

Conclusion: use of estradiol improves ossification capacity in vitro and promote tendon to bone healing after anterior cruciate ligament reconstruction in vivo.

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B0218

Percutaneous repair of Achilles tendon rupture under ultrasound surveillance as effective method of treatment in patients with other diseases

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Background: Open repair of torn Achilles tendon is a standard procedure, however complications may occur due to extensive approach, especially in older patients with general conditions. Different systems for minimally invasive procedures were also introduced but the risk of damaging sural nerve was pointed out.

Aims: We developed percutaneous repair of Achilles tendon rupture under ultrasound surveillance and assessed safety and results of the procedure.

Methods: Since May 2011 until September 2015 we performed 14 procedures. The tendons were repaired with Ethibond suture loop passed through the tendon below and above rupture through the skin with elastic needle under direct ultrasound visualization.

We analyzed results of patients with minimally 3 months follow up. Some of patients were also burden with diabetes, cardiac diseases, psychiatric disorders and thrombocytopenia. We qualified for treatment only acute ruptures (up to 10 days), with relative contraindications for open procedures.

Results: We assessed function of repaired tendon in clinical examination and ultrasound exam 6 weeks and three months after surgery. Also AOFAS score was used.

13 of 14 patients healed tendon and returned to their activities. In one case conversion to open surgery was necessary as patient experienced another trauma in postoperative period. Another patient reported persisting pain due to suture conflict with soft tissues. Release of the suture was necessary six months after surgery. There was no sural nerve entrapment nor skin healing problems. AOFAS score raised from 57,8 to 92,8 three months after surgery.

Conclusions: Percutaneous repair of Achilles tendon rupture under ultrasound surveillance is minimally invasive and effective method of treatment of acute ruptures. It is safe and allows to avoid both sural nerve entrapment and skin healing problems. However, it requires some experience with ultrasound diagnostics.

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B0220

Open wedge high tibial osteotomy using three-dimensional printing model: Experimental analysis using porcine bone

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The purpose of this study was to evaluate the usefulness of a three-dimensional (3D) printing model for open wedge high tibial osteotomy (HTO) in patients with medial knee osteoarthritis. Computed tomography (CT) images were obtained from 10 extended porcine knees and 3D imaging was planned using the 3D-Slicer program. The osteotomy line was drawn from the predicted medial osteotomy site (approximately 3 cm below the medial tibial plateau) to the hinge point, the proximal end of the fibular head. After the osteotomy, the osteotomy gap was opened until the mechanical axis line connecting the hip and ankle joint centers was 62.5% from the medial border along the longest medial-to-lateral width of the tibial plateau maintaining the posterior tibial slope angle. The wedge-shaped 3D printing model was designed with the measured angle and osteotomy section and was produced by the 3D printer. The open wedge HTO surgery was reproduced in porcine bone using the 3D printing model and the osteotomy site was fixed with a plate. Accuracy of osteotomy and posterior tibial slope was evaluated after the osteotomy. The mean mechanical axis line on the tibial plateau was $61.8 \pm 1.5\%$ from the medial tibia. There was no statistically significant difference ($p = 0.160$). The planned and post-osteotomy correction wedge angles were $11.5 \pm 3.2^\circ$ and $11.4 \pm 3.3^\circ$, and the posterior tibial slope angle was $11.2 \pm 2.2^\circ$ pre-osteotomy and $11.4 \pm 2.5^\circ$ post-osteotomy. There were no statistically significant differences ($p = 0.854$ and $p = 0.429$, respectively). This study could obtain good results of high tibial osteotomy using 3D printing model in porcine legs. Therefore, this method can be applied later to open wedge high tibial osteotomy clinically in human.

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B0228

Chondral lesions with medial meniscal posterior root tear are located more medially and more progressive than those with other meniscal tears

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Introduction: Medial meniscal posterior root tear (MMPRT) is associated with development or worsening of medial tibiofemoral cartilage damage. The purpose of this study is to demonstrate the characteristics of chondral lesion on the medial femoral condyle (MFC) in patients with MMPRT.

Materials and Methods: Fifteen patients who underwent arthroscopic repair of MMPRT from August 2014 to July 2015 were included. Chondral lesions of the medial femoral condyle on preoperative MRI and arthroscopic finding were recorded according to ICRS - articular cartilage injury classification and mapping system. The incidence of grade 3 or above chondral lesion on each compartment was compared between the findings on MRI and arthroscopy. And the incidence of grade 2 or above chondral lesion and the location of first lesion (most severely injured) on arthroscopic findings were compared between the MMPRT group and the patients group who underwent arthroscopic surgery for degenerative medial meniscus posterior horn (MMPH) tear other than MMPRT during the same period as the control.

Results: Arthroscopic findings of 13 patients (86.7%) exhibited grade 3 or above chondral lesion on the MFC, whereas it is exhibited on only 8 preoperative MRI (53.3%). The incidence of chondral lesion in central-medial compartment showed significant difference between the findings on MRI and arthroscopy (26.7% vs 66.7% , $p < 0.05$), and the difference between MRI and arthroscopy is significantly correlated with the day from the taking MRI to the surgery (Pearson's correlation coefficient = 0.659 , $p = 0.008$). All 15 patients with the MMPRT had the ICRS grade ≥ 2 chondral injuries at medial compartment, whereas only 23 of 69 patients (33.3%) in control group had the grade ≥ 2 injuries. In MMPRT group, central-medial compartment is most frequently affected ($N=17$, 73.3%), whereas central-central compartment is major affected site in control group ($N=13$, 56.5%). This injury pattern showed statistically significant difference between two groups ($p=0.004$).

Conclusion: Chondral lesions on MFC developed in patients with MMPRT are located more medially than those in patients with degenerative MMPH tear other than root tear, and these lesions are more likely to develop with the time. Early intervention should be considered in patients who exhibiting MMPRT, to prevent the development of these lesions.

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B0236

Relationship between tunnel malposition and intra-articular degeneration in anterior cruciate ligament reconstruction

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Background: To elucidate the relationship between radiographic tunnel position parameters in primary anterior cruciate ligament (ACL) reconstruction and arthroscopic findings of cartilage degeneration or bucket-handle meniscal tear using arthroscopy in revision surgery.

Materials and Methods: Thirty-five patients who underwent ACL revision reconstructions were recruited; their primary surgeries were single-bundle reconstructions. Tunnel positions of primary reconstructions were evaluated using the plain radiograph prepared before revision surgery. The sagittal tunnel positions (%) of the femur (FP) and tibia (TP) were determined on the lateral view. To evaluate the tunnel angle, the line connecting the midpoint of the femoral and tibial tunnel aperture was drawn to divide a line parallel to the tibial plateau on the coronal view. Articular cartilage was evaluated arthroscopically by International Cartilage Repair Society (ICRS) grade at primary surgery and at revision surgery, and two-grade progression was defined as cartilage degeneration. The bucket-handle meniscal tear was also evaluated by probing. Logistic regression analysis was conducted using the prevalence of cartilage degeneration or bucket-handle meniscal tear as the dependent variable; tunnel parameters, including sex and the duration (months) from primary surgery to revision surgery, were used as the independent variables.

Results: Seven patients (20.0%) had cartilage degeneration and nine patients (25.7%) had bucket-handle meniscal tear in their medial meniscus. In logistic regression models, %FP [odds ratio (OR): 1.547; $P=0.089$] was not correlated with cartilage degeneration, whereas the cut-off of 59% in the FP (OR: 14.859; $P=0.027$) was significantly correlated with cartilage degeneration. On the contrary, %TP (OR: 1.204; $P=0.026$) was significantly correlated with the prevalence of bucket-handle meniscal tear.

Discussion: While there are substantial evidences of the tunnel position on the femoral side, it is less debated on the tibial side. Limited studies have mentioned how posterior tunnel malposition on the tibial side affected the biomechanical or clinical outcome in ACL reconstruction. One important biomechanical function of menisci is to stabilize the ACL-deficient knee. During chronic ACL deficiency, menisci always are in danger of the bucket-handle meniscus tear, which occurs with continuous episodes of giving way. In accordance with the current data, posterior tibial tunnel malposition can induce clinical and biomechanical burdens on the medial meniscus.

Conclusion: In our revision series, anterior femoral tunnel malposition in the femur affected the definitive cartilage degeneration, and posterior tibial tunnel malposition resulted in the prevalence of bucket-handle meniscal tear.

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B0237

Relationship between humeral torsion and career of pitcher in elementary and junior-high schools

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Background: Repetitive throwing motion generates tremendous stress on the dominant shoulder in baseball players, resulting in osseous change in the shoulder joint, especially increased humeral retroversion. Here we hypothesized that the career of a pitcher in elementary and junior-high