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

http://dx.doi.org/10.1016/j.asmart.2016.07.050

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 tissue. 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.

http://dx.doi.org/10.1016/j.asmart.2016.07.051

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 planted using the 3D-Slicer program. The osteotomy line was drawn from the pre- dicted 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 mediolateral -wards 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 61.5±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±3.2° and 11.4±3.3°, and the posterior tibial slope angle was 11.2±2.2° pre-osteotomy and 11.4±2.5° 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.

http://dx.doi.org/10.1016/j.asmart.2016.07.052

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 (MMRPT) 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 MMRPT.

Materials and Methods: Fifteen patients who underwent arthroscopic repair of MMRPT 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 MMRPT group and the patients group who underwent arthroscopic surgery for degenerative medial meniscus posterior horn (MMPH) tear other than MMRPT 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 MMRPT 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 MMRPT 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 MMRPT 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 MMRPT, to prevent the development of these lesions.

http://dx.doi.org/10.1016/j.asmart.2016.07.053

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 reviewed. Patients included primary surgical failures and late (>1 year) revisions. 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-hand- le 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 meniscus 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 meniscal 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.

http://dx.doi.org/10.1016/j.asmart.2016.07.054

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
schools might increase humeral torsion on the dominant shoulder. The objective of this study was to assess the effect of baseball position in youth and adolescent athletes on humeral torsion.

Materials and Methods: We studied 153 high school baseball players who began to play baseball in elementary school at the age of 8.1 ± 1.6 years old. All subjects completed questionnaires about their baseball history, including their activity years; they then were physically examined. We divided them into four groups according to their baseball positions in elementary and junior-high schools: 35 players were pitchers in both elementary and junior-high school (group 1), 32 players were pitchers in elementary school but fielders in junior-high school (group 2), 17 players were fielders in elementary school but pitchers in junior-high school (group 3), and 69 players were fielders in both elementary and junior-high school (group 4). Humeral torsion was assessed bilaterally by using ultrasound. Humeral torsion was defined as the angle between the long axis of the forearm and a line parallel to the trunk, when the line tangential to the bicipital groove was parallel to the horizontal baseline in supine position with the shoulder at 90° abduction, the elbow at 90° flexion, and the forearm in the neutral position.

Results: Beginning age of baseball did not differ significantly among four groups. Among the 153 high school baseball players, 113 players (73.9%) had history of shoulder or elbow injuries. Humeral torsion was significantly greater (<p = 0.01) on the dominant shoulder than on the non-dominant shoulder in all groups. Humeral torsion on the dominant shoulder was significantly greater (<p = 0.03) in group 1 than in group 4 (mean difference, 7.1°). A logistic regression analysis showed that humeral torsion on the dominant shoulder was not a predictive factor for shoulder and elbow injuries (odds ratio, 0.99; 95% confidence interval, 0.96 - 1.02; p = 0.70).

Conclusions: In high school baseball players, humeral torsion was greater on the dominant shoulder than on the non-dominant shoulder. Players who played baseball as pitchers during both elementary and junior-high school had greater humeral torsion on the dominant side than did players who were fielders during both periods. Given that pitchers throws more frequently than do fielders, this study suggests that increased time pitching in youth and adolescent athletes increases the humeral torsion on the dominant shoulder. Increased humeral torsion on the dominant shoulder was not a predictive factor for shoulder and elbow injuries.