

The Body Project: Anatomy, Relationships, and Representation
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Oral Presentation

Evaluation of a novel bone-tendon allograft technique for rotator cuff repair

Background: The rotator cuff consists of a group of four muscles that collectively are vital for shoulder joint stability. A rotator cuff tear is a condition common in humans, occurring as a result of impingement of the cuff tendons under the coracoacromial arch. Repairs of chronic tears have reported to fail in 89%-94% of cases depending on the technique used. One of the common reasons for failure has been the weakness of the interaction at the bone-tendon junction. The technique we postulate uses a bone-tendon allograft (as opposed to a tendon only allograft) putting less emphasis on the weak interaction at the bone-tendon junction. In addition by using a bone allograft attached to the tendon, there is conceivably better bone union as opposed to tendon allografts without a bone plug. To our knowledge no previous study has investigated this technique as a repair method for rotator cuff tears. We will be using a canine model to investigate this primarily human problem.

Hypothesis: The bone-tendon allograft will be superior to tendon-alone allograft for rotator cuff repair in a canine model based on construct stiffness and gap formation at the bone-tendon interface.

Method: We will be using a canine model with 4 purpose bred dogs. The dogs will undergo bilateral complete infraspinatus tendon (IST) release and repair. The IST will be detached from its insertion at the greater tuberosity; but the joint capsule will not be compromised. The dog shoulders undergoing surgery will be split into 3 main groups (n=4 dogs, 8 shoulders) and there will be 1 control group:

1. Isotope autograft technique (n=2)
2. Tendon allograft (n=3)
3. Bone-tendon allograft (n=3)
4. Control - Normal IST from cadaveric dog shoulders not having undergone surgery (n=4)

Group 1 will undergo an isotope autograft where the bone will be decorticated from the humerus but there will be no rupture of the bone-tendon junction – this will allow us to observe bone-bone healing. Groups 2 and 3 will have either tendon allograft or bone-tendon allograft span the rotator cuff defect. This graft material will have two attachments, one to the native bone and the other to the native IST which has been iatrogenically ruptured as described above. The dogs will be housed in individual cages and allowed unrestricted cage activity until euthanasia at 12 weeks.

Results & Discussion: Functional assessments will be via lameness scores prior to sacrifice. Radiographs of all shoulders will be taken to assess the positioning of the shoulder and the union of the graft to recipient bone immediately post surgery and on the day of euthanasia. In addition, ultrasound on the day of sacrifice will be used to subjectively assess infraspinatus tendon architecture and integrity throughout the grafts. Histology will be performed on the bone-tendon units to assess tissue morphology and collagen scaffolding. Biomechanical strength of the constructs are to be assessed by repair stiffness and repair gapping i.e. the amount of gap formation at the bone-tendon junction.