 1 was treated with DB ACL reconstruction utilizing autologous fibrin clots (n = 4), and group 2 was treated with standard DB ACL-R (n = 4). Histological and radiographic analysis was performed at 12 weeks. Each animal underwent 3-T MRI immediately after euthanization for evaluation of graft signal intensity utilizing the signal noise quotient (SNQ). Specimens were then sectioned and stored for standard histological and immunohistochemistry testing. The mean ligament tissue maturity index score was significantly higher for group 1 (15 ± 2.3) compared with group 2 (7.7 ± 5.2) (p< 0.05). The mean vascularity (cell/mm(2)) for group 1 was 7.1 ± 1.3 and 9.3 ± 3.1 for group 2 (n.s.). The mean collagen type 1 (% 50× field) for group 1 was 35.8 ± 22.1 and 19.9 ±
20.5 for group 2 (n.s.). The mean SNQ for the AM bundle was 1.1 ± 0.7 for group 1 and 3.1 ± 1.8 for group 2 (n.s.). The mean SNQ for the total PL bundle was significantly lower for group 1 (1.1 ± 0.7) compared with group 2 (3.7 ± 1.3) (p< 0.05). There was a significant correlation between the vascularity and the ligament tissue maturity index score as well as between collagen type 1 and SNQ, both AM and PL bundles (p< 0.05). The use of fibrin clot in ACL reconstruction in a caprine model demonstrated improved healing with respect to histological analysis of the intra-articular ACL reconstruction segment and decreased signal intensity on MRI. It may lead to improved graft healing and maturation. By accelerating the intra-articular healing and ligamentization, the outcome of patients after ACL-R can be improved with faster return to sports and daily activity.