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Shrinking the ACL

ABSTRACT & COMMENTARY

Synopsis: *Thermal treatment of partial ACL tears was successful in restoring stability in carefully selected patients.*

Source: Indelli PF, et al. Monopolar thermal treatment of symptomatic anterior cruciate ligament instability. *Clin Orthop.* 2003;407:139-147.

STANDARD TREATMENT OF FUNCTIONALLY UNSTABLE KNEES with partial ruptures of the ACL has been either nonoperative or ACL reconstruction surgery. Studies reporting on thermal ACL treatment are limited. The purpose of this study is to present the short-term results of ACL insufficient knees that are functionally unstable but in continuity. Twenty-eight consecutive partial ACL or ACL reconstruction failures were treated with thermal “shrinkage” with a monopolar device and were followed for a minimum of 2 years. All ACL injuries were less than 6 months old, and KT-1000 differences at 134 N in the anterior-posterior direction were > 6 mm. Further documentation at arthroscopy showed an incomplete tear defined as > 7 mm of intact ACL at the minimum cross-sectional area after thermal treatment and intact ligament origins and insertions. KT-1000, IKDC scores, and return-to-sport activities were used to measure outcomes. Postoperative rehabilitation included nonweight bearing in a locked brace and increased to progressive knee range of motion at 2-6 weeks.

The IKDC outcomes were nearly normal in 96% of the patients, and KT-1000 side-to-side differences were on average 1.9 mm in 26 of the 28 knees. One failure was noted at 8 weeks and resulted in ACL reconstruction. Indelli and colleagues concluded that ACL shrinkage seems to be an alternative to ACL reconstruction in selected patients.

COMMENT BY JAMES R. SLAUTERBECK, MD

Thermal denaturation of collagen in the ACL had not been reported in large numbers. The idea appears attractive, but few guidelines exist, and treatment, technique, outcomes measures, and rehabilitation protocols are not commonplace. At this stage, much of the sci-

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VOLUME 5 • NUMBER 6 • JUNE 2003 • PAGES 45-52

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ence and surgical indications behind ACL denaturation has been borrowed from the literature surrounding capsular shrinkage in shoulders.

Although this study does not provide any basic science information as to the quality of the ACL or the graft tissue, the strength of the article is that strict inclusion criteria were adhered to, operative details provided, and postoperative protocols followed. However, a comparative group of nonoperatively treated ACL-deficient patients or ACL-reconstructed patients would have been a nice addition to the paper.

I am overall intrigued by this article. I have performed several ACL “denaturations” and have been happy with my short-term results. I have been tempted to apply thermal energy to partial ACL ruptures in several other cases but was not sure of the potential adverse or successful outcomes. I have been concerned that the thermal shrinkage would mostly treat the surface of the ACL and not penetrate the depths of the injured tissues. Additionally, I have been concerned about potential stiffness from limited motion and weight bearing postoperatively. This article alleviates some of my anxieties. I will be looking for some basic

science articles in this area defining the mechanical and geometric characteristics of the treated ACL and will await longer-term follow-up before performing this procedure on a large scale. However, in selected moderately athletic individuals, I will be less hesitant to consider this treatment. ■

ACL Rupture After Thermal Treatment

ABSTRACT & COMMENTARY

Synopsis: Radiofrequency energy treatment of the normal ACL in canines appears to result in death and dissolution of the ligament and development of secondary laxity.

Source: Lopez MJ, et al. Anterior cruciate ligament rupture after thermal treatment in a canine model. *Am J Sports Med.* 2003;31(2):164-167.

LOPEZ AND ASSOCIATES EVALUATED THE EFFECTS of monopolar radiofrequency energy on native ACLs in 18 female research hounds. The ACL of the one extremity of the anesthetized dog was arthroscopically treated with monopolar radiofrequency energy at temperature and power settings of 70°C and 25 watts. The contralateral joint underwent a sham operative procedure. No postoperative bracing was used; however, postoperatively animals were confined to kennels.

Dogs were observed daily for signs of ACL rupture—that is, lameness, an effusion, or a positive anterior drawer sign. Gait analyses were done preoperatively and at 4, 8, 12, 16, 26, and 36 weeks postoperatively. Animals were sacrificed at 16 weeks, 26 weeks, and 36 weeks following detection of ligament failure, and their knee joints were examined. All had a mean time to rupture of 55 days post-treatment. On evaluation of the energy-treated knee joints, complete dissolution of the ACL was observed, whereas joints in which sham operative procedures had been done demonstrated normal ligament structures.

■ COMMENT BY LETHA Y. GRIFFIN, MD, PhD

Although initially popularized to shrink lax collagen in loose shoulders, the idea of using radiofrequency energy to shrink loose cruciate ligaments has garnered recent interest. However, the shoulder capsule and its

Sports Medicine Reports,™ ISSN 1524-0991, is published monthly by Thomson American Health Consultants, 3525 Piedmont Rd., NE, Bldg. 6, Suite 400, Atlanta, GA 30305.

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GST Registration Number: R128870672.

Periodical postage pending at Atlanta, GA.

POSTMASTER: Send address changes to **Sports Medicine Reports**, P.O. Box 740069, Atlanta, GA 30374.

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Subscription Prices

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\$269 per year (Student/Resident rate: \$108).

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surrounding structures have a rich blood supply when compared with the native or reconstructed anterior cruciate ligament. Therefore, Thabit has suggested leaving the posterior aspect of the ligament untreated to allow for revascularization when performing shrinkage of the ACL with radiofrequency energy.¹ In his report of 25 patients so treated with a monopolar radiofrequency device, 23 patients had only 2-mm side-to-side differences in graft laxity as measured by the KT-1000 arthrometer.

However, in 2000 Sekiya and colleagues published his case report in the *Journal of Bone and Joint Surgery* on autodigestion of a hamstring ACL autograft in a 16-year-old treated with a monopolar heat probe at 65°C and 40 watts of energy.² The heat probe was used to treat laxity, which occurred following re-injury to an ACL hamstring graft, which had been in place for 5 months. Despite 12 weeks of a well-constructed postoperative rehabilitation program that emphasized graft protection, the thermally treated graft reruptured upon the athlete's return to sport. At the time of re-operation, no remnant of the previous hamstring autograft was identified. Sekiya et al expressed concern over the use of thermal energy for treatment of ACL laxity pending further laboratory studies.

The present article seeks to more clearly understand the effects of thermal energy on normal anterior cruciate ligaments. However, Lopez et al do emphasize the study's limitations: The entire dorsal surface of the ACL was treated (no mention was made of whether the ventral surface was also treated); no postoperative rehabilitation or immobilization was done, although the animals remained caged postoperatively; and the test species (canine) had a knee joint angle subjected to different forces than the human ACL. **Nonetheless, the study's findings are disturbing in that all ligaments were found to be totally absent upon re-operation.**

Lopez et al caution against widespread adoption of radiofrequency energy to shrink injured native or reconstructed ACLs pending additional research. ■

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Neuromuscular Training Decreases ACL Injury Risk in Females

ABSTRACT & COMMENTARY

Synopsis: *The study found that it is possible to prevent ACL injuries with successful completion of a specific neuromuscular training program. This is confirmation of prior studies that neuromuscular training can decrease ACL injury rates in female athletes.*

Source: Myklebust G, et al. Prevention of anterior cruciate ligament injuries in female team handball players: A prospective intervention study over three seasons. *Clin J Sport Med*. 2003;13(2):71-78.

NEUROMUSCULAR TRAINING IS BEING USED IN AN attempt to decrease injury and enhance performance in female athletes participating in high-risk sports like basketball and soccer. Myklebust and colleagues instituted a prospective study assessing the effect of a neuromuscular training program on the incidence of ACL injuries in Norwegian female team handball players. The top 3 Norwegian divisions were studied during a 3-year period. Myklebust et al used an initial season without intervention to determine injury rate, which they term the "control season," which included 942 players (1998-1999). The next year, the first intervention season, included 855 players (1999-2000), and the third year, the second intervention season, included 850 players (2000-2001). The neuromuscular training program involved 3 different balance exercises focusing on neuromuscular control and planting/landing skills.

The teams were supplied with an instructional video, balance mats, and wobble boards. A physical therapist was assigned to every team to assist the athletes. The success of the program was measured by identifying the number of ACL injuries during the seasons. **Twenty-nine ACL injuries were reported during the control season, 23 injuries during the first intervention season, and 17 injuries during the second intervention season.** When normalized to injury exposures (player-hours), ACL injury risk decreased 36%. These decreases per season were not statistically significant. However, when the athletes were separated by division, in the elite division there were 13 injuries during the control season, 6 injuries during the first intervention season ($P = .17$), and 5 injuries in the second intervention season ($P = .06$). Among those who met the compliance criteria (at

least 15 of 21 possible training sessions), there was a significant drop in injury rates ($P = .01$). In addition, about half of the ACL injuries were noncontact injuries. When Myklebust et al separated out the contact injuries, they observed 18 injuries in the control season and 7 in the second intervention season ($P = .04$).

■ COMMENT BY TIMOTHY E. HEWETT, PhD

This is a very well-done prospective study. I think we can learn much from Myklebust et al's innovative approach. They should be commended for their analysis of compliance, which hasn't been well addressed in this literature previously. Their data demonstrate what a challenge compliance is, even with athletes of high caliber, as only 26% of the teams were judged compliant the first year and 29% the second year of intervention.

There appears to be a consistent effect of neuromuscular training on ACL injury rates. The jury is still out, however, concerning the contribution of hormonal fluctuation to ACL injury risk. Myklebust et al found evidence of higher risk during menses, whereas others have reported the ovulatory and luteal phase of the cycle to be the higher-risk phases.

A few weaknesses/limitations to the study were methodological in nature. They included a lack of sufficient documentation of ACL injury status, adjustment of all menstrual cycles to 28 days without an explanation of the method for adjustment, and not enough detail on statistical testing. In addition, Myklebust et al make several references to insignificant results without performing a power analysis for the study. A power analysis should have been performed to determine if the lack of significance was likely due to an insufficient number of subjects. ■

Laser Capsulorrhaphy for MDI

ABSTRACT & COMMENTARY

Synopsis: *Laser capsulorrhaphy may be effective for patients with acquired multidirectional instability (MDI) secondary to repetitive microtrauma but is less predictable in other patient subgroups.*

Source: Joseph TA, et al. Laser capsulorrhaphy for multidirectional instability of the shoulder. *Am J Sports Med.* 2003; 31:26-35.

THE USE OF THERMAL ENERGY HAS GAINED POPULARITY within the orthopedic community due to its mini-

mally invasive approach and ease of use. Early anecdotal results of laser capsulorrhaphy for treating shoulder instability appear promising; however, these studies have included mixed patient populations, inconsistencies in defining MDI, and various combinations of surgical procedures for treatment. The present study evaluates patient satisfaction and functional outcomes after Ho:YAG laser capsulorrhaphy treatment of MDI in 3 specific patient subgroups.

Joseph and associates define MDI as global shoulder laxity on physical examination with symptoms inferiorly and in at least 1 other direction. Twenty-five shoulders in 21 patients met the inclusion criteria for this study—patients with MDI who had no prior surgical procedure to address instability and no concomitant surgical procedures to address other shoulder pathology. All patients had failed a course of at least 3 months of physical therapy. Patients were classified etiologically: Type I—congenital/inherited with generalized ligamentous laxity and no history of trauma; Type II—acquired with history of repetitive microtrauma; and Type III—post-traumatic with identifiable traumatic event precipitating onset of symptoms. Postoperative questionnaires assessing patient satisfaction and level of pain, the Simple Shoulder Test (SST), and physical examination were used to evaluate outcomes.

Type I patients ($n = 10$) tended to present at a younger age and became symptomatic with activities of daily living. Type II ($n = 6$) patients commonly had less severe instability. Pain represented a more significant and consistent symptom in Type III patients ($n = 9$). At a mean follow-up of 32 months (range, 24-48 months) 10 of 25 shoulders (40%) experienced recurrent postoperative instability, with 8 of these patients remaining stable for at least 1 year after the procedure. Patients with generalized ligamentous laxity had a 60% recurrence (9 of 15) compared to 10% of those (1 of 10) without generalized ligamentous laxity ($P < .05$). Recurrence rates based on etiology were 60% for Type I, 17% for Type II, and 33% for Type III ($P = 0.20$). Mean SST and pain scores at most recent follow-up were 84% and 3.3 (10-point scale), respectively. Shoulder strength was near or equal to that of the opposite extremity in all patients at most recent follow-up, and no patient lost more than 10 degrees of forward elevation, external rotation, or 3 spinal levels of internal rotation. Patient satisfaction with the procedure showed a significant decline from follow-up at 1 year (80%) to the most recent follow-up (44%) ($P = .008$), respectively. Reasons for dissatisfaction included recurrent instability, persistent pain, and inability to participate in desired activities due to shoulder discomfort. Five of 6 shoulders (83%) with Type II MDI

reported subjective improvement after the procedure, while only 4 of 10 (40%) with Type I and 2 of 9 (22%) with Type III noted improvement ($P = 0.06$).

■ **COMMENT BY BRIAN J. COLE, MD, MBA, AND
STEPHEN J. LEE, BA**

With the advancement in surgical techniques and equipment, the use of arthroscopic stabilization has rapidly increased. However, outcome studies must demonstrate similar or better results compared to an open inferior capsular shift, the standard surgical treatment, to justify their use. The findings of this study suggest laser capsulorrhaphy may be an effective treatment for patients with Type II MDI and those without generalized ligamentous laxity. However, the sharp rise in recurrence rates and decline in satisfaction 1 year after the procedure indicate that these outcomes may only be of short-term benefit. Long-term clinical outcome studies are needed to assess the clinical efficacy of this technology and its potential use in the treatment of shoulder instability. ■

Stephen J. Lee, BA, Northwestern University Feinberg School of Medicine, Chicago, Ill.

Iontophoresis for Tennis Elbow

ABSTRACT & COMMENTARY

Synopsis: *Iontophoresis was more effective than placebo in relieving tennis elbow symptoms in the short term.*

Source: Nirschl RP, et al. Iontophoretic administration of dexamethasone sodium phosphate for acute epicondylitis: A randomized, double-blinded, placebo-controlled study. *Am J Sports Med.* 2003;31(2):189-195.

LATERAL EPICONDYLITIS (TENNIS ELBOW) AND MEDIAL epicondylitis (golfer's elbow) are common complaints for both working and athletically active adults. Inflammation at the common tendon origin due to overuse can lead to degenerative changes, tendinosis, microtears, and amorphous fibrous tissue. Although surgery can be effective at relieving symptoms, there is a high recurrence rate of at least 15%. Therefore, nonoperative methods for treatment continue to be explored. Iontophoresis is a method to deliver steroid locally with the assistance of a small, external electric current to drive water-soluble drugs through the skin to the target

area. Locally high concentrations of drug can be achieved with few systemic side effects.

Nirschl and colleagues performed a randomized, double-blinded, placebo-controlled study of 199 patients with either medial or lateral epicondylitis. Patients received either active drug or placebo on 6 separate occasions 1-3 days apart for a 15-day period of time. They found that the active treatment group that received dexamethasone improved significantly on visual analogue scale ratings (23-mm improvement compared to 14 mm for placebo). The improvement was most notable in the short term with differences becoming less distinct at 1-month follow-up. Other primary variables measured included an investigator's global evaluation scale and a patient's global evaluation scale, both of which were significantly improved for the treatment group in the short term.

Secondary variables included assessment by the investigator of the patient's level of severity. All measures showed improvement for the treatment group regarding pain, tenderness, and assessment of disease severity. Again, differences were more pronounced at short-term follow-up with less distinction at 1 month from treatment. Nirschl et al found on more careful analysis of their data that those patients who received their 6 treatments over fewer total days tended to have more pronounced improvements. Their conclusion was that iontophoresis with dexamethasone was both safe and effective, especially if treatments are condensed over fewer days (10 days or fewer).

■ **COMMENT BY DAVID R. DIDUCH, MS, MD**

Tennis elbow or golfer's elbow are very common complaints. Repetitive activities are often the inciting event, but continued use in the work or home environment perpetuates the process. Surgery can be effective but has a high recurrence rate so is often avoided until nonoperative measures have failed. This paper is by Robert Nirschl, probably the leading authority on tennis elbow surgery, and other authors in a multicenter study that was IRB approved and extremely well designed. That the champions for surgery of tennis elbow are presenting this nonoperative treatment underscores the importance of treating these patients without surgery initially.

They found that iontophoresis with dexamethasone was indeed effective. The placebo-controlled, double-blinded design of the study adds credibility to their findings. They were very astute to analyze their data more carefully and determine that condensing the treatments over fewer days was more effective. Although the differences between treatment and control groups were less

distinct with longer follow-up, Nirschl et al are encouraged to perform further studies with a more condensed administration of the drug and the addition of therapeutic exercises. None of these patients underwent physical therapy or other modalities to keep the study design as clean as possible. It is likely that in combination we will see even more pronounced effects.

It is also important to note that iontophoresis was found to be a very safe drug delivery method. This provides local delivery of a relatively high concentration of agent without many of the side effects, such as subcutaneous fat necrosis, skin depigmentation, and pain associated with steroid injections. Studies like this that validate safe, effective, nonoperative treatment for common problems are a welcome addition to the literature. ■

Psychological Aspects of Sport-Injury Rehabilitation

ABSTRACT & COMMENTARY

Synopsis: *Health care providers should take into account psychological, as well as physical, factors when considering patients' readiness for surgery.*

Source: Udry E, et al. Psychological readiness for anterior cruciate ligament surgery: Describing and comparing the adolescent and adult experiences. *Journal of Athletic Training*. 2003;38(2):167-171.

THIS STUDY IS 1 OF 5 COMPRISING A *Journal of Athletic Training* special section on developmental differences in psychological aspects of sport-injury rehabilitation. The 2 objectives of this paper were to describe mood-disturbance levels and psychological readiness levels of preoperative ACL patients and to examine differences between adolescent and adult sports medicine patients' psychological readiness for ACL surgery.

Sixty-seven subjects between 15 and 19 were considered adolescents, and 32 subjects who were 1 standard deviation older than the mean age of 21.6 (30 years of age or older) were considered adults. The subjects were assessed with 4 instruments: a modified version of Wong's 30-item Processes of Change Questionnaire for Injury Rehabilitation; the perceived pros and cons associated with engaging in a rehabilitation program with a 15-item questionnaire by Marcus et al; a self-efficacy measure developed by Marcus et al and modified by Wong; and the short-form Profile of Mood States.

The subjects tended to perceive more pros than cons

associated with ACL surgery, and they had relatively high levels of self-efficacy in anticipation of injury rehabilitation. The adolescents reported higher levels of mood disturbances, more pros associated with surgery and greater use of 5 of the 10 processes of change in comparison to the adults.

■ COMMENT BY DAVID H. PERRIN, PhD, ATC

The finding that adolescents reported higher levels of mood disturbances yet more pros associated with surgery seems paradoxical. Perhaps their more effective use of the processes of change (ie, dramatic relief, environmental reevaluation, social liberation, helping relationships, and self-liberation) accounts for this paradox. A limitation of the study is that the level of mood disturbances in these adolescents before their injury is not known. Nevertheless, the implication for the practitioner is that the adolescent sports medicine patient might be more challenging to work with, but is likely to be more enthusiastic about undergoing ACL surgery and returning to pre-injury levels of physical activity.

Certainly, the physical parameters associated with readiness for ACL surgery in adolescent and adult patients are more straightforward than the psychological factors. Surgeons and sports medicine rehabilitation specialists are normally not trained psychologists, yet they should be cognizant that patients vary in their psychological readiness for surgery and rehabilitation. Moreover, the findings of this study suggest that clear differences exist between adolescent and adult sports medicine patients. A comprehensive sports medicine practice should include the presence or availability of a sport psychologist or other qualified professional in the event that referral, assessment, and potentially psychological intervention are indicated prior to ACL surgery. ■

Age and ACL Rehabilitation

ABSTRACT & COMMENTARY

Synopsis: *The age of athletes with ACL injury may be an important factor to consider when planning sport-injury rehabilitation programs.*

Source: Brewer BW, et al. Age-related differences in predictors of adherence to rehabilitation after anterior cruciate ligament reconstruction. *Journal of Athletic Training*. 2003;38(2): 158-162.

BREWER AND ASSOCIATES SOUGHT TO DETERMINE whether the relationships between psychological

factors and rehabilitation adherence after ACL surgery differed as a function of age. Sixty-one subjects with a mean age of 26 (range, 14-47) completed a battery of psychological inventories before ACL reconstruction and recorded their adherence to a home-based accelerated rehabilitation program after surgery. The 4 psychological assessments included: the Self-Motivation Inventory, Social Support Inventory, Athletic Identity Measurement Scale, and Brief Symptom Inventory to assess psychological distress.

Clinic-based rehabilitation adherence was measured by calculating the ratio of appointments attended to appointments scheduled and by the attending rehabilitation professional completing the Sport Injury Rehabilitation Scale. This scale rates the intensity with which the subjects complete exercises, the frequency with which they follow directions and advice, and how receptive they are to rehabilitation program modification. Adherence to home-based rehabilitation was assessed by asking subjects to rate their compliance to prescribed exercises and cryotherapy.

Regression analysis found the following: self-motivation and social support were not significantly related to home exercise completion for younger subjects but were positively associated for older subjects; the relationship between athletic identity and home exercise completion was positive in younger subjects but was not significant for older subjects; and younger subjects had a positive relationship between athletic identity and home cryotherapy completion and older subjects showed no significant relationship between these variables.

■ COMMENT BY DAVID H. PERRIN, PhD, ATC

The most important variables in this study of age-related differences in rehabilitation adherence appear to be self-motivation, social support, and athletic identity as related to home exercise completion. Brewer et al define self-motivation as the tendency to persevere in the absence of external rewards, social support as level of satisfaction with support received in the previous month, and athletic identity as the degree of identity with the athlete role. Self-motivation and social support are more strongly related to adherence in older subjects and athletic identity more positively associated in younger subjects, who consisted primarily of adolescents in this study.

The finding that athletic identity has greater relevance to home exercise adherence in adolescents is not surprising. The 10-item Athletic Identity Measurement Scale examples cited by Brewer et al include “I consider myself an athlete,” “Sport is the most important part of my life,” and “I feel bad about myself when I do poorly

in sport.” This scale could be included in a pre-operative workup to help identify adolescent patients who might require closer oversight at home and/or more frequent clinic-based visits during the rehabilitation process.

This study is 1 of 5 comprising a *Journal of Athletic Training* special section on developmental differences in psychological aspects of sport-injury rehabilitation. The articles collectively illustrate the importance of considering developmental differences in patients during the process of anterior cruciate ligament reconstruction and rehabilitation. ■

ACL Reconstructions: Which is the Preferred Graft?

ABSTRACT & COMMENTARY

Synopsis: *Hamstring tendons are comparable to the patellar tendon in anterior cruciate ligament reconstructions.*

Source: Jansson KA, et al. A prospective randomized study of patellar versus hamstring tendon autografts for anterior cruciate ligament reconstruction. *Am J Sports Med.* 2003; 31(1):12-18.

PATIENTS WITH ANTERIOR KNEE LAXITY HAVE BEEN treated with good-to-excellent results with intraarticular ACL reconstructions with autogenous graft material. The most commonly used autogenous grafts are the central third of the patellar tendon (bone-patellar tendon-bone) and the hamstring tendon (semitendinosus-gracilis) constructs. The present study evaluates the difference in outcome between the 2 autografts.

This was a prospective, randomized clinical trial that included 99 patients. Surgery was indicated in an otherwise healthy patient with a clinically diagnosed ACL rupture who experienced instability or wished to maintain preinjury levels of activity. All patients underwent a primary, arthroscopically assisted ACL reconstruction with graft randomization into a patellar or hamstring group according to even or odd birth year. The bone-patellar tendon-bone grafts were fixated with interference metal screws (Linvatec) and the double-looped semitendinosus and gracilis tendons were fixated with a small metal plate (AO, Bern, Switzerland).

Knee function and stability were clinically evaluated preoperatively and at 1 and 2 years postoperatively. Of the 99 patients, 90% were available for 2-year follow-up. Based on a minimum level of significance of $P = .05$,

Jansson and colleagues found no statistically significant differences preoperatively or postoperatively between the 2 groups with respect to clinical and instrumented laxity testing, International Knee Documentation Committee Score ratings, isokinetic muscle torque measurements, and Kujala patellofemoral, Lysholm, and Tegner scores. Both autografts were shown to result in comparable outcomes 2 years following ACL reconstructions with improvements seen in the patients' performances.

■ **COMMENT BY BRIAN J. COLE, MD, MBA, AND NINA SHERVIN**

The central third of the patellar tendon and the hamstring tendon are the 2 most commonly used autogenous grafts in ACL reconstructions. It has been reported that the postoperative disadvantages and potential complications of the patellar autograft include patellofemoral pain, weakness of the quadriceps muscle, rupture of the patellar tendon, and patellar fracture. It has also been proposed that potential disadvantages of the hamstring tendon include failure of immediate rigid fixation and lower stiffness relative to the patellar tendon graft or native ACL. Although Jansson et al have recognized the limitations in their study design, including the inability to isolate the comparison to the patellar and hamstring tendons alone as differing fixation techniques were used, they concluded that neither technique had a clear advantage over the other. ■

CME Questions

35. ACL thermal denaturation can:

- a. restore partially ruptured ACL collagen back to its pre-injury material properties.
- b. return the partially ruptured ACL back to its original hourglass shape.
- c. return knee stability, as measured by KT-1000 measurements of < 2 mm, in > 90% patients.
- d. not return knee stability, as measured by KT-1000 measurements of < 2 mm, in > 90% patients.

36. Radiofrequency energy:

- a. can be used to decrease the volume of the shoulder capsule.
- b. has been extensively used to treat laxity of the ACL.
- c. has been shown to be more efficient in shrinking PCLs than ACLs.
- d. has no effect on the human collagen.

37. Based on this study, which of the following is true?

- a. Patient satisfaction remained the same at 1-year follow-up to the most recent follow-up.
- b. Type II MDI patients had the lowest rate of recurrent instability.

- c. Patients with generalized ligamentous laxity show no higher rate of recurrence than those without generalized ligamentous laxity.
- d. Patients who experienced recurrent instability were most likely to do so within the first 12 months postoperatively.

38. Iontophoresis with dexamethasone for tennis elbow was found to be most effective if:

- a. treatments were delivered close together over the fewest days possible.
- b. increased concentrations of the drug were given.
- c. treatments were spaced out over a month of time.
- d. increased electrical current was used.
- e. treatments were combined with physical therapy.

39. Neuromuscular training decreased ACL injury incidence by approximately what percent in Norwegian handball players?

- a. 0%
- b. 12%
- c. 36%
- d. 96%

40. Which of the following statements is true as related to age-related differences in adherence to rehabilitation after ACL reconstruction?

- a. Self-motivation and social support were not significantly related to home exercise completion for younger patients.
- b. Self-motivation and social support were not significantly related to home exercise completion for older patients.
- c. The relationship between athletic identity and home exercise completion was positive in older subjects.
- d. Older subjects had a positive relationship between athletic identity and home cryotherapy completion.

41. Which of the following statements regarding intra-articular ACL reconstructions is true?

- a. The bone-patellar tendon-bone and hamstring tendon autografts are used less frequently than allografts.
- b. Bone-patellar tendon-bone autografts produce significantly better outcomes than hamstring tendon autografts.
- c. Hamstring tendon autografts produce significantly better outcomes than bone-patellar tendon-bone tendon autografts.
- d. Both bone-patellar tendon-bone and hamstring tendon autografts produce comparably good results.

42. Which of the following statements is true as related to adolescent and adult readiness for ACL surgery?

- a. All subjects tended to perceive more cons than pros associated with ACL surgery.
- b. Adults tended to perceive more pros than cons in comparison to adolescents.
- c. Adolescents tended to perceive more pros than cons in comparison to adults.
- d. Adults had higher levels of mood disturbances than adolescents.

Answers: 35(c); 36(a); 37(b); 38(a); 39(c); 40(a); 41(d); 42(c)

In Future Issues:

Comparing Hamstring ACL Fixation Methods

PHARMACOLOGY WATCH



Pneumococcal Vaccine Ineffective at CAP Prevention

Pneumococcal vaccine protects older adults from developing pneumococcal bacteremia but does not prevent community-acquired pneumonia (CAP), according to a new study from Group Health Cooperative in Seattle. The study reviewed records of more than 47,000 adults aged 65 and older who were followed for more than 3 years. During that period 1428 were hospitalized with CAP, 3061 were diagnosed with outpatient pneumonia, and 61 had pneumococcal bacteremia. Prior receipt of the pneumococcal vaccine was associated with a reduction in the risk of pneumococcal bacteremia (HR 0.56; 95% CI, 0.33-0.93), but an increased risk of hospitalization with CAP (HR, 1.14; 95% CI, 1.02-1.28). The pneumococcal vaccination did not change the risk of outpatient CAP (HR, 1.04; 95% CI, 0.96-1.13), or the combined outcome of inpatient and outpatient CAP (HR, 1.7; 95% CI, 0.99-1.14). The authors point out that these results are consistent with those of 4 meta-analyses, which also showed no reduction of CAP with the pneumococcal vaccine. They state, however, that the reduction in pneumococcal bacteremia, which is also consistent with results of other studies, is reason enough to administer the vaccine (*N Engl J Med.* 2003;348:1747-1755). A separate study in the same issue suggests that vaccinating children with pneumococcal vaccine may also benefit adults. Using CDC surveillance statistics, a dramatic reduction in invasive pneumococcal disease was found between the years 1998 and 1999 and the year 2001, one year after the licensing of the protein-polysaccharide conjugate vaccine with the largest decline in children younger than the age of 2, when a 69% reduction was seen. A reduction in disease rates for adults and, especially young adults, was also noted over this time period. Interestingly, the 35% reduction in penicillin-resistant pneumococcus was also noted over the same timeframe (*N Engl J Med.* 2003; 348:1737-1746).

Flu Vaccine Limits Hospitalization

The influenza vaccine is highly effective at preventing hospitalization and death during the influenza season. A recent study reviewed the records of more than 140,000 adults aged 65 and older during the 1998-1999 and 1999-2000 influenza seasons, during which 55.5% and 59.7%, respectively, were immunized. The flu vaccine was associated with a reduction in the risk of hospitalization for cardiac disease (reduction of 19% during both seasons [$P < 0.001$]), cerebrovascular disease (reduction of 16% during the 1998-1999 season [$P < 0.018$] and 23% during the 1999-2000 season [$P < 0.001$]), and pneumonia or influenza (reduction of 32% during the 1998-1999 season [$P < 0.001$] and 29% during the 1999-2000 season [$P < 0.001$]) and a reduction in the risk of death from all causes (reduction of 48% during the 1998-1999 season [$P < 0.001$] and 50% during the 1999-2000 season [$P < 0.001$]). The subgroups were well matched for major medical illnesses. The authors point out the extraordinary effectiveness of the influenza vaccine, which has also been seen in other studies, but they also point out that the national rate of vaccination against influenza was only 63% of adults older than the age of 65 in 2001 (*N Engl J Med.* 2003;348:1322-1332).

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Verapamil Not Up To Competition

Controlled-onset extended-release (COER) verapamil “is not equivalent to atenolol or hydrochlorothiazide in preventing cardiovascular disease-related events” is the conclusion of the CONVINCe trial (Controlled Onset Verapamil Investigation of Cardiovascular Endpoints). The study was terminated early by the sponsor for “commercial reasons.” CONVINCe was initially designed to test the hypothesis that control of early morning blood pressure might reduce cardiovascular mortality given that acute myocardial infarction (MI), cardiovascular event-related death, and stroke all have their highest incidence during the early morning hours (6 AM to noon). More than 16,000 patients were randomized to receive COER verapamil or either of atenolol 50 mg or hydrochlorothiazide 12.5 mg. Other antihypertensives were added if needed. The main outcome was stroke, MI, or cardiovascular related death. Blood pressure control was virtually identical between the 2 groups. There were fewer myocardial infarctions in the COER verapamil group, but more strokes, and cardiovascular deaths were similar (hazard ratios: MI 0.82, CVA 1.15, CV death 1.09, all-cause mortality 1.08). Both groups had more cardiovascular deaths between 6 AM and noon (COER verapamil 99/277, atenolol or HCTZ 88/274). The authors state that low-dose thiazide diuretics and/or beta blockers remain first-line therapy for hypertension, a recommendation that is in line with the recent Sixth report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (*JAMA*. 2003;289:2073-2082).

International Companies Unite Against SARS

As researchers move closer to identifying the etiologic agent of SARS, several international drug companies are collaborating to develop a vaccine. GlaxoSmithKline has announced it is working with France’s Institut Pasteur along with several other pharmaceutical companies to develop a vaccine. The SARS vaccine would have a massive worldwide market, and traditionally companies would compete to bring a product to market. But partially under urging from US government officials, companies such as Merck, Wyeth, Chiron, Baxter, J&J, and others have committed to collaborating in this important effort. Scientists involved in this process warn, however, that this process will likely take years.

New FDA Commissioner Brings Controversy

The pharmaceutical industry is still analyzing whether Mark McClellan, the FDA’s new

Commissioner, is friend or foe. The 38-year-old Commissioner has hit the floor running but has generated controversy in the process. Harvard trained as a physician and economist, McClellan was teaching medicine and economics at Stanford, and advising the Bush administration on health-care economics when he was tapped to head the FDA. The new Commissioner has pleased the pharmaceutical industry by pledging to speed the new drug evaluation process. But a new proposal to force drugmakers to switch some prescription drugs to over-the-counter (OTC) status is strongly opposed by the industry. Dr. McClellan confirmed to the *Washington Post* in late April that forced switches are being “actively considered.” The controversy centers on nonsedating antihistamines. Schering-Plough recently took loratadine (Claritin) OTC with urging from the FDA. Now 2 competitor drugs, Aventis’s fexofenadine (Allegra) and Schering-Plough’s cetirizine (Zyrtec) are under consideration for forced switches to OTC status. Both these drugs have several years of lucrative patent protection during which time they are unlikely to pursue OTC status on their own. All 3 drugs are sold OTC in many other countries and are considered safer than current OTC antihistamines. The price of most drugs drop significantly when they are available OTC, a fact that is not lost on pharmaceutical companies or consumer groups. Opposing the powerful pharmaceutical lobby has never been politically savvy, but Dr. McClellan may choose to court an even more powerful lobby—the American health care consumer.

Janssen: ‘Dear Doctor’ Letter for Risperidone

Janssen pharmaceuticals has issued a “Dear Doctor” letter concerning its antipsychotic medication risperidone (Risperdal). The letter warns health-care providers about a possible increased risk of stroke among elderly patients taking the drug. “Cerebrovascular adverse events (eg, stroke, transient ischemic attack), including fatalities, were reported in patients (mean age, 85 years; range 73-97) in trials of risperidone in elderly patients with dementia-related psychosis. In placebo-controlled trials, there was a significantly higher incidence of cerebrovascular adverse events in patients treated with risperidone compared to patients treated with placebo.” Risperidone is approved for treatment of schizophrenia, but it is commonly used off label to treat delusional or aggressive behavior in elderly patients with dementia. ■