

SPORTS MEDICINE REPORTS™

The essential guide to developments in sports medicine and orthopaedics

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Arthroscopic Bankart Reconstruction—A New Standard?

ABSTRACT & COMMENTARY

Synopsis: *For the first time, an arthroscopic technique for shoulder stabilization had long-term success that is essentially equivalent to that reported for open Bankart reconstruction.*

Source: O'Neill, DB. Arthroscopic Bankart repair of anterior detachments of the glenoid labrum. A prospective study. *J Bone Joint Surg Am* 1999;81(10):1357-1366.

Numerous authors have presented various techniques for arthroscopic stabilization of anterior shoulder instability. However, if followed longer than two years, none of the previous studies reported results that approached the 95% success of open Bankart reconstruction. O'Neill has now crossed that barrier in a well-designed prospective study of 41 patients treated arthroscopically who had experienced at least two dislocations and failed formal rehabilitation. During a mean follow-up of more than four years (range, 25 months-7 years), only two patients experienced subluxations and none had redislocations. Nearly half of the patients were football players, and all were athletic. All but one patient returned to their sport at the same level postoperatively.

The arthroscopic technique involved a variation of prior transglenoid methods. The capsule was pulled up before being transfixated with a passing pin used to pull a suture out the back of the scapula. A mulberry-style knot was tied on the outside, then pulled against the back of the glenoid. A second suture was passed through the glenoid below the first, and the two sutures were tied together anteriorly using an arthroscopic knot pusher. This was then repeated for at least one more pair of sutures.

Rigorous evaluation included radiographs, isokinetic strength testing, physical examination, and rating with the shoulder scale of Rowe and Zarins, as well as the scoring system of the American Shoulder and Elbow Surgeons. Good and excellent results were achieved in 90% of patients as determined by the Rowe and Zarins

INSIDE

*Correlating
KT-1000
measure-
ments with
clinical tests
of knee
stability*
page 2

*Suture
anchors—
update 1999*
page 3

*Posterior fat
pad sign as
an indicator
of occult
elbow fracture*
page 4

*Axial and
lateral
radiographs
in evaluating
patello-
femoral
malalignment*
page 5

score, and 95% of patients as per the Shoulder and Elbow Surgeons' score. Full range of motion and strength were regained by about half of the patients. Those patients with loose bodies, osseous Bankart lesions, or multiple dislocations indicative of more severe trauma tended to have more difficulty regaining strength or motion.

■ COMMENT BY DAVID R. DIDUCH, MS, MD

Previously reported arthroscopic stabilization techniques for shoulder instability yielded success rates of roughly 70-85%. Initial reports of higher success rates deteriorated with longer follow-up as patients regained motion and returned to athletics. Because open Bankart reconstruction results in 95% success even for recurrent dislocators, many surgeons are reluctant to recommend operative management of initial dislocations. This report by O'Neill is the first to report long-term success rates equivalent to those achieved by open methods. This paper is, therefore, likely to rekindle the debate about open vs. arthroscopic management and treatment of initial dislocations.

What is different about this study is the method of fixation. Transglenoid sutures are secured on the back of the scapula over bone, then tied over the labrum anterior-

ly. Other transglenoid methods tied sutures posteriorly over soft tissues that could necrose with time, possibly creating laxity in the construct. Why this new configuration would be better than suture anchors anteriorly is unclear and needs to be assessed with comparative biomechanical studies in cadaver models.

O'Neill's study is well done, with careful, prospective follow-up that is complete and detailed. His results are excellent, even for patients returning to contact sports. However, these results may not be reproducible for a less-experienced arthroscopist, and one needs to be honest about his or her surgical abilities.

This paper probably should not alter management of initial dislocations, but may affect the decision to perform arthroscopic vs. open reconstruction. If patients who have recurrent anterior instability with documented Bankart lesions can have arthroscopic success equal to an open procedure, the reduced pain and recovery time tips the scale toward the less invasive method.

Hopefully, other authors will confirm these results, as should occur before a new technique enjoys widespread acceptance. ❖

Correlating KT-1000 Measurements with Clinical Tests of Knee Stability

ABSTRACT & COMMENTARY

Synopsis: *KT-1000 measurements may have little correlation with the patient's perception of knee function and stability.*

Source: Tyler TF, et al. Association of KT-1000 measurements with clinical tests of knee stability one year following anterior cruciate ligament reconstruction. *J Orthop Sports Phys Ther* 1999;29(9):540-545.

A variety of clinical tests are available that assist in determining the status of the knee after cruciate ligament reconstruction. The purpose of this study was to determine the relationship between measurements using the KT-1000 arthrometer at 89N and other outcome measures. Outcome measures used in this study included the Lysholm and Tegner questionnaires and Lachman and Pivot shift tests. The KT-1000 measurements (side-to-side difference measurements) have historically been used to evaluate the amount of knee joint laxity following anterior cruciate ligament (ACL) reconstruction. The question remains as to how KT-1000 val-

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ues relate to the ability of the knee to function as well as to other clinical tests.

Tyler and colleagues studied 90 patients who had undergone ACL reconstruction using a patella tendon autograft by the same surgeon. Approximately one year following surgery, KT-1000 testing was performed by one of two experienced testers. In addition, patients were evaluated with the Lysholm and Tegner questionnaires for a subjective rating of knee function and activity level, and underwent a physical examination that included Lachman and pivot shift tests.

Data analysis included Pearson product moment correlations to determine the association between KT-1000 measurements, Lysholm scores, and Tegner scores. Spearman rank correlations were used to determine the relationship between KT-1000 measures, Lachman grades, and pivot shift grades. In addition, a one-way analysis of variance (ANOVA) was used to compare Lysholm and Tegner scores between patients with tight, moderate, and loose KT-1000 measurements (1, 3, and 5 mm, respectively). KT-1000 results indicated that there were 60 tight, 11 moderate, and 19 loose patients.

Lysholm and Tegner scores were not associated with KT-1000 scores. In addition, there was a weak relationship ($r = 0.39$) between KT-1000 measures and Lachman grades. This relationship went down even further when KT side-to-side differences were compared to the Lachman. Pivot shift grades, in addition, had a weak relationship to KT-1000 measures ($r = 0.24$) and this relationship became a negative one when side-to-side differences were addressed.

■ COMMENT BY CLAYTON F. HOLMES, EdD, PT, ATC

The results of this study indicate that the KT-1000 measure, while possibly a clinical measure of knee joint laxity, has little to do with the patient's perception of the functional ability of the knee. In addition, while a relationship is acknowledged between Lachman and pivot shift tests and KT-1000 measures, these measures are weak. These findings do not indicate that any of these measures should be used solely to measure final outcome. Instead, the question becomes what is the "gold standard." In today's health care environment, where the focus is on outcome measures, the seemingly best outcome measure is the patient's perception of reality. If this is true, then questionnaires such as the Lysholm and Tegner would be more indicative of a positive outcome than more "objective" measures such as the KT-1000 or the Lachman and pivot shift. It should also be noted that this study was well done in many respects. However, there was no indication that the examiners who performed all KT-1000 measures had any data to support

their reliability other than their experience with the instrument. In addition, there was no inclusion or exclusion criteria described in the article with regard to sample population. We do not know how the sample was chosen. These weaknesses notwithstanding, this study gives us another indication that our reliance on so-called "objective" data may need to be rethought. All of these measures have their value; however, any of them alone may be limited. ❖

Suture Anchors— Update 1999

ABSTRACT & COMMENTARY

Synopsis: *Screw-type suture anchors continue to have higher values for pullout strength than newer generation nonscrew designs; nonetheless, the new designs are noted to have increasing pullout strength with the difference between threaded types less distinct. New biodegradable anchors composed of poly L-lactic acid demonstrate loads to failure similar to other nonabsorbable anchors in their class.*

Source: Barber FA, Herbert MA. Suture anchors—Update 1999. *Arthroscopy* 1999;15(7):719-725.

Suture anchors continue to be frequently used in the shoulder, knee, and ankle as well as other joints in the body. Multiple suture anchor devices, designs, and techniques of placement are available with a myriad of indications and uses. Barber and Herbert have evaluated the pullout strength of newly developed suture anchors with their well-established porcine model. They have reported on similar pullout studies in three previous publications in 1995, 1996, and 1997. This current study allows comparison to the previously tested anchors since they used the same experimental model. Load to failure was tested using tensile stress parallel to the axis of insertion with pullout applied at 12.5 mm per second using an Instron 1321 machine. Interestingly, the screw-type suture anchors continue to have greater pullout strength than most nonscrew designs but, as Barber and Herbert noted, the distinctions between these are becoming less apparent with further design modifications.

Newer, biodegradable suture anchors most commonly used poly L-lactic acid, which Barber and Herbert note is longer lasting and less inflammatory than previously used polymers. These anchors demonstrated similar strengths to metal anchors in their class. Once again, all

of the suture anchors tested were stronger than the suture for which they were designed.

■ COMMENT BY ROBERT C. SCHENCK, Jr., MD

This is another of a well-designed series of studies by Barber and colleagues evaluating the pullout strength of multiple suture anchors, thus allowing the clinician to compare those newly produced to those previously tested and published in the *Journal of Arthroscopy*.^{1,2,3} The study design is well detailed and the information is extremely useful for the clinician, as it allows for an independent, reproducible assessment of pullout strength of suture anchors.

Orthopaedic surgeons are bombarded by multiple implant design changes. However, this study helps the surgeon determine whether newer is indeed better. Barber and Herbert do not focus on biocompatibility of the anchors, which may be an issue for the new absorbable anchors, but instead discuss only the mechanical performance based upon pullout strength. As Barber and Herbert note, ideally the suture anchor selection should not be the weakest link in the repair of soft tissue to bone. Good pullout strength does not substitute for poor technique. Lastly, this paper provides a photographic inventory of the newer anchors available to assist the surgeon in identification. ❖

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Posterior Fat Pad Sign as an Indicator of Occult Elbow Fracture

ABSTRACT & COMMENTARY

Synopsis: The posterior fat pad sign was 76% effective in detecting nondisplaced fractures.

Source: Skaggs DL, Mirzayan R. The posterior fat pad sign in association with occult fracture of the elbow in children. *J Bone Joint Surg Am* 1999;81:1429-1433.

Consecutive pediatric subjects were prospectively enrolled in this study if they had an elevated

posterior fat pad noted on initial radiographic evaluation of the post-traumatic elbow without evidence of fracture. All subjects initially received anteroposterior, lateral, and two oblique views. If the attending pediatric radiologist, attending pediatric emergency medicine physician, or orthopedic resident noted a fracture, the subject was excluded. All patients were casted above the elbow. The main outcome measure was the incidence of fracture healing (periosteal elevation, callus formation, or both) seen at follow-up, which was designed to be three weeks after the initial visit.

Forty-five children were included in the study, with a mean age of 4.5 years. Thirty-four (76%) had evidence of fracture healing, and were thus judged to have had an occult fracture on initial evaluation. Anatomic breakdown was as follows: supracondylar fracture, 18 (53%); proximal ulna, nine (26%); lateral condyle, four (12%); and radial neck, three (9%). Skaggs and Mirzayan conclude that presence of a posterior fat pad sign on initial radiographic evaluation of the post-traumatic elbow occurring in the absence of detectable bony fracture should lead the practitioner to treat such patients as though they have a nondisplaced fracture of the elbow. Although this is not a new recommendation, their results were inconsistent with earlier studies that found lower rates of fracture at follow-up. Skaggs and Mirzayan speculate that those studies suffered from design flaws (all were retrospective studies), including follow-up radiography that may have been too early (14 days or earlier). The average time to follow-up imaging in the present study was 20 days (range, 8-37 days); more important, the average follow-up x-ray that was negative for fracture was 21.5 days (range, 18-35 days).

■ COMMENT BY RICHARD A. HARRIGAN, MD, FACEP

Skaggs and Mirzayan are to be congratulated on performing a prospective study. The high incidence of radiographic evidence of fracture healing seen in follow-up of these elbows that initially had only posterior fat pads as evidence of fracture should remind us to be vigilant for this radiographic sign. There were a few study design flaws worth discussing, however. Whereas both the pediatric radiology and pediatric emergency medicine attending were blinded to the study, the orthopedic resident was not; a positive finding by any of the three led to exclusion from the study population. Thus, all initial evaluators of the data were not on equal footing. It would have been more consistent to make all three aware of the study. The main outcome measure was evidence of new bone formation (signifying fracture healing) seen on follow-up x-ray. No mention is made of who was reading these films, although it is alluded that the attending

orthopedists followed these patients during a discussion of why they were not involved in the initial radiograph evaluation (fear of introducing bias into the study). It is unclear how inconsistency between the attending orthopedist and the attending pediatric radiologist in the interpretation of follow-up films would be reconciled in determining the main outcome measure. Interrater reliability data would have been important to report—for both initial and follow-up films. Moreover, were those who read the follow-up films blinded to the study? Significant bias would exist if those charged with reading follow-up films were aware of the hypothesis and design of the study. ❖

Axial and Lateral Radiographs in Evaluating Patellofemoral Malalignment

ABSTRACT & COMMENTARY

Synopsis: *Combining AP, lateral, and axial views helps to best understand a patient's patellofemoral alignment.*

Source: Murray TF, et al. Axial and lateral radiographs in evaluating patellofemoral malalignment. *Am J Sports Med* 1999;27(5):580-584.

Murray and associates performed a prospective study to determine the effectiveness of lateral and axial x-rays to detect patellofemoral problems. History, physical examination, and radiographs were obtained for both knees of 431 patients (862 knees). Patients with 217 asymptomatic knees without patellofemoral problems in either knee served as the controls. Radiographs included standard axial patellar (AP) views, AP views in 30° of knee flexion, and standing lateral films at 0° and 30° of flexion. The presence of patellar tilt or subluxation was noted on the axial view. The lateral views were taken with precise overlap of the posterior femoral condyles, which allowed the determination of the relationships between the medial border of the patellar, the median ridge, and the lateral ridge in an attempt to assess patellar tilt. This is termed the Maldagne lateral view.

Sixty-two percent of the patients with patellar dislocations demonstrated subluxation on the axial view, while 98% demonstrated malalignment on the extended lateral view. Eighteen percent of the control knees had evidence of subluxation on the axial view, where 35% demonstrated subluxation on the extended lateral view.

The axial view demonstrated 62% sensitivity for previous dislocation, while the lateral view taken in full extension demonstrated 98% sensitivity. Specificity for prior dislocation was 82% for the axial view, 93% for the flexed lateral view, and 65% for the extended lateral view. Murray et al concluded that with the high sensitivity on the lateral view for detecting a patellar dislocation, a normal result on the full extension lateral view can virtually eliminate any question of previous dislocation. Given the high specificity on the axial view and lateral view with knee flexion, those two views combined can confirm a clinical impression of patellofemoral malalignment.

■ COMMENT BY JAMES P. TASTO, MD

Radiography of the patellofemoral joint has been well described in the literature and probably the most popular and commonly quoted article is that written by Merchant et al.¹ These axial views are taken with the knee in approximately 45° of flexion with a specifically designed cassette. This is the view that most of us are familiar with. This is in contrast to the older, conventional “sunrise” view, which was an axial view taken with the knee in about 60-70° of flexion. The “sunrise” view has been fairly well discounted in the orthopaedic literature as giving little useful information on subluxation, dislocation, or tilt since the patella is deeply seated in the groove at that degree of flexion. There have been a lot of papers written concerning CT, MRI, and even dynamic MRI, but these tests are quite costly and in today's environment are probably not practical.

Maldague and Malghem originally described the radiographic anatomy on lateral films and the ability to detect malalignment in the literature, and Malghem and Maldague have taken this information and converted it into an excellent study.^{2,3}

When viewing the patella on lateral radiographs in full extension and 30° of flexion, three specific categories are isolated. Grade I alignment (normal) shows a slight concavity of the patellar median ridge and lateral facet relative to the femoral condyles. For grade II alignment (slight subluxation), the median ridge and lateral facet are overlapped, producing a dense, relatively straight line. Grade III alignment (more subluxed) demonstrates a convex median ridge and lateral facet surface, with the lateral facet being located closer to the femur.

This paper helps the clinician to use conventional AP, lateral, and axial radiographs to support his/her clinical impression of patellar malalignment without the need for more expensive studies. However, these x-ray findings do not have significant correlation with patellofemoral pain. The difficulty in this particular radiographic assessment lies in training the x-ray technician to be able to overlap

the medial and lateral posterior femoral condylar outlines. If this is not done, then the radiograph cannot be adequately assessed. Murray et al originally used fluoroscopy for this study, but in practice merely have trained their technicians to manually line up the knee so that reproducibility can be obtained. I would suggest that we all spend a little time to train our radiology technicians to take these views and add them to our armamentarium, as this may help us better assess and treat patellofemoral disorders that commonly present in the office. ❖

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Concussions in Sports

ABSTRACT & COMMENTARY

Synopsis: *The AOSSM Concussion Workshop Group presents evaluation and return-to-play criteria.*

Source: Wojtys EM, et al. Current concepts. Concussion in sports. *Am J Sports Med* 1999;27(5):676-687.

This “current concepts” article, which is a special report of the findings of a concussion workshop sponsored by the American Orthopaedic Society for Sports Medicine (AOSSM), is an excellent review of the pathophysiology, diagnosis, management, and return-to-play guidelines following a concussion in an athlete. Dr. Hovda, in his section on the neurobiology of concussions, emphasizes how little we really know about the short- and long-term effects of concussions on brain cells. A concussion, or cerebral contusion, is followed by a reduction in cerebral blood flow. In the immediate post-concussion period (approximately 3 days), brain cells that are not irreversibly destroyed may exist in a “vulnerable state,” most likely secondary to metabolic dysfunction. This period of enhanced vulnerability is characterized by an increase in the demand for glucose but at the same time a decrease in cerebral blood flow.

This decrease in cerebral blood flow is thought to be

due to increased vasoconstriction caused by endothelial accumulation of CA⁺⁺.

Wojtys and colleagues remind us that the initial on-field evaluation of a concussed athlete is similar to that for any acutely injured athlete, i.e., first assess the athlete’s airway, breathing, and circulation. Also, all head-injured athletes must be assumed to have had a concurrent neck injury until ruled out through a thorough physical examination. Art Boland’s explanation of the steps for evaluation of the concussed athlete on the field and on the bench is excellent.

Wojtys et al stress the need for a reliable, easily administered neurophysiologic evaluation for concussed athletes and end the article with recommendations for return to play following a head injury.

■ COMMENT BY LETHA Y. GRIFFIN, MD, PhD

Recently, there has been a fair amount of debate as to what constitutes reasonable criteria for return to play following a head injury. Several concussion-rating systems have appeared in the literature, including those of Cantu, the Colorado Medical Society, and the American Academy of Neurology.

The AOSSM-sponsored concussion workshop arrived at several conclusions regarding return-to-play issues:

1. If the signs and symptoms of concussion clear within 15 minutes or less, both at rest and with exertion, and the athlete has a normal neurologic exam and had no loss of consciousness, the athlete can return to competition that day.

2. A loss of consciousness precludes return to play that day.

3. Persistence of symptoms longer than 15 minutes, or delayed onset of symptoms, should prevent return to play that day and the athlete should be closely monitored. Symptoms indicative of a head injury are headache, dizziness, memory loss, slowness in response to questions, difficulty concentrating, and physical sluggishness.

4. Any deterioration in physical or mental status warrants emergency transportation for further evaluation.

5. Athletes with prolonged symptoms may return to play after five to seven days of rest, although this time frame varies and should be individualized. Repeated examinations as activity is resumed should be performed to determine if stress triggers symptoms.

6. A physician should evaluate every athlete with a concussion.

This article is an excellent overview of an important topic that all of us covering sports events should be familiar with. ❖

Elbow Injuries in Young Baseball Players

ABSTRACT & COMMENTARY

Synopsis: *Young throwers should limit their pitches to prevent overuse elbow injuries.*

Source: Whiteside JA, et al. Elbow injuries in young baseball players. *Phys Sports Med* 1999;27(6):87-92,102.

This article by Whiteside and colleagues reminds us that growing bones are at risk of overuse injuries if subjected to too much, too hard, too soon. They report an incidence of injury in 12-year-old pitchers of 40%. Unlike adults, elbows of skeletally immature athletes, when subjected to repetitive valgus stress, do not sustain chronic or acute ulnar collateral ligament (UCL) injuries but instead may partially or completely avulse the medial apophysis attachment of the UCL.

The same mechanisms also produce compressive loads to the radial side of the elbow (the radial capitellar joint), resulting in abnormalities of the subchondral bone and overlying articular cartilage. Panner's disease—osteochondrosis of the capitellum—occurs in younger children (7- to 11-year-olds) and typically heals if the player rests from throwing activities. True osteochondritis dissecans (OCD), which occurs in the slightly older child, may not resolve completely but instead results in separation of the osteochondral fragment, necessitating surgical intervention.

Not only do Whiteside et al detail the most common elbow injuries in young children, but their article also contains guidelines for diagnosing, treating, and rehabilitating injuries that occur in the young pitcher's elbow. The importance of prevention is also stressed, and Whiteside et al present their recommendations for the maximum pitches that should be thrown by young-

sters at various ages. For example, 8-10-year-olds should throw no more than 52 ± 15 pitches per game, whereas a 15-16-year-old should pitch no more than 91 ± 16 pitches per game. All of the age groups were limited to roughly 2 ± 0.6 games per week. Whiteside et al also suggest that youngsters should not begin pitching until age 8, at which time they should start with pitching fastballs, progressing to change-up pitches at age 10, and then to curves, knuckleballs, sliders, and forkballs. The screwball should be the last pitch learned and should not be attempted until age 17.

■ COMMENT BY LETHA Y. GRIFFIN, MD, PhD

An estimated 3 million* youngsters participate in Little League baseball each year and another 400,000* are involved in T-Ball. (*Source: American Academy of Orthopaedic Surgeons.) The benefits of sports participation are many and include increased physical fitness, increased socialization skills, and positive self-image. However, this article stresses what we have all witnessed in our practices. During the last several decades there has been a rise in not only acute injuries but also in overuse sports injuries. Kids are participating in organized sports at higher levels of competition at earlier ages. No more is baseball a sandlot pickup game where you go home when you're tired. Now children play with real or perceived pressure from coaches, parents, siblings, and friends. They hesitate to say they are hurt and, as Whiteside et al stress, may try to work through pain until their performance is hampered.

Whiteside et al rightly suggest that coaches of youth baseball must not only know the fundamentals of baseball but must teach the proper mechanics of pitching and throwing to their young players. They also comment that parents should ensure that young players are not required to throw excessively. However, parents, even those with excellent intentions, frequently become preoccupied with the child's potential abilities and are more supporters of increased pitching efforts rather than increased bench time for their youngsters. ❖

Alternative Medicine Alert—

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CME Questions

- The historically accepted success rate for open Bankart reconstruction, against which newer arthroscopic techniques are compared, is:**
 - 95%.
 - 90%.
 - 85%.
 - 80%.
- Which of the following tests were strongly related, according to the Tyler study?**
 - KT-1000 results and Tegner scores.
 - KT-1000 results and Lysholm scores.
 - KT-1000 results and pivot shift.
 - KT-1000 results and Lachman exam.
 - None of the above
- Suture anchor failure strength is best related to:**
 - screw vs. modular design.
 - suture strength.
 - anchor composite material.
 - screw thread taper.
- In the pediatric patient with elbow trauma:**
 - the posterior fat pad sign is always indicative of fracture.
 - occult fracture may be implied by the presence of the anterior fat pad.
 - evidence of occult fracture has been found at follow-up in 76% of patients with only a posterior fat pad on initial radiographs.
 - occult fat pad signs have been found at follow-up in 76% of patients with bony evidence of fracture on initial plain films.
- A grade III alignment film of the patellofemoral joint has a high degree of sensitivity with which of the following clinical conditions?**
 - patellar subluxation and dislocation.
 - patellar alta.
 - chronic patellofemoral pain.
 - normal finding.
- Symptoms associated with concussions include:**
 - headache and vertigo.
 - slowness in responding and difficulty concentrating.
 - confusion and memory loss.
 - nausea and physical sluggishness.
 - All of the above
- The first pitch youngsters should master is the:**
 - curve ball.
 - slider.
 - fastball.
 - change-up.
 - screwball.

Readers are Invited . . .

Readers are invited to submit questions or comments on materials seen in or relevant to *Sports Medicine Reports*. Send your questions to: Robin Mason—Reader Questions, *Sports Medicine Reports*, c/o American Health Consultants, P.O. Box 740059, Atlanta, GA 30374.

You can also reach the editors and customer service personnel for *Sports Medicine Reports* via the Internet by sending e-mail to robin.mason@medec.com. You can also visit our home page at <http://www.ahcpub.com>. We look forward to hearing from you. ❖

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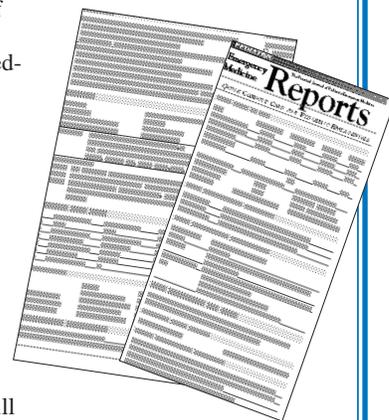
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CUMULATIVE INDEX

Volume 1, Numbers 1-12, Pages 1-96

January 1999–December 1999

A

Achilles tendon rupture, 12:95
ACL
 impairment, 10:75
 injury, 1:5, 7:50
 injury patterns, 11:83
 reconstruction, 1:6, 2:12, 2:13, 3:18,
 4:27, 8:59, 8:62, 9:67
 rupture, 12:94
 tears, partial, 11:82
 trauma, 6:46
acromioclavicular joint resection, 9:68
active physical training, 7:51
adductor-related groin pain, 7:51
adjuncts
 walking, 5:34
androstenedione, 10:77
ankle injuries, 2:15
ankle motion, 12:95
ankle sprains, 1:7, 5:39
 surgical repair, 3:20
anterior shoulder dislocation, 1:3
anterior shoulder instability
 evaluation of, 11:86
arthroplasty, hip, 5:35
arthroscopic drilling, 12:89
arthroscopic rotator
 interval repair, 6:41
arthroscopy
 knee, 2:9
 shoulder, 2:14
articular cartilage
 treatment options for injury to, 7:52
asymptomatic shoulder injuries, 7:49

B

biceps tendon, 3:19

bone morphogenetic protein enhancement,
 9:70

bone strain, 12:93
bone tunnel, 9:70

C

cardiovascular risks, 4:29
cartilage
 articular, 7:52
catheter system
 transducer-tipped, 8:60
cerebral concussions, 4:25
certified athletic trainers, 12:90
chondrocyte implantation, 6:44
cold and compression dressings, 2:12
concussions, cerebral, 4:25
Council on Scientific Affairs,
 AMA Report of, 12:90
creatine, 6:47, 8:57
cryotherapy, 8:62

D

deltoid muscle, 2:14
dementia pugilistica, 5:36
discoid lateral meniscus, 5:35
dislocation
 shoulder, 9:65
dressings
 cold, 2:12
 compression, 2:12
drilling, arthroscopic, 12:89

E

elbow dislocation
 treatment of, 10:73
elbow function, 4:30
EMG, 4:30

examination and care
 on-field, 5:38
exertional anterior
 compartment syndrome, 10:76

F

fasciotomy, 10:76
foot structure, 11:84
football helmet cover, polyurethane, 4:25

G

gamekeeper's thumb, 1:1
glenohumeral instability, 6:41
groin pain
 adductor-related, 7:51

H

hamstring, 12:91
hamstring injuries, 6:45
helmet removal, 3:21
hip arthroplasty, 5:35
hyperhydration, 8:59

I

impingement syndrome, 6:43
injuries
 ACL, 1:5, 7:50, 11:83
 ankle, 2:15
 hamstring, 6:45
 musculoskeletal, 11:84
 overuse, 6:42
 pediatric cervical spine, 11:87
 posterior cruciate ligament, 10:74
 shoulder, 7:49
 skiing, 4:30
 wrestling, 2:10
intra-articular temperature, 8:62

intracompartmental pressure, 8:60

J

joint resection, acromioclavicular, 9:68

K

knee

- arthroscopy, 2:9
- bracing, 4:27
- joint accessory motion, 2:13, 3:18
- joint laxity, 11:81
- proprioception, 6:46

L

lateral epicondylitis, 4:30

lesions

- chondral, 6:44
- occult osteochondral, 12:94
- osteochondral, 12:89
- SLAP, 1:2
- superior labral, 8:61

Little Leaguer's shoulder, 2:11

lower leg compartment syndrome, 5:33

lower limb stability

- with ACL impairment, 10:75

M

meniscal

- repair, 3:19, 3:22
- tears, 12:92

meniscectomy, 5:35

menstrual cycle, ACL injury, 1:5

motion protocol, 10:73

MRI, 2:15

muscle cramps, 4:28

musculoskeletal overuse injuries, 11:84

N

neuromuscular characteristics, 11:81

nitric oxide, 4:28

O

osteochondral lesions, 12:89

occult, 12:94

Ottawa Ankle Rules, 4:26

overuse injuries, 6:42

overuse tendon conditions, 3:17

P

partial ACL tears, 11:82

patellar tendon, 12:91

patellar tendon rupture

repair of, 7:52

patellofemoral disorders, 9:69

pediatric cervical spine injuries, 11:87

physical examination

preparticipation, 9:70

physical fitness, older adults, 3:23

physical training

active, 7:51

posterior cruciate ligament injuries

natural history, 10:74

posterior cruciate ligament surgery, 4:31

postural control, assessing, 11:85

pressure

intracompartmental, 8:60

R

range of motion, 11:84

rotator cuff, 5:37

tears, 1:2

rupture, Achilles tendon, 12:95

S

screws

absorbable vs. metal, 9:67

shoulder arthroscopy, 2:14

shoulder dislocation, anterior, 1:3

shoulder injuries

asymptomatic, 7:49

Little Leaguer's shoulder, 2:11

skier's thumb, 1:1

skiing injuries, 4:30

snowboarding, 4:30, 6:45

Speed's test, 3:19

subacromial contact pressure

measurement of, 6:43

superior labral lesions, 8:61

T

tendon

Achilles, 12:95

biceps, 3:19

patellar, 7:52, 12:91

thrower's exostosis, 5:38

transducer-tipped catheter system, 8:60

W

walking adjuncts, 5:34

wrestling injuries, 2:10

wrist guards, 12:93

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