The American Orthopaedic Society for Sports Medicine

Abstract Id: Paper 1

Abstract Title: The Latarjet Procedure for Recurrence of Anterior Instability of the Shoulder after Operative Repair

Authors

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Objectives:

Recurrence of anterior shoulder instability after operative repair is a rare but disabling condition for which treatment options are insufficiently studied. Coracoid transfer according to Latarjet is a highly successful treatment option for recurrent anterior shoulder instability. It was the purpose of this study to verify the hypothesis that this procedure is also effective after recurrence of instability after previous operative repair.

Methods:

Forty-nine consecutive patients with either one (n=32), two (n=12) or at least three (n=5) previous stabilizations other than the Latarjet procedure and recurrence of anterior instability associated with a lesion of the anterior glenoid rim were revised with a coracoid transfer according to Latarjet. Clinical outcome was assessed at a mean follow-up of 38 (23-63) months with standard clinical parameters including subjective shoulder value (SSV), scoring according to Constant and Murley (CS) and testing of stability. Standardized antero-posterior and axillary lateral radiographs before and after the Latarjet revision were used to assess osteoarthritis.

Results:

All 49 patients could be reviewed. No shoulder redislocated, subluxations recurred in two patients and five further patients reported a slight, unspecified uncertainty. No revision surgery was carried out or planned. Forty-three shoulders (88%) were subjectively excellent or good, 3 fair, 3 poor. Dissatisfaction was associated with persistent pain. Preoperative pain was the key predictor of postoperative pain: Patients with postoperative pain had a more than 20 fold chance to have preoperative pain than those without postoperative pain. The mean SSV increased from 53% to 78% ($p<0.001$) and the CS remained high (from 80% to 85%; $p=0.061$). Optimal graft placement was obtained in 30 cases and was related with better clinical outcome and lesser progression of osteoarthritis than suboptimal graft placement.

Conclusions:

Coracoid transfer according to Latarjet can effectively restore anterior shoulder stability if previous operation(s) have failed to do so. If such recurrence is associated with chronic pain, this is likely to persist and to compromise subjective outcome.

Relevant disclosure for all authors

Nothing to disclose

AOSSM 2012 Specialty Day

Abstract Id: Paper 2

Abstract Title: A Comparison Between Glenoid Bone Loss Measurement Techniques: Axial CT vs. 3D CT Sagittal Reconstruction

Authors

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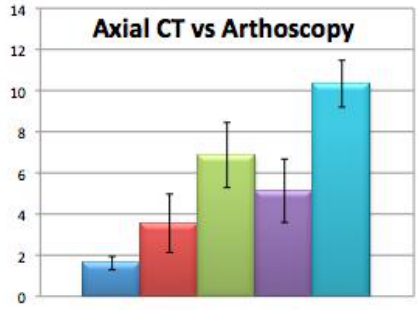
Objectives:

To determine which method of glenoid bone loss measurement more closely resembles the findings at time of surgery, axial CT scan or Three-dimensional (3D) sagittal CT reconstruction.

Figure:



Methods:

Over a 5 year period, a total of 113 patients had Computed Tomography scans which included 3D sagittal reconstructions. The axial CT images were measured for each patient by selecting 3 levels to measure below the coracoid process. The glenoid was measured by drawing a line perpendicular to the glenoid, then through the center of the humeral head. A line was then drawn and measured from this midpoint perpendicular to the bisecting line to the posterior edge of the glenoid. This distance was estimated to be half of the native glenoid AP distance. The sagittal CT scans were measured using a best fit circle method described by Huysmans in 2006 where a circle is drawn on the lower 2/3s of the glenoid to approximate an unaffected, native glenoid and any defect in the circle represents glenoid bone loss. Using this method, the measured area of the defect was divided by the total area of the circle centered on the glenoid approximating the native glenoid with bone loss representing a percentage of lost area. Image J 1.42 (available at rsb.info.nih.gov/ij/) was used to calculate the area of the circle and the measured area of the defect using the free hand draw tool.

Results:

Axial CT scan bone loss at the 3rd 5th and 7thslices below the coracoid combined was 19.4% (SD 9.1%). The average bone loss measured by sagittal CT was 11.9% (SD 6.0%). The bone loss as measured at the time of shoulder arthroscopy for the 43 patients was 10.3% (SD 7.9%).

Conclusions:

Our study found that not only does the three-dimensional sagittal CT scan give a bone loss estimate close to the bone loss found at time of surgery, but also is statistically significantly different from the axial CT measurements. With this new knowledge, 3D sagittal CT reconstructions can be a reliable method to accurately measure and estimate the amount of glenoid bone loss preoperatively.

References:

BoileauP, Villalba M, Héry JY, Balg F, Ahrens P, Neyton L. Risk factors for recurrenceof shoulder instability after arthroscopic Bankart repair. *J Bone Joint SurgAm* 2006; 88: 1755-1763

Relevant disclosure for all authors

Nothing to disclose

Abstract Id: **Paper 3**

Abstract Title: The Evaluation of Arthroscopic Remplissage by High Resolution MRI: Are We Getting Our Fill?

Authors

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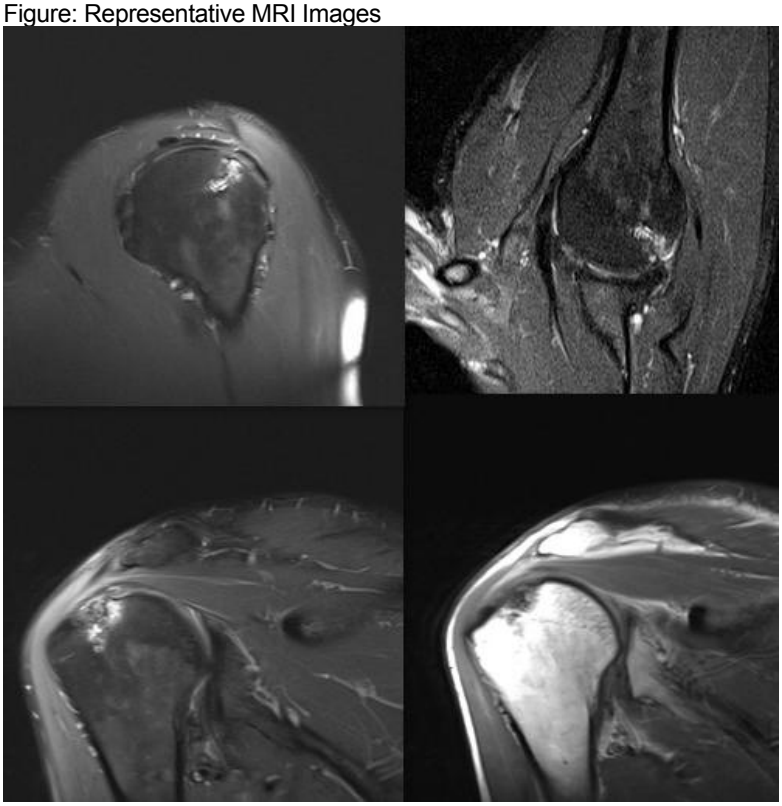
Objectives: To evaluate and characterize the post-operative appearance of the Remplissage procedure on high resolution MRI, and correlate these findings to clinical outcome (WOSI score, range of motion).

Methods: This is a prospective cohort study of patients who had undergone arthroscopic Remplissage for recurrent glenohumeral instability with large Hill Sachs defects. Images were acquired with a 3T protocol, reviewed by two musculoskeletal radiologists, with the shoulder in the ABER and neutral position. Measured parameters included: signal intensity of tissue within the prior defect, signal intensity of the residual infraspinatus, degree of atrophy, presence of marrow edema, and number of anchors in the defect. Functional scores were obtained with the WOSI questionnaire and comprehensive range of motion data was recorded with a goniometer.

Results: Nine patients were recruited for this study and the average follow up of the patients was 14.8 months (range 7.0 – 24.6). The average size of the Hill Sachs deformity was 311.2 cm^3 (range 93.6 to 825.1). The percentage of the deformity filled in with tendon was 75-100% and the degree of atrophy was 0-25% for all patients studied. No defects were left unfilled. Two patients had granulation tissue filling the deformity, and three patients had fibrous tissue, rest of the patients with mixed granulation tissue and fibrous tissue, with transition from granulation to fibrous tissue between 8.1 and 9.5 months post surgery. Four out of nine patients had tendinopathy or partial tears of the residual tendon insertion.The average number of anchors used was 1.4 (range 1 – 3). One patient with the largest Hill-Sachs defect (825.1 cm^3) dislocated once at 21 months post-operatively while playing softball, but was able to relocate without incident, and was satisfied with the procedure reporting marked improvement of symptoms compared to prior to the surgery. The average WOSI score was 71.0 (range 41.6 – 91.7) with the average external rotation loss of 7.1 degrees. None of the patients reported having noticed losing external rotation on the operative shoulder. There was no clear correlation between WOSI score, defect size, and degree of fill.

Figure: Representative MRI Images



Top left: T2 Sagittal, Top right: T2 ABER view, Bottom left: T2 coronal, Bottom right: T1 coronal.

Conclusions: Our data suggest that there is evidence of tendon incorporation and fill into the Hill-Sachs defect following Remplissage at 7 months and beyond. Although MRI findings did not correlate with the clinical findings, patients did not have significant external rotation deficit and were satisfied with the procedure.

Relevant disclosure for all authors

Nothing to disclose

Abstract Id: **Paper 4**

Abstract Title: Treatment of Elbow Partial Ulnar Collateral Ligament Tears With Platelet Rich Plasma

Authors

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Objectives: Studies have demonstrated the potential of platelet rich plasma (PRP) to heal damaged tissue. To date, there are no published reports of clinical outcome of partial ulnar collateral ligament (UCL) tears of the elbow treated with PRP. The purpose of this study is to evaluate the clinical outcome of patients who have undergone PRP injection for treatment of a partial ulnar collateral ligament tear.

Methods: Seventeen athletes with a partial thickness ulnar collateral ligament tear confirmed on MRI were prospectively followed. All patients had failed conservative treatment, including rest and physical therapy. Baseline questionnaires, including the Kerlan Jobe Shoulder and Elbow Score (KJOC Score) and Disability of the Arm, Shoulder, and Hand Score (DASH Score) were completed for each patient prior to injection. Baseline ultrasound measurement of the medial elbow joint space was assessed with 10 pounds of valgus stress on the elbow. Each patient underwent a single PRP injection at the ulnar collateral ligament under ultrasound guidance. All injections were performed by the same treating physician at a single institution. The same system for PRP preparation was used with each of the injections. Patients completed a course of guided physical therapy and were allowed to return to play based on their symptoms and physical examination. Outcome scores, including KJOC and DASH Scores, were collected after return to play and were compared with baseline scores. Ultrasound measurements were collected at final follow-up and compared with pre-injection values.

Results: At an average follow-up of 19 weeks (range 12-46 weeks), 16 of 17 athletes had returned to play without any complaints. The average time to return to play was 12 weeks (range 10-15 weeks). The average KJOC Score improved from 47 to 93, p=.0001. The average DASH Score improved from 24 to 3, p=.003. The Sports Module of the DASH questionnaire improved from 74 to 6, p=.0001. Medial elbow joint space with valgus stress decreased from 3.1 mm prior to injection, to 2.1 mm at final follow-up, p=.0004. One player sustained a complete tear of the ulnar collateral ligament at 31 weeks after injection and required ligament reconstruction.

Conclusions: The results of this study indicate that PRP is an effective option to successfully treat partial ulnar collateral ligament tears of the elbow in high demand athletes.

Relevant disclosure for all authors

Nothing to disclose

AOSSM 2012 Specialty Day

Abstract Id: Paper 5

Abstract Title: Elbow Positioning: A Predictor for Injury and Performance in Baseball Pitching?

Authors

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Objectives:

Elbow position plays a role in pitching and coaches talk about getting the elbow in line with the shoulder. When the elbow is not in line with the shoulder coaches say the player is dragging or dropping their elbow. Coaches suggest that a dropped or dragging elbow can increase stresses and reduced ball velocity. The purpose of this study was to determine how the position of the elbow can affect the stresses on the glenohumeral and elbow joints and affect the ball velocity.

Methods:

54 collegiate pitchers threw a fastball from a mound toward a target 60'6" away. Kinematic data were collected using a VICON 512 motion system (Vicon, Los Angeles, CA), and kinetic data were computed using inverse dynamic techniques. Elbow vertical position (drop) was calculated by determining the vertical distance between the shoulder joint center (SJC) and the elbow joint center (EJC) in laboratory coordinates. Elbow horizontal position (drag) was calculated as the horizontal distance between the SJC and EJC in laboratory coordinates. Values were calculated at the time of maximum elbow varus moment. A Pearson's correlation determined if elbow position correlated with the elbow varus moment, glenohumeral rotation moment, ball velocity, and thoracic position. A two-variable regression (alpha=0.05) determined the relationship between the elbow position and these variables.

Results:

The average elbow drop was -7±7cm and the average elbow drag was 0±4cm. Elbow drag did not correlate with any of the measured variables. Thoracic lean highly correlated with elbow drop (r=0.77) and elbow drag correlated with thoracic rotation (r=0.44). Regressions analysis showed that neither elbow drop nor drag were a predictor of the joint stresses. However, elbow drag did show a statistically significant relationship with ball velocity indicating that for every 10cm of drag ball velocity decreased 1.3m/s (p=0.048). Elbow drag and drop both showed a relationship with thoracic positioning, a 10° increase in thorax rotation increased drag by1.6cm (p=0.0007) and a 10° increase in thoracic lean increased elbow drop by 4.4cm (p=<0.0001).

Conclusions:

Elbow positioning does not seem to affect joint loads. However, elbow drag does affect a pitcher's performance. Furthermore an elbow that is visually in the wrong position may actually indicate that a pitcher's thoracic positioning is incorrect. Therefore coaches should understand the thorax's effect on visual elbow positioning.

Acknowledgements:

This work was supported in part by a grant from Major League Baseball

References:

Dun et al - A biomechanical comparison of youth baseball pitches: Is the curveball potentially harmful - AJSM 2008

Nissen et al - Adolescent baseball pitching technique - MSSE 2007

Relevant disclosure for all authors

Nothing to disclose

Abstract Id: **Paper 6**

Abstract Title: **Prevalence of Hip Pathology in Asymptomatic Subjects. A Prospective Investigation Using Magnetic Resonance Imaging (MRI)**

Authors

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Objectives: Previous studies have shown a high prevalance of hip pathology in athletes with groin pain, however, the prevalence of abnormal MRI findings in an asymptomatic population has yet to be defined. The purpose of this study was to assess a cohort of asymptomatic individuals to determine the prevalence of hip pathology.

Methods:

Forty-five volunteer subjects with no history of hip pain, symptoms, injury, or surgery were recruited for enrollment in this IRB approved study. Patients underwent a unilateral MRI scan using a Siemens 3.0 Tesla scanner. The extremity side evaluated by MRI was selected randomly. All MRI scans were reviewed by three separate fellowship-trained musculoskeletal radiologists. The scans were mixed randomly with 19 scans from symptomatic patients to blind the radiologists to the possibility of patient symptoms. An abnormal finding was considered positive when 2 of 3 radiologists agreed on the pathology.

Results: The average volunteer age was 37.8 years (range 15 to 66). There were 60% males and 40% females. Labral tears were identified in 69% of hips, chondral defects in 24%, ligamentum teres tears in 2.2%, labral/paralabral cysts in 13%, acetabular bone edema in 11%, fibrocystic changes of the head neck junction in 22%, rim fractures in 11%, subchondral cysts in 16%, and osseous bumps in 20%. Subjects over the age of 35 were 13.7 [95% CI: 2.4 to 80] times more likely to have a chondral defect and 16.7 [95%CI: 1.8 to 158] times more likely to have a subchondral cyst compared to those subjects 35 or younger. No other joint pathology was associated with age. Male subjects were 8.5 [95% CI: 1.2 to 56] times more likely to have an osseous bump compared to female subjects. No other joint pathology was associated with gender.

Conclusions: The prevalence of hip pathology on magnetic-resonance images of asymptomatic volunteers revealed abnormailites in 73% (Total number of patients with any abnormality as agreed upon by 2 radiologists) of hips with labral tears being identified in 69% of the joints. A strong correlation was seen between patient age and early markers of cartilage degeneration such as cartilage defects and subchondral cysts. The high prevalence of abnormal hip finding on MRI emphasizes the importance of correlating clinical signs and symptoms with imaging findings during the surgical decision-making process.

Relevant disclosure for all authors

Nothing to disclose

AOSSM 2012 Specialty Day

Abstract Id: Paper 7

Abstract Title: Osteoplasty for Cam Type Impingement Is More Accurate When Performed Open than Arthroscopic

Authors

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Objectives:

Cam type femoral acetabular impingement (FAI) is characterized by reduced offset of the femoral neck and an increased alpha angle. The purpose of the study was to compare a single surgeon results of femoral neck osteoplasty performed via the open surgical dislocation approach versus the arthroscopic one. The null hypothesis was that the radiographic measurement of the cam lesion post-operatively will be similar between the two approaches.

Methods:

Between January 2008 and January 2011, 797 hip preservation surgeries were done by the senior author, 17 open and 780 arthroscopically. The inclusion criteria for the study were patients who underwent femoral neck osteoplasty and were younger than 31 year old. Revisions surgeries, cases with previous hip condition such as LCPD or AVN and hips with Tonnis arthritic grade greater than 1 were excluded from the study. A total of 92 hips (83 patients) fitted the inclusion/exclusion criteria, 8 cases were treated by open surgical dislocation and 84 arthroscopically.

A surgical reshaping (osteoplasty) of the femoral head-neck was done in the presence of alpha angle > 50 degrees. During open surgical dislocation the femoral osteoplasty was performed using a plastic spherical template and an osteotome, while arthroscopically it was done under fluoroscopy using a 5.5mm burr.

The cam lesions were radiographically quantified pre- and post-operatively according to the alpha angle and the head-neck offset ratio as measured on Dunn view.

Results: The mean age of the patients was 22 (range, 14 to 30 years). Pre-operative cam lesions were not found to be statistically different between the groups; with a mean alpha angle of 60.6 (±14.9) and 72.3 (±12.4) degrees and mean offset of 5.4 (±3) and 3.5 (±2.6) millimeters for the open and arthroscopic groups respectively. However, there was significant difference in the post-operative head-neck morphology as reflected by the alpha angle and the femoral neck offset. The mean post-operative alpha angle of the open group was 39.8 (± 2.3) degrees versus 49.3 (±11.9) degrees for the arthroscopic group ($p<0.0001$). The post-operative head-neck offset ratio was found to be 9.3 (±1.2) and 7.9 (±2.6) millimeters for the open and arthroscopic groups respectively ($p=0.016$).

Conclusions: The results suggest that, despite the rapidly growing popularity of hip arthroscopy, open surgical dislocation may still be the gold standard for surgical treatment of FAI as this approach led to a more accurate osteoplasty.

Relevant disclosure for all authors

Finacial compensation was received for this research from the following organization(s): Arthrex, Inc.

AOSSM 2012 Specialty Day

Abstract Id: Paper 8

Abstract Title: Long Term Survival of ACL Reconstruction in a Series of 760 Patients

Authors

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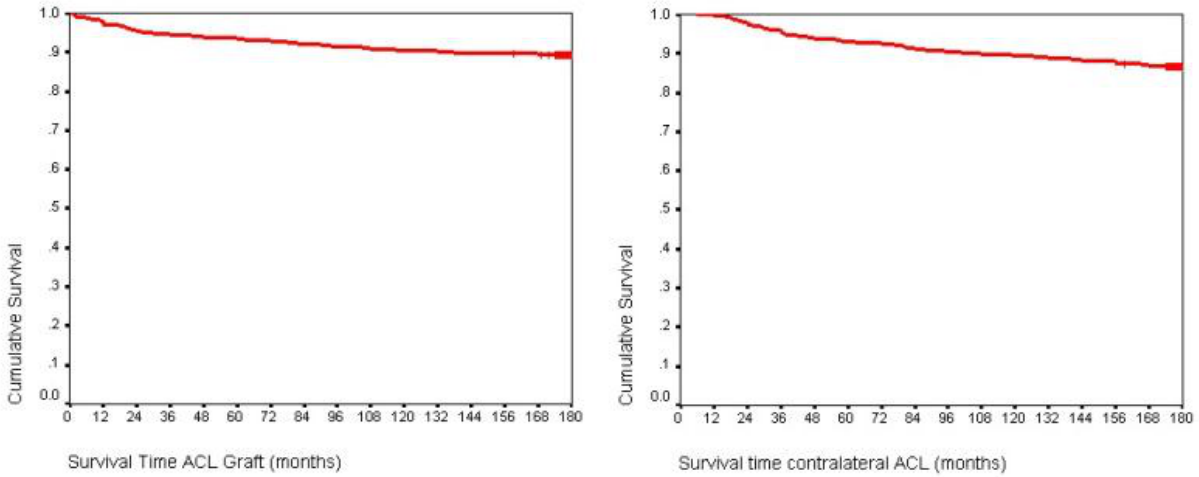
Objectives: The aim of this study was to examine the long term survival of anterior cruciate ligament reconstruction in a large series of patients 15-19 years after their surgery, and to identify characteristics which may increase risk of reinjury.

Methods: Over a 2 year period 889 consecutive patients underwent ACL reconstruction. Patients with a previous contralateral ACL injury (n=96), those seeking compensation for their injury, those who refused to participate in a research program, and those who were deceased were excluded. There were 760 patients remaining who underwent ACL reconstruction with either hamstring (n=405) or patellar tendon autograft (n=355). At a minimum of 15 years after surgery patients were contacted and completed a subjective interview. Assessment included incidence of further injury or surgery to either knee, IKDC subjective score, and activity level. A survival analysis was carried out according to Kaplan and Meier.

Results: Over 15 years after ACL reconstruction 23% of patients had sustained either an ACL graft rupture or contralateral ACL injury. Expected survival of the ACL graft was 96%, 93%, 90% and 89% at 2, 5, 10 and 15 years after ACL reconstruction. Expected survival of the contralateral ACL was 97%, 93%, 89% and 86% at 2, 5, 10 and 15 years after ACL reconstruction. ACL graft survival was less favourable in males compared to females (p=0.01) and those with a family history of ACL injury compared to those with no family history of ACL injury (p=0.05). ACL graft survival was not significantly different between hamstring or patellar tendon grafts (p=0.16). Contralateral ACL survival was less favourable in patients who received a patellar tendon graft compared to those who received a hamstring tendon graft (p=0.05), and those with a family history of ACL injury (p=0.03). The mean IKDC subjective score at 15 years was 85. 69% of patients reported they returned to the same level of activity as prior to their ACL injury and 50% of patients were still participating in strenuous or very strenuous activities at 15 years.

Figure:



Kaplan-Meier survivorship analysis of the ACL graft and the contralateral ACL

Conclusions: Fifteen years after ACL reconstruction expected survival of the ACL graft is 89% and expected survival of the contralateral ACL is 86%. Graft choice did not affect ACL graft rupture but the patellar tendon graft increased the risk of contralateral ACL rupture, compared to the hamstring tendon graft. Males had less favourable survival of the ACL graft than females and a family history of ACL rupture increased the risk of both ACL graft and contralateral ACL rupture.

Relevant disclosure for all authors

Nothing to disclose

Abstract Id: Paper 9

Abstract Title: Return to High School and College Level Football Following ACL Reconstruction

Authors

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Objectives:

ACL injuries are common career threatening injuries in football. However, there is limited information on specific return to play (RTP) and no published studies exist on RTP for high school (HS) and college (C) football or on the ability to play at the next level after ACLR.

Hypotheses: First, quantify the percentage of football players who RTP. Second, determine player opinion on their performance if RTP as well as reason(s) for not RTP. Third, determine the risk factors for not RTP or RTP not at the same level.

Methods: Retrospective identification of all football players enrolled in 2002 and 2003 of the MOON cohort. Players were contacted and underwent a structured phone interview regarding participation in football surrounding the injury and factors involved with RTP. Descriptive data were analyzed and presented. Multivariable analysis was not available for football players who did not RTP due to inadequate sample.

Results: 145 football players were contacted from the 2002/2003 MOON cohort. There were a total of 96 freshman-junior football players at either the high school or college level that had a competitive football program to RTP (68 HS, 28 C). The results are summarized in Table 1 below. The RTP rates were similar for high school and collegiate athletes with ~64% RTP. Based on player perception, there was a 42% overall RTP at the same performance level with ~30% who felt they did not perform at a level attained prior to their ACL tear. At both levels, a main reason players did not RTP was fear. As a result of the relatively low numbers at both levels of players who did not RTP (HS=8, C=20), multivariable analysis to determine potential risk factors (i.e., player position, meniscus and articular cartilage injuries, and graft type) could not be performed. Additionally, 12% of high school and 14% of college athletes report playing at the next level.

Figure:

	High School (n = 68)	College (n = 28)
TOTAL Return to Play	62%	68%
Return to SAME performance	42%	42%
Return to NOT same performance	29%	26%
Did NOT RTP	29%	34%
Reason for NOT RTP: Fear	53%	44%
Play at the NEXT level	12%	14%

Table 1.

Conclusions: RTP after ACLR in competitive high school and college football is only ~64%. To our knowledge, this is the first report of football-specific RTP for amateur athletes and to identify fear as a modifiable risk factor to improve RTP in competitive football at these levels of play. Further ongoing recruitment is required for a detailed, multivariable analysis of multiple risk factors. The psychological component of RTP is all too

frequently underestimated and warrants further investigation.

Acknowledgements: Partially funded by NFL Charities grant and grant Nos. 5R01AR053684 (KPS) and 5K23AR052392-04 (WRD) from NIH/NIAMS.

Relevant disclosure for all authors
Nothing to disclose

Abstract Id: **Paper 10**

Abstract Title: **The Swedish National Anterior Cruciate Ligament Register; A Report of Baseline Variables and Outcome of Surgery for Nearly 18, 000 Patients**

Authors

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Objectives: The Swedish National ACL register was initiated in January 2005. Until year 2010, 17, 794 patients have been registered. The register covers >90% of all ACL procedures in Sweden.

Methods: The register is a general database and the registrations are made using a web-based protocol. It consists of two parts, one patient section with self reported outcome scores and one surgeon-based part where factors such as age, gender, cause of injury, previous surgery, time between injury and reconstruction, graft selection, fixation technique and concomitant injuries are reported. The self reported part is registered pre-operatively, at one, two and five years.

Results: The male:female ratio was 58:42 both for primary (n=16, 767) and revision (n=1, 027) reconstructions. The mean age at primary reconstruction was 26 and 28 years for females and males respectively. The cause of injury was soccer in half of the male patients and in one third of the female patient. In 2010, 98% of the primary reconstructions were performed using the hamstring tendon autograft. In 2010 cortical button was used for fixation on the femoral side in 60% of the patients, and on the tibial side the fixation was made with a metal or absorbable interference screw in 50% of the patients. Pre-operatively there was impairment in the KOOS score especially in sports/recreation and knee related quality of life. All dimensions of the KOOS score were significantly improved uptil 5 years post-operative. In terms of the KOOS, revisions did significantly worse than primary reconstructions at all follow-up occasions and smokers were significantly worse than non-smokers both pre- and post-operatively. Patients who had concomitant meniscal or chondral injuries at reconstruction did marginally worse at 5 years than patients without such injuries. Double bundle reconstructions did marginally worse than single bundle reconstructions at 1 year; at 2 years the opposite was found. During a five year period the cumulative incidence to undergo a contra lateral ACL reconstruction or revision reconstruction of the index knee is >9%. The corresponding incidence for a 15-18 year old female soccer players is 22%.

Conclusions: The Swedish ACL Register reveals that revision reconstructions do worse than primary ones, smokers do worse than non-smokers and young female soccer players have a major risk to injure and reinjure their knees.

Acknowledgements: The Swedish Association of Local Authorities and County Councils supported the study.

Relevant disclosure for all authors
Nothing to disclose

Abstract Id: **Paper 11**

Abstract Title: **Meniscal and Chondral Injury in Association with Pediatric Anterior Cruciate Ligament Tears: Relationship of Treatment Time and Patient Specific Factors**

Authors

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Objectives:

Meniscal and chondral injuries may occur in association with anterior cruciate ligament (ACL) deficiency. The purpose of this study is to evaluate the relationship of elapsed time from injury with the incidence of meniscal and chondral injury noted at the time of surgical treatment for ACL tears in pediatric patients. The effect of age, gender, weight, and mechanism of injury will also be evaluated

Methods:

A retrospective chart review of pediatric patients undergoing primary arthroscopic anterior cruciate ligament reconstruction between January 2005 and January 2011 was performed. The presence of meniscal tear, chondral injury, number of days from injury to treatment, age, weight, gender, and mechanism of injury were recorded for each patient. The data was analyzed to determine if time before treatment and patient specific factors were associated with rates of meniscal injury. Analysis was also performed to identify the number of patients with an articular cartilage lesion in the same compartment as a concurrent medial or lateral meniscal tear.

Results:

370 pediatric patients who underwent primary ACL reconstruction were included. 241 were treated ≤150 days (early) from injury, and 129 were treated >150 days (delayed) from injury. 91(37.8%) patients in the early treatment group and 69 (53.5%) patients in the delayed treatment group had medial meniscal tears (MMT) (p=0.014, OR 1.8). Lateral meniscus tear (LMT) rates were similar (56.0% and 57.4%) in each group. 87/160(54.4%) patients with MMT and 26/210(12.4%) without MMT had medial femoral condyle articular injuries (p<0.001, OR 8.6). 57/209(27.3%) patients with LMT and 11/161(6.8%) without LMT had lateral femoral condyle articular injuries (P<0.001, OR 4.6). Tibial chondral injuries were far less common, but also associated with meniscal injury. 54/170(31.8%) patients weighing ≤65kg and 106/200(53%) weighing >65kg had MMTs (p<0.001, OR 2.2). Age ≥16 tears also influenced presence of MMT (p<0.05, OR 1.6). Weight >65kg influenced the presence of LMT (p<0.05, OR 1.7).

Conclusions:

Pediatric patients treated >150 days after injury for ACL tears have a higher rate of MMT than those treated ≤150 days after injury. Increased age and weight are associated with a higher rate of medial meniscus tears. Patients with ACL tears and a medial or lateral meniscus tear are more likely to have chondral injury in that particular compartment than those without meniscal tears

Relevant disclosure for all authors

Nothing to disclose

Abstract Id: **Paper 12**

Abstract Title: Results of a Novel Single-stage Cartilage Restoration Technique: Minced Juvenile Articular Cartilage Allograft for Chondral Defects of the Patella

Authors

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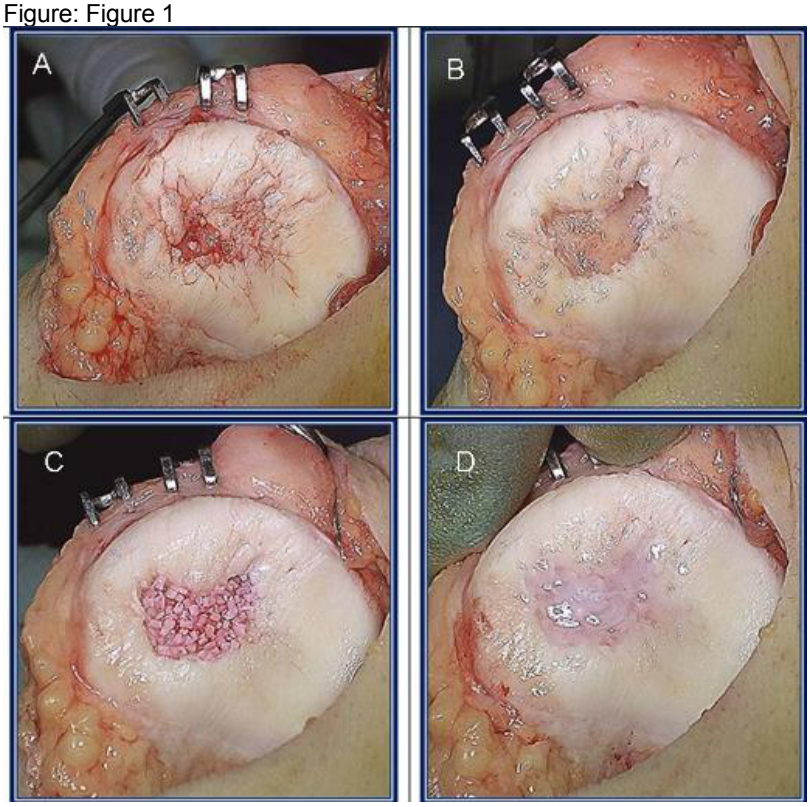
Objectives: Treatment options for patellar chondral defects are limited. The purpose of this study is to evaluate outcomes using minced juvenile cartilage for treatment of focal Outerbridge grade 4 articular cartilage defects of the patella.[1]

Figure: Figure 1



Allograft Placement Technique--A: Patellar Chondrosis; B: Patellar Preparation; C: Allograft; D: Solidified graft

Methods: From 2007 to 2010, 13 patients (2 bilateral) underwent a novel single-stage articular cartilage restoration procedure utilizing minced juvenile articular cartilage allograft. **Fig. 1** All patients were contacted at a minimum of 6 months post-op. Three did not return phone calls, 1 had experienced a patellar dislocation, and 10 knees (9 patients) were enrolled in this study. The average age at surgery was 27.8 years (range 15-37) and post-operative follow-up was 22.7 months (range 6.2-42). All patients completed KOOS, IKDC, and Kujala clinical outcome surveys (scale 0-100), as well as Tegner Activity and Visual Analog Pain Scales (scale 0-10). All knees also underwent post-operative MRI evaluation as a non-invasive assessment of cartilage repair. MRI was evaluated by a musculoskeletal radiologist using the ICRS cartilage repair assessment, as well as an evaluation of graft hypertrophy, bony changes around the graft, and percent fill of defect.

Results: Average clinical outcomes scores at follow-up for each scale were 76.6 (range 52.9-96.6) for IKDC; 84.5 (range 71-97) for Kujala; and 90.6 (Pain), 88.9 (Symptoms and Stiffness), 93.5 (Activities of Daily Living), 72.5 (Sports and Recreation), and 68.1 (Quality of Life) for each subdomain of KOOS. Scale scores were 6.1 (range 4-9) for Tegner, and 1.05 (range 0-2) for Visual Analog, indicating minimal to no pain. The average ICRS cartilage repair assessment score on MRI was 8.6 (range 3-12), a nearly normal assessment. All but two patients showed normal or nearly normal cartilage repair. Two patients had mild graft hypertrophy while two had gross graft hypertrophy, one of which required arthroscopic debridement due to symptoms. Bony changes were limited to signal changes in the surrounding bone, but no frank fluid or cystic change. Average fill of the defect was 94.5% with all but two demonstrating 100% fill.

Conclusions: Cartilage restoration utilizing minced juvenile articular cartilage allograft offers a viable option for patients with focal grade 4 articular cartilage defects of the patella. The findings of this study, from both subjective and objective data, support this procedure for patella chondral defects, a location previously shown to have less predictable outcomes with alternative treatment options.

References: Bonner KF, et al. 2-year postoperative evaluation of a patient with a symptomatic full-thickness patellar cartilage defect repaired with particulated juvenile cartilage tissue. J Knee Surg; 23:109-14.

Relevant disclosure for all authors
Nothing to disclose

AOSSM 2012 Specialty Day

Abstract Id: **Paper 13**

Abstract Title: Intra-operative Determinants of Rotator Cuff Repair Integrity: An Analysis in 500 Consecutive Repairs

Authors

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Objectives:

Rotator cuff repair has a relatively high (20-90%) chance of re-tear. Patients with an intact rotator cuff six months post-surgery have better subjective and objective outcomes at six months and two years following rotator cuff repair than those who do not have an intact repair. The aim of this study was to determine if, and if so, which, intra-operative factors predict an intact repair six month after rotator cuff repair

Methods:

The study consisted of a cohort of 500 consecutive patients who had an arthroscopic rotator cuff repair performed by a single surgeon and an ultrasound evaluation of the repair six months post repair using standard protocols. Exclusion criteria included previous fractures or shoulder surgery, incomplete or partial rotator cuff repair and concomitant arthroplasty. Rotator cuff tear size was measured intra-operatively and mapped. The quality of the tendon, tendon mobility and repair quality were assessed and ranked based on pre-determined scales (1 to 4) and recorded on a specifically designed form. Logistic regression analysis was performed with cuff integrity at 6 months as the dependent variable and tear/repair factors as the independent variables.

Results:

The overall post-operative re-tear rate was 19 % at 6 months post repair. The best predictor of rotator cuff integrity was pre-operative tear size (correlation coefficient, $r = 0.33$, $p < 0.001$). Patients with small (≤ 2 cm2) rotator cuff tears were least likely to re-tear (re-tear rate: 10 %). As the tear-size increased, the re-tear rate increased in a linear fashion: ≤ 2 cm2 (10 %), 2-4 cm2 (16 %), 4-6 cm2 (31 %), 6-8 cm2 (50 %), >8 cm2 (57 %). Other surgeon-ranked intra-operative assessments did correlate (negatively) with re-tear, but the correlations were relatively weak: repair quality ($r = -0.17$, $p < 0.001$), tendon mobility ($r = -0.15$, $p < 0.001$), tendon quality ($r = -0.14$ $p < 0.01$). Regression analysis showed that the re-tear rate at 6 months was best predicted from the preoperative tear size and surgeon-ranked repair quality: chance of re-tear = 0.4 + (0.02 x tear size in cm2) - (0.08 x repair quality). Tendon quality and tendon mobility did not contribute significantly to this prediction.

Conclusions:

Tear size was the best intra-operative predictor of repair integrity post-rotator cuff repair, with tears less than 2 cm^2 twice as likely to heal than tears greater than 6 cm^2.

Relevant disclosure for all authors

Nothing to disclose

AOSSM 2012 Specialty Day

The American Orthopaedic Society for Sports Medicine

Abstract Id: Paper 14

Abstract Title: Factors Most Closely Associated With Functional Outcomes in Rotator Cuff Repair

Authors

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Objectives: Reduction in pain and restoration of strength are the two primary goals of rotator cuff repair. The objectove of this study was to determine if subjective (pain) or objective (strength) measures correlate to patient satisfaction, functional outcomes, validated disease specific outcome measures and general quality of life metrics. We hypothesize that both overall satisfaction and quality of life metrics will correlate more closely to a decrease in pain rather than an improvement in strength. Conversely, validated functional outcome scores will more closely correlate with strength rather than pain.

Methods: We performed a retrospective review of data from a randomized controlled trial on the effect of acromioplasty in rotaotor cuff repair. Pre and post-operative data was collected and outcomes at one year were examined. Pain and strength were the primary predictive variables. Strength was measured in an isometric fashion using a digital dynamometer by independent observers. Pain was measured by VAS scale. The degree of correlation with three primary groups of outcomes will be examined. These groups are: 1) validated, disease-specific outcome measures including the American Shoulder and Elbow Surgeons score (ASES), the Constant score (CS), and Simple Shoulder Test (SST), (2) general quality of life measured by the SF-12 and (3) patient satisfaction. The degree of change in pain and strength will be compared to patient and disease specific characteristics including sex, age,worker's compensation status and tear size. The extent of correlation was assessed using Spearman's rank correlation with correlation coefficients of >0.50, 0.35-0.50 and <0.35 considered strong, moderate and weak, respectively with <0.05 deemed statistically significant.

Results: Change in strength (forward flexion) correlated with two outcomes, change in SF-12 (0.327) and SST (0.395). Change in pain was correlated only with the change in the ASES. (Table 1)

Figure:

	Post operative SF 12 Physicals	Change in SF-12 Physcial	Change in SF-12 Mental	Post operative SST	Change in SST	Post operative ASES	Change in ASES
Change VAS							
Spearman Rank	-0.29421	-0.20575	0.30598	-0.24923	0.05408	-0.29014	0.70427
p-value	0.0619	0.2089	0.0655	0.1161	0.737	0.0657	<.0001
Change FF Strength							
Spearman Rank	0.327	0.41303	-0.27019	0.28606	0.39509	0.26055	0.21885
p-value	0.0451	0.0123	0.1165	0.0817	0.0141	0.1141	0.1868
Change ER Strength							
Spearman Rank	0.00724	0.15281	-0.4312	0.01777	0.3303	0.15231	0.22475
p-value	0.9661	0.3898	0.0109	0.9168	0.0459	0.3682	0.1811

Table 1. Red represents p>0.05, yellow represents a weak correlation with p>0.05, and blue a moderate correlation with p<0.05

Conclusions: Our results suggest that increases in strength correlate with improvements in general quality of life for patients who undergo rotator cuff repair. Among validated outcome measures, pain correlates with the ASES and strength with the SST. Overall, correlations were weak and no validated outcome measure correlated with both strength and pain. This finding suggests these outcome measures may be unable to capture basic treatment effects and development of novel, more accurate measures may be indicated.

Relevant disclosure for all authors

Nothing to disclose

AOSSM 2012 Specialty Day

Abstract Id: Paper 15

Abstract Title: Biomechanical Evaluation of Trans-Osseous Rotator Cuff Repair: Do Anchors Really Matter?

Authors

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Objectives:

The purpose of this study is to compare the initial biomechanical properties of 4 RCR techniques: Arthroscopic trans-osseous equivalent repair using suture anchors (TOE), traditional trans-osseous repair (TO), trans-osseous using the ArthroTunneler (AT) (Tornier, Edina, MN) and ArthroTunneler with X-Box suture configuration (ATX).

Methods:

27 human cadaveric shoulders were dissected down to supraspinatus and randomized into one of four repair groups (TOE, TO, AT, ATX). BMD was obtained via CT scan. Tensile testing was conducted in 30° of abduction, and involved an initial preload, cyclic loading, and pull to failure. Elongation during testing was measured using optical tracking. Data was statistically assessed using ANOVA with a Tukey post-hoc test for multiple comparisons.

Results:

The TOE repair demonstrated a significantly higher mean failure load (558.5 N ± 122.9) than the TO (325.3 N ± 79.9), AT (291.7 N ± 57.9), and ATX (388.5 N ± 92.6) repairs ($p<.05$). There was no statistical difference in cyclic elongation between groups TOE (5.9% ± 3.3%), TO (13.7% ± 7.4%), AT (14.3% ± 8.9%), and ATX (11.7% ± 5.3%). There was no significant difference between repair groups in elongation or stiffness during maximum load-to-failure, in excursion during the first cycle of cyclic testing, or in average secant stiffness of last 5 cycles. Failure modes were: TOE - tendon (4), bone (3); TO - suture (6), bone (1); AT - bone (2), tendon (2), suture (1); ATX - tendon (n=7).

Conclusions:

This study demonstrates that anchorless repair techniques using trans-osseous sutures only resulted in lower failure loads than a repair model utilizing anchors in a TOE construct. Changing to an X-Box suture configuration increased the construct failure load, although not significantly so. The TOE repair offers superior biomechanical properties to trans-osseous repairs regardless of tunnel or suture configuration

Relevant disclosure for all authors

Nothing to disclose

Abstract Id: Paper 16

Abstract Title: Do Diabetes or Statins Affect Clinical Outcomes or Healing of Arthroscopic Rotator Cuff Repairs?

Authors

Salma Chaudhury MD PhD MRCS[1]; Alice J. Fox MSc[2]; Florian Wanivenhaus MD[1]; Lawrence V. Gulotta MD[1]; Russell F. Warren MD[1]; Ronald Adler MD[1]; Joseph Nguyen MPH[3]; Joshua S. Dines MD[4]; Scott A. Rodeo MD[1]

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Objectives:

Questions remain about the impact of the increasing incidence of diabetes and statin use on rotator cuff healing following surgical repair, in view of the reported association between tendinopathies, diabetes and hypercholesterolaemia [1, 2]. The purpose of this study was to investigate whether there is an association between concomitant diabetes or pre-operative statin use and the success of arthroscopic rotator cuff repair as assessed by clinical outcomes or healing measured by ultrasound.

Methods:

We prospectively collected data from 104 patients who underwent arthroscopic rotator cuff repairs to determine medical history of diabetes or statin use, pre and post-operative physical examinations, manual muscle testing, VAS and ASES scores. Structural healing was assessed using ultrasound at one and two years post-operatively. Clinical outcomes and ultrasound parameters indicating healing were compared between affected and unaffected patients. Statistical comparisons for two year follow-up were done using paired t-tests for continuous variables and chi-square/Fisher's exact tests for categorical comparisons with alpha set at 0.05

Results:

The mean age of patients was 58.6 ± 9.8 years with 41.5% females. 11.5% (n=12) of patients had diabetes and 19.2% (n=20) used statins. No association was found between the presence of diabetes ($p=0.705$) or statin use ($p>0.999$) and healing rates. Failure of rotator cuff repairs was also unaffected by other pre-operative factors such as previous surgery to the contralateral shoulder ($p=0.423$), smoking ($p=0.632$), alcohol use ($p=0.883$), other tendinopathies ($p>0.999$), and previous joint replacements ($p>0.999$).

Conclusions:

Pre-operative diabetes or statin use in patients with rotator cuff tears was not found to affect clinical outcomes or radiological healing at two years. Data was only collected from a single time point, pre-operatively. Further studies are required to quantify blood glucose or cholesterol levels and the duration of statin use to delineate whether these factors may increase the incidence of rotator cuff tears or impair healing.

Acknowledgements:

We would like to thank all of the Sports Service Attendings at Hospital for Special Surgery

References:

1. Bediet al. JSES, 2010;19(7):978-882. Chenet al. JSES, 2003; 12(5): p. 416-421.

Relevant disclosure for all authors

Nothing to disclose

Abstract Id: **Paper 17**

Abstract Title: Helmet Characteristics as Profile Elements Identifying Susceptibility to Mild Traumatic Brain Injury (Concussion) in Tackle Football

Authors

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Objectives: **The** current literature for managing mild traumatic brain injury (concussion) emphasizes careful evaluation and safe return to play guidelines for the prevention of complications including re-concussion and post-concussion syndrome. The purpose of this paper is to identify characteristics that contribute to a predisposing profile of concussions that occur in tackle football. By identifying etiologic components of such a profile and modifying their demographics presumedly the incidence of the index injury would be reduced.

Methods: Reports from 1006 concussions, collected by the National High School Sports-Related Injury Surveillance System using High School RIO™, were examined using loss of consciousness (LOC) incidence 44/1106 = .040 and amnesia incidence 267/1106 = .2414 as hard end points for concussion severity. Multivariate odds ratios for LOC was calculated for helmet fit, inner helmet padding systems, helmet condition as new vs. reconditioned and athlete age.

Results: . Athletes wearing properly fitting helmets, as reported by team certified athletic trainers, were 80% less likely to experience LOC (OR = 0.214, – 95% CI .066 - .693, p=.0102), Predominantly air – filled bladder lined helmets also increased risk of LOC. (OR = 5.566, 95% CI 1.756 – 1.7649, P=.0035). Helmet condition and athlete age were not significant predictors for loss of consciousness. A significant risk factors for the occurrence of amnesia was a predominately foam lined helmet (OR = 1.720, 95 % CI 1.003 – 2.949).

Conclusions: . Helmet fit is an important and easily modifiable risk factor for severe concussion injury. Also, it appears that helmet lining – air bladder vs. foam – is an important and modifiable risk factor for severe concussion.

Acknowledgements: The authors indebted to Dawn Comsat PhD for sharing the data from the National High School Sports- Related Injury Surveillance System.

Relevant disclosure for all authors

Nothing to disclose

Abstract Id: Paper 18

Abstract Title: Surgical Repair of Complete Proximal Hamstring Rupture: A Clinical Outcomes Study

Authors

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Objectives:

Limited studies are available that use validated outcome measures to assess the results of complete proximal hamstring avulsions after surgical treatment. The purpose of this study is to report subjective and objective outcomes in this population.

Methods:

A retrospective review of 14 patients was performed. 10 patients (71.4%) witha mean age of 43.7 years (range 26 to 53 years, SD 8.1) were available for follow-up at a mean of 31.8 months (range 21 to 57 months, SD 12.2). Outcome measures included the Single Assessment Numeric Evaluation (SANE), Visual Analog Scale (VAS), Proximal Hamstring Injury Questionnaire, Lower Extremity Functional Scale (LEFS), Harris Hip Score (HHS) and Tegner Activity Level Scale (TALS).

Results:

90% patients (9/10) sustained a proximal hamstring avulsion in during a traumatic injury in an athletic event. No concomitant procedures were performed atthe time of hamstring repair. Prior tosurgery, 2 of the patients had unsuccessful conservative treatment (physicaltherapy) and ultimately consented to surgical repair at 2 months and 4 years. The rest of the patients were treated at<1 month from injury.

All patients (10/10) were satisfiedwith the surgery. The meanpost-operative scores were as follows: SANE 92.7 (range 75 to 100, SD 8.3), VAS1.2 (range 0 to 4, SD 1.8), LEFS 90.6 (range 74 to 100, SD 8.3), HHS 88 (range67 to 100, SD 13.5). TALS improved from7.1 (range 1-8, SD 2.4) preoperatively to 3.9 (range 1-7, SD 2.2) postoperatively. All 8 patients who participated in sports prior to surgery were able to return to sport, but 75% reported a decrease in their current level of activity due to the injured hamstring.

Conclusions:

The results of this study indicate that surgical repair of acute complete hamstring rupture provides reliable pain relief, but does not fully restore hamstring function to pre-injurylevels. All patients reportedsatisfaction with the surgery and experience little to no limitations to activities of daily living, but noted deficits in sport activity levels. Longer-term studies are required to determine if similar results are maintained in hamstring repairs over time.

Relevant disclosure for all authors

Nothing to disclose

Abstract Id: Paper 19

Abstract Title: Return to Play After Epidural Steroid Injection for Lumbar Disc Herniation in Professional American Football Athletes

Authors

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Objectives: To our knowledge, there is currently no published information on the efficacy of epidural steroid injections for the treatment of lumbar disc herniation in an athletic population. The purpose of the present study is to evaluate the efficacy of epidural corticosteroid injection for treatment of lumbar disc herniation in a group of professional American football players, and also to identify risk factors for success or failure of this treatment approach.

Methods: We retrospectively reviewed the records of all professional American football players that underwent an epidural steroid injection at our institution for incapacitating pain secondary to an acute lumbar disc herniation (confirmed on magnetic resonance imaging) from 2003 to 2010. The primary outcome was success of the injection, defined as return to play. The secondary outcome of the study was to evaluate risk factors for failure of this treatment approach. To assess risk factors, *P* values were calculated using a logistic regression model, with values <0.05 considered statistically significant.

Results: Thirty-seven injections were performed for 27 distinct lumbar disc herniation episodes from 2003 to 2010. The success rate of returning an athlete to play for a given episode of disc herniation was 89% (24 of 27 episodes) with an average loss of 2.8 practices (range, 0-12) and 0.6 games (range 0-2) after the injection. Following successful return to play, athletes played an average of 2.8 seasons (range, 1-6) at their previous activity level, with ten players still active in their career. Three players failed injection therapy and required surgical intervention. Risk factors for failure included sequestration of the disc herniation on MRI (p=0.01) and weakness on physical examination (p=0.02). There were no complications reported.

Conclusions: In professional athletes, our results suggest epidural steroid injections are safe and effective in treating symptomatic lumbar disc herniations, with an 89% success rate. This compares favorably to previously reported success rates following conservative treatment (79% at an average of 4.7 months)[1] or lumbar discectomy (74-90%) in athletes.[2] However, we recommend prudence when applying this treatment approach to athletes that present with weakness or with sequestration of the disc on MRI, as they demonstrate a higher rate of treatment failure in this series.

References:

[1]Iwamoto J et al. Am J Phys Med Rehabil. 2006;85:667-674.

[2]Wang JC et al. Spine (Phila Pa 1976). 1999;24:570-573.

Relevant disclosure for all authors

Nothing to disclose