**FIRST CLINICAL EVALUATION OF PORCINE XENOGRAFT DEVICE FOR ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION: SIX-MONTH FOLLOW-UP**

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**INTRODUCTION:**

Xenograft ACL reconstruction previously met with failure due to glutaraldehyde synovitis, abrasion, poor fixation and immunologic rejection. Studies by Stone and Galili have shown that treatment of porcine tissues with alpha-galactosidase reduces immune recognition of the grafts and slows the immune mediated destruction of the graft [1,2,3]. Pre-implantation biomechanical properties of treated porcine grafts matched human controls, and tests for biocompatibility and sterility were satisfactory. Preclinical primate studies with treated porcine grafts demonstrated graft/host integration and gradual graft remodeling assessed at two, six and twelve months. This study is the first human clinical evaluation of porcine xenografts for application in anterior cruciate ligament reconstruction for the purpose of evaluating the safety of the device.

**METHODS:**

Porcine bone-patellar tendon-bone grafts (Z-Lig™, CrossCart, Inc.) were processed with recombinant alpha-galactosidase enzyme, low-level glutaraldehyde and terminally sterilized. This was an FDA and IRB approved pilot clinical investigation in 10 human patients requiring ACL reconstruction. All patients received the porcine xenograft. Two of the patients were autograft ACL revisions and three of the patients had previous ACL surgery of the contralateral knee. This was an extremely athletic patient population with average age of 41 years (range 21-51). The study included seven males and three females with five acute (<3 months) and five chronic ACL ruptures. Study endpoints were knee stability and effusion as assessed by the principal investigator and an outside orthopaedic surgeon, MRI and serum antibody levels.

**RESULTS:**

The device and surgery were well tolerated by all patients. Nine of ten patients demonstrated acceptable knee stability at six months post-operative. All stability assessments demonstrated improvement at six-months with Lachman scores improved from 2.9 to 0.7 (p = 0.003), Anterior Drawer scores improved from 2.7 to 0.7 (p = 0.001), Pivot Shift scores improved from 2.7 to 0.5 (p = 0.001) and KT-1000 Manual Max improved from 5.4 to 1.9 (p = 0.0001). Results are shown in Figures 1 through 4 and present means and standard deviation of ten patients.

**DISCUSSION:**

Biopsies of the ACL graft and synovium were taken from three patients and all samples indicate cellular infiltration into the porcine graft with fibroblast populations and an absence of significant lymphocytic or inflammatory cells. The synovial samples indicated no evidence of synovitis or other significant inflammation. MRIs of the reconstructed grafts at six months post-operative show signs of ligament maturation and no signs of degenerative changes except tibial tunnel widening in one patient and synovial thickening in six patients. While levels of effusion were graded as none to mild in seven patients, several patients did exhibit recurring low-level effusion over six months corresponding to activity level. Patient antibody response to the graft is consistent with preclinical models and generally shows a slight increase in the anti-Gal antibody at two-months followed by a gradual decline in titers. Antibody titers to other pig antigens were lower than anti-Gal levels at each measured time point and generally reflect a gradual increase through the six-month time point.

**REFERENCES:**


**AFFILIATIONS:**

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