tered in the setting of massive rotator cuff tears, and may have a central role in the development of atrophy that is seen in these large tears.


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**Summary:**
A histologic evaluation of the infraspinatus tendon healing was performed in 16 sheep to study whether the platelet rich plasma (PRP) is useful to help in the tendon healing, comparing eight repairs with PRP with eight repairs without it and, in this study we did not find advantages to use it at the tendon-bone interface during the repair.

**Abstract:**

**Objective:** The aim of this study was to perform a histologic evaluation of the rotator cuff repair in sheep which was conducted with or without the addition of Platelet Rich Plasma

**Methods:** The study was performed with adult Hampshire Down sheep. Through a superior approach to the right front paw of 16 animals, a complete tear of the infraspinatus tendon was created at the greater tuberosity site and, then, repaired with Mason-Allen knots. In eight sheep the repair was performed without Platelet Rich Plasma and in other eight, at the tendon-bone interface, it was added 3 ml Platelet Rich Plasma. Four animals were sacrificed after 24 hours of the repair (two with and two without Platelet Rich Plasma) and, then, it was performed the resection of the entire infraspinatus muscle with the humeral head. On the other 12 animals the same procedure was done and, four of them were sacrificed after one week, four after one month and four after 10 weeks (always two with Platelet Rich Plasma and two without it). All samples were submitted to histological evaluation by a Pathologist who did not know which samples were treated with Platelet Rich Plasma.

**Results:** After one day, one week and four weeks, the histological analysis did not show any difference regarding the inflammatory reaction and/or tendon healing when we compare the histological evaluation of the sheep treated with and without the use of the Platelet Rich Plasma. After ten weeks, the histological analysis showed a better healing of the infraspinatus tendon of the two sheep treated without the addition of the Platelet Rich Plasma.

**Conclusion:** At least with these sheep models the use of Platelet Rich Plasma at the tendon-bone interface did not lead to a better tendon healing.

Paper # 266: Reconstruction of Massive Immobile Full Thickness Tears of the Rotator Cuff Tendon Using a Lars Ligament

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**Summary:**
The use of the Lars polyester ligament to substitute a deficient tendon showed improvement in shoulder pain and function.

**Abstract:**
The treatment of symptomatic massive rotator cuff tears is controversial and limited. Frequently the eventual outcome with conservative treatment is a rotator cuff arthropathy and resulting poor function of the shoulder. The surgical options of partial repair, debridement and decompression, and tendon transfer or slide have been shown to provide a possible improvement but are not predictable. Porcine graft has been used to augment a repair. The Lars polyester ligament permits fibroblastic ingrowth and is used to reinforce and substitute the rotator cuff when tendon mobilisation is not sufficient to allow a low tension repair.

Twenty four patients presented between 2007 and 2009 with loss of shoulder function due to a symptomatic massive tear or re-tear of the rotator cuff tendon. They were considered to be un-repairable at surgery by arthroscopic debridement, acromioplasty and open mini-arthrotomy with attempted tendon release. All patients were noted to have a retracted adhered tendon with a large residual defect, no edge stability and an imbalance of force couples. In a few cases a partial rotator cuff repair was possible but the rotator cable was not intact. Twenty two then underwent a reconstruction of the tendon using a Lars artificial ligament. Patients were selected for the Lars ligament procedure when there was reasonable excursion of the tendon but it was unable to be approximated near to the lateral edge of the humeral articular surface with the arm abducted thirty degrees. Ten to 12 sutures of FiberWire No 2 were used to fix the ligament to the edges and body of the tendon and the ends of the ligament were fixed to the humeral neck with screws or staples. The purpose of the Lars ligament
procedure was to recreate the force couples and thus help restore function and reduce pain with the aim of avoiding future loss of shoulder function. Rehabilitation was then able to be fast tracked.

Two patients had very atrophic and severely retracted tendons which were not able to be reconstructed and were treated with debridement alone. One patient ruptured the Lars ligament and sutures with heavy physical activity (log splitting). Two patients were deceased prior to review. Nineteen patients were available for review with the age range of 46 to 86 years and the length of follow up from a minimum of 12 months and up to 3 years. All patients were assessed pre-operatively using the UCLA score and VAS pain rating. Post-operative assessment was by an independent assessor using the UCLA score, VAS pain rating and the Constant/Murley score. Pre-operative and post-operative ultrasounds studies were performed to assess the integrity of the repair. The results showed statistically proven improvement in shoulder function and pain level.

The use of the Lars ligament to substitute a deficient rotator cuff tendon showed improvement in shoulder pain and function. There were no cases of synovitis, ligament rejection or infection. This technique is considered a useful way of managing patients with massive immobile tears of the rotator cuff tendon.

Paper # 267: Enhancement of Rotator Cuff Tendon-Bone Healing with Injectable Periosteal Progenitor Cells-Bmp-2 Hydrogel

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Summary:

We develop an injectable hydrogel that support progenitor cell adhesion via tethered BMP-2 signaling ligands to encourage robust extracellular matrix synthesis for tendon-to-bone healing in rotator cuff repair.

Abstract:

Fixation and incorporation of ruptured rotator cuff tendon to bone is a major concern in rotator cuff repair surgery. Rotator cuff repairs usually fail with a gap formation due to the weak incorporation in the tendon-bone repair interface, especial in a large or massive tear. Bone morphogenic signaling protein can augment tendon-bone healing. Mesenchymal progenitor cells from periosteum could develop osteogenic and chondrogenic tissues. We develop an injectable hydrogel that support progenitor cell adhesion via tethered BMP-2 signaling ligands to encourage robust extracellular matrix synthesis for tendon-to-bone healing in an infraspinatus repair that is clinically relevant model of rotator cuff tear in rabbits. The infraspinatus tendon was cut from the greater tuberosity and repaired through a transosseous tunnel. The infraspinatus tendon was repaired with the injectable progenitor cell-BMP-2 hydrogel applied between tendon-bone repair junction. The injectable hydrogel was prepared from 10% of poly (ethylene glycol) diacrylate (PEGDA) dissolved in PBS containing 0.05% of the photoinitiator (Irgacure 2950). Bone morphogenic protein-2 (BMP-2) tethered hyaluronan (HA) conjugate was blending to the hydrogel. Rabbit progenitor progenitor cells (PPCs) isolated from periosteum were resuspended in co-gel solutions at a concentration of 20 million/ml, then were injected in the bone tunnel. The contralateral limb received the same procedures without hydrogel application. Ultraviolet irradiation (365nm) was applied for 60 sec to photopolymerize the injections to solidize the hydrogel. The rabbits were sacrificed at 2, 4, 8, 12 weeks. The morphological characteristics of the healing tendon-to-bone interface were evaluated by histological and immunohistochemical methods. RT-PCR was used for evaluate the gene expression of cartilage and bone. The biomechanical test was done to determine healing attachment strength. At each time period at sacrifice, there was a significant statistic increase in attachment strength in the hydrogel-treated groups. Histological analysis of tendon-bone interface showed an interface fibrocartilage and bone layer formed in tendon-bone interface. At 4 weeks, this layer showed progressive integration over the interface between cuff tendon and bone. At 8 weeks, progressive fibrovascular tissue with fibrocartilage and bone formation appeared between tendon and bone. At 12 weeks, progressive fibrocartilage tissue formation appeared between tendon and bone. At 12 weeks, more fibrocartilage tissue formation at the interface. In failure mode assessment, most specimens failed from the tendon-bone interface. Immunohistochemistry revealed the presence of aggrecan and type II collagen. RT-PCR demonstrated early appearance of collagen type I, actin, aggrecan, and type II gene expression in hydrogel-treated group. Since the "weak link" in rotator cuff repair is the tendon-bone interface, outcomes may be improved by biological augmentation of tendon-to-bone healing. Improve healing process could be achieved when progenitor cell-BMP-2 hydrogel