



# Proceedings of the APKASS 2016 Congress

## B0010

### Arthroscopic treatment for chronic Achilles tendon rupture on high demand patients

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**Background:** Chronic Achilles Tendon Rupture (CATR) results in symptomatic insufficiency of the Achilles tendon with evident impairment in ankle function.

Surgery is required and an open procedure is usually performed. There is some experience with arthroscopic transfer of Flexor Hallucis Longus (ATFHL) but most authors recommended this technique only on low demanding patients.

The purpose of this paper is to present our early experience using ATFHL on athletic patients. **Material and Methods:** We did ATFHL on five non-professional athletes (three runners, one recreational footballer and one surfer), one neglected ruptures and four re-ruptures. All patients were male and the main age was 31 years old (range 23 to 40 years old). The patients were evaluated after a mean follow-up of 21 months (range 8 to 34 months) using the AOFAS score for hindfoot/ankle.

**Results:** The mean pre-operative AOFAS score was 63 (range 49 to 79) and a mean post-operative AOFAS score was 99 (range 97 to 100). All patients were able to do single foot heel rise and return to sports at the same level.

One patient had transient hypoesthesia of tibial nerve. No other complications were registered.

**Discussion:** CATR can be solved with ATFHL. However, most authors only recommend this type of procedure for low demanding patients. For the athletic population, the usual solution is an extensive approach with some kind of plasty of the remnant tendon or other aggressive techniques with the inherent morbidity and risk of soft tissue complications.

We present a small group of recreational athletes in which the ATFHL had a good result, avoiding the risk of a more extensive surgery, with a remarkable functional rehabilitation.

**Conclusion:** Our experience, although relatively short in term and in numbers, made us believe that the ATFHL may play a role in a treatment of CATR, not only on low demand patients but also in the athletic population, with overall advantage comparing with the open procedures.

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## B0011

### A study of Tibial Osseous Tunnel intersection when reconstruct PCL and POL simultaneously

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**Background:** When simultaneous reconstruction of the Posterior Cruciate Ligament (PCL) and Posterior Oblique Ligament (POL) is necessary, tibial tunnel intersection is a serious concern and its avoidance can be a technically challenging endeavor.

**Material:** A three-dimensional image from a single cadaveric limb was created.

**Methods:** A transtibial PCL reconstruction was simulated with two tibial tunnel entry points; one with the PCL tunnel centered directly within the native fovea, the second with the tibial tunnel placed in the posterior half of the fovea. Both tunnels were set to be 10mm in diameter and 50° of the joint line in the sagittal plane. Two different geometries of POL tunnels were then simulated within each of these PCL models; one utilizing a continuous “cylindrical” tunnel, and one utilizing a differentially reamed “grenade” shaped tunnel. Utilizing a coronal plane along the posterior tibial condyles as a reference, we then noted the degree of angle(s) at which the POL tunnel would intersect the PCL tunnel. We also noted the POL tunnel relationship with respect to Gerdy’s tubercle and the tibial tubercle.

**Results:** With the PCL tunnel centered directly in the fovea, PCL tunnel intersection occurred at angles  $\leq 26^\circ$ , and tibial tubercle violation occurred at angles  $\geq 28^\circ$  with a “cylindrical” shaped POL tunnel. With a “grenade” shaped tunnel these values were  $\leq 24^\circ$  and  $\geq 29^\circ$  respectively. When the PCL tunnel was placed in the posterior half of the fovea these values were  $\leq 18^\circ$  and  $\geq 29^\circ$  with a “cylindrical” shaped POL tunnel; and  $\leq 17^\circ$  and  $\geq 28^\circ$  with a “grenade” shaped tunnel.

**Discussion:** Our study indicated that when reconstructing the PCL and POL simultaneously, utilizing a transtibial technique, there is an extremely small margin of error when drilling the POL tunnel. The reconstructive technique that provided the largest margin of error to prevent PCL tunnel intersection and tibial tubercle violation was use of a PCL tunnel centered in the posterior

half of the fovea and either geometry of POL tunnel. This combination provided a safe zone of approximately  $11^\circ$ . Given the difficulty of referencing tunnel direction off of the posterior tibial condyles intraoperatively, we recommend that the POL tunnel start just off of the medial edge of Gerdy’s Tubercle and be aimed towards the lateral edge of the tibial tubercle. Our model suggests that utilizing these easily identifiable landmarks would likely keep the trajectory of the POL tunnel within the above-described safe zone.

**Conclusions:** Drilling the PCL tibial tunnel in the posterior half of the fovea and utilizing a POL tunnel starting off of the medial edge of Gerdy’s tubercle and exiting anteriorly just lateral to the tibial tubercle is the most effective reconstruction technique to minimize tunnel intersection.

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## B0013

### Effectiveness of full-length laterally wedged insoles for posterior medial meniscus root tears

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**Background:** Posterior medial meniscus root tears (PMMRTs), which mainly occur among middle-aged women, disrupt hoop tension and cause medial extrusion of the medial meniscus. Therefore, PMMRTs are considered an important risk factor for osteoarthritis and osteonecrosis. We treated the PMMRT knees in our study with full-length laterally wedged insoles (FLLWs), with satisfactory results. We report on the effectiveness of this conservative treatment.

**Materials and Methods:** From January 2011 to October 2013, magnetic resonance images (MRI) were used to diagnose 122 knees (28 men and 94 women) with PMMRTs. Consequently, they were treated with FLLWs. The average age was 65.0 years. All cases were followed up for at least 1 year.

**Results:** In twelve cases (10%), the knee pain was almost completely relieved (excellent cases). In 103 cases (84%), the knee pain was reduced by more than 50% of pre-treatment discomfort (Good cases). In only 5 cases (4%), the pain did not improve, so surgery was performed.

**Discussion:** Recently, the number of reports on suture repair for PMMRTs has increased. However, MRI has shown that, in the majority of these cases, the medial meniscus underwent relatively extensive degenerative change. Therefore, we think that the indications for suture repair are limited and that the priority when treating PMMRT is to reduce the load stress to the medial compartment of the knee.

**Conclusion:** We believe that FLLW is the first-choice treatment for PMMRT.

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## B0014

### Effects of remnant tissue preservation on the tendon autograft in anterior cruciate ligament reconstruction: Biomechanical and histological study with a sheep model

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**Background:** No studies using an ACL reconstruction model with large animals have been conducted to clarify the effect of remnant tissue preservation on outcome after ACL reconstruction. We have hypothesized that, remnant preservation may accelerate revascularization and reinnervation in the graft, and significantly improve the anterior translation of the knee at 12 weeks after surgery. The purpose of this study was to test these hypotheses.

**Methods:** Forty-two sheep were randomly divided into 2 groups of 21 animals each. In group I, the ACL was completely removed. In group II, the ACL was transected at the midsubstance. Then, ACL reconstruction was performed using a semitendinosus tendon autograft in each group. Histological changes of the grafted tendon and the preserved remnant tissue were observed at 4 and 12 weeks after surgery. Biomechanically, the anterior translation and the

stiffness of the knee under an anterior drawer force and the structural properties of the femur-graft-tibia complex were evaluated.

**Results:** The remnant preservation significantly accelerated revascularization in the grafted tendon, and significantly increased the number of mechanoreceptors in the reconstructed ACL at 4 and 12 weeks. The remnant preservation significantly improved the anterior translation and the initial stiffness of the ACL-reconstructed knee in drawer testing at 12 weeks.

**Discussion:** Preservation of the remnant tissue in ACL reconstruction not only enhanced cell proliferation, revascularization, and regeneration of proprioceptive organs in the reconstructed ACL, but also improved the knee stability.

**Conclusion:** Preservation of the remnant tissue may be beneficial in improving the clinical outcome of ACL reconstruction.

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#### B0015

##### Research of biocompatibility of PET artificial ligament modified by silk fibroin coating in vitro and in vivo

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**Background:** To investigate the effect of silk fibroin (SF) coating for the cell compatibility *in vitro* of polyethylene terephthalate (PET) material and for the ligamentization of intra-articular segment *in vivo* of PET artificial ligament.

**Methods:** The surface of PET artificial ligament was treated by plasma, and then PET artificial ligament was soaked in an SF solution. BALB/C CL7 mice ligament fibroblasts was cultured in the uncoated-PET material (control group), SF coating-PET material (SF group). Subsequently, scanning electron microscope (SEM), methyl thiazolyl tetrazolium (MTT), cell cycle analysis, collagen protein and DNA content was detected. Furthermore, the mRNA expression levels of fibronectin (FN),  $\beta$ -actin, integrin  $\alpha 1$  and integrin  $\beta 1$  were also detected. Intra-articular segment of PET artificial ligament was coated by SF, which was used to reconstruct Beagles' anterior cruciate ligament (ACL). The coverage of intra-articular synovial tissue covering the artificial ligament was assessed.

**Results:** The results of SEM, MTT and cell cycle analysis showed SF group could significantly improve the proliferation of BALB/C CL7 mice ligament fibroblasts ( $P < 0.05$ ). Collagen protein and DNA content analysis showed that the specific surface area was increased by 3D structure in the SF group ( $P < 0.05$ ), which provides a good growth substrate for the high density culture of BALB/C CL7 mice ligament fibroblasts. MRNA expression analysis of FN,  $\beta$ -actin, integrin  $\alpha 1$  and integrin  $\beta 1$  showed that the normal BALB/C CL7 mice ligament fibroblasts related gene expression was not changed in the PET-SF composite materials ( $P > 0.05$ ). One month after ACL reconstruction, synovial tissue coverage in the SF group and control group was  $85.4 \pm 4.3\%$  and  $62.8 \pm 5.7\%$ , respectively ( $P < 0.05$ ). Moreover, three months after ACL reconstruction, synovial tissue coverage in the SF group and control group was  $97.7 \pm 2.1\%$  and  $92.5 \pm 4.3\%$ , respectively ( $P > 0.05$ ).

**Conclusion:** PET-SF composite materials has good cell biocompatibility *in vitro*. ACL reconstruction *in vivo* confirmed that the SF coating could improve the coverage of intra-articular synovial tissue covering the artificial ligament early, which speeds up the process of ligamentization.

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#### B0018

##### The middle to long term results of reconstruction of stiff elbow under arthroscopy technique

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**Objective:** To evaluate the middle to long term results of reconstruction of stiff elbow under arthroscopy technique.

**Methods:** To re-evaluate the clinical results of the 38 stiff elbows treated under arthroscopy technique previously, and to compare the clinical results between the early follow-up and the middle – long term follow up.

**Results:** There were 36 patients completed the follow-up. There were 24 male and 12 female. The age was 47.8 years old on average (14-65 years old) and the average follow up time was 71.5 months (60-96 months). The preoperative average range of motion for the 36 patients was  $80.1 \pm 24.4^\circ$ , which increased to  $121.4 \pm 24.8^\circ$  at six months postoperatively and was  $118.6 \pm 24.0^\circ$  at the final follow up time; the averaged MEPS was  $70.4 \pm 16.6$  preoperatively, which increased to  $89.4 \pm 16.5$  at six months postoperatively and was  $88.6 \pm 15.8$  at the final follow up time; whereas the averaged VAS score was  $2.8 \pm 2.2$  preoperatively, which decreased to  $0.5 \pm 0.5$  at six months postoperatively and was  $0.6 \pm 1.0$  at the final follow up time. The middle-long term follow up showed superiorly results in terms of range of motion, MEPS (Mayo Elbow Performance Score), VAS for pain compared with preoperative results, whereas showed no significant difference compared with short term follow up results.

**Conclusion:** The arthroscopy is an effective technique to reconstruct the function of the stiff elbow, and the clinical results did not decrease with time.

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#### B0022

##### The validity of the classification for lateral hinge fractures in open wedge high tibial osteotomy

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**Background:** Open wedge high tibial osteotomy (OWHTO) for knee osteoarthritis has become an increasingly performed technique. However, various complications including lateral hinge fracture (LHF) have been reported. Takeuchi et al. classified LHF into three anatomically based types, related to the proximal tibiofibular joint. Here, the objective of this study was to validate the efficacy of their classification.

**Material:** Patients treated with OWHTO using TomoFix between 2009 and 2012 were investigated. The knees were divided into non-fracture (59 knees) and LHF (15 knees) groups, and the LHF group was further divided into Takeuchi types I, II, and III (seven, two, and six knees, respectively).

**Method:** The Japanese Orthopaedic Association (JOA) score and range of knee flexion were assessed pre-operatively and one year after OWHTO. The details of postoperative course were reported in LHF group.

**Results:** Pre-operative characteristics (age, gender and body mass index) showed no significant difference between the two groups. The mean JOA score was significantly improved one year after operation regardless of the presence or absence of LHF ( $p < 0.005$ ,  $p < 0.001$ , respectively). However, six of seven type I cases had no LHF-related complications; both type II cases had delayed union; and of six type III cases, two had delayed union with correction loss and one had overcorrection.

**Discussion:** These results suggest that Takeuchi type II and III LHF are structurally unstable compared to type I. [Conclusion] Takeuchi classification can provide an indication of potential complications relating to bone union after OWHTO.

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#### B0025

##### Enhancement of polyethylene terephthalate artificial ligament graft osseointegration using a periosteum patch in a goat model

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**Purpose:** to investigate whether a periosteum patch could enhance polyethylene terephthalate (PET) artificial ligament graft osseointegration in bone tunnel.

**Methods:** Twelve female goats underwent ACL reconstruction with PET artificial ligament graft in the right knees. Right knees in six goats were reconstructed with periosteum patch enveloped PET grafts (Periosteum group) in the tibia bone tunnel, whereas the other six goats had no periosteum patch made as the control group. All the goats were sacrificed at 12 months after surgery. Three tibial-graft complex samples in each group were harvested for microcomputed tomography (micro-CT) scan, magnetic resonance imaging (MRI) scan and histological evaluation consecutively. The other three tibial-graft complex samples in each group were harvested for biomechanical testing.

**Results:** The mean pull-out load of the Periosteum group at 12 months was significantly higher than that of the control group ( $p < 0.05$ ). According to micro-CT scan, more new bone formation was observed at the graft-bone interface in the Periosteum group compared with the control group. Furthermore, MRI showed that the Periosteum group appeared to have a better graft osseointegration within the bone tunnel compared with the control group. Histologically, application of periosteum patch induced more new bone and Sharpey's fiber formation between graft and bone tunnel compared with the controls.

**Conclusion:** The study has shown that periosteum enveloping on the PET artificial ligament has a positive effect in the induction of artificial ligament osseointegration within the bone tunnel.

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#### B0030

##### All-arthroscopic anatomical reconstruction of anterior talofibular ligament using semitendinosus autografts

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**Purpose:** To show a new technique of all-arthroscopic anatomical anterior talofibular ligament reconstruction (ATFL) using semitendinosus autografts and fixed with double suture anchor for chronic ATFL rupture.

**Methods:** From January 2013 to February 2014, 12 patients (9 male and 3 female), underwent an arthroscopic anatomic reconstruction of the ATFL for chronic ATFL rupture with double suture anchors in tibia. Their ages ranged from 18 to 32 giving a mean age of 26 years. The American Orthopaedic Foot and Ankle Society (AOFAS) score was administered to assess the functional status; clinical examination and conventional radiographs were performed in all patients.

**Results:** 12 patients were followed up for an average of 19.3 months (13-26 months). The mean AOFAS score was 93.25 (range 80-100) at the last follow-up ( $P =$ ,  $T =$ ). Postoperative AOFAS scores were graded as excellent and good in all patients. One patient undergone transient sural