

SPORTS MEDICINE REPORTS™

The essential guide to developments in sports medicine and orthopaedics

American Health Consultants Home Page—<http://www.ahcpub.com>

CME for Physicians—<http://www.cmeweb.com>

EDITOR

David R. Diduch, MS, MD
Assistant Professor,
Department of Orthopaedic
Surgery, University of
Virginia School of Medicine,
Charlottesville, VA

ASSOCIATE EDITORS

Letha Y. Griffin, MD, PhD
Adjunct and Clinical
Faculty, Department of Kinesiol-
ogy and Health, Georgia State
University, Atlanta, GA

Stephen B. Gunther, MD
Assistant Professor of Clinical
Orthopaedic Surgery, UCSF
Department of Orthopaedic
Surgery, San Francisco, CA

Christopher D. Harner, MD
Blue Cross of Western
Pennsylvania Professor
Director, Division of
Sports Medicine
UPMC Health System
Center for Sports Medicine
and Rehabilitation
Pittsburgh, PA

Clayton F. Holmes, EdD, PT, ATC
Assistant Professor,
University of Central Arkansas,
Department of
Physical Therapy,
Little Rock, AR

Mark D. Miller, MD
Associate Professor,
UVA Health System,
Department of Orthopaedic
Surgery, Charlottesville, VA

David H. Perrin, PhD, ATC
Joe Gieck Professor of
Sports Medicine; Chair,
Department of Human Services,
Curry School of Education,
University of Virginia,
Charlottesville, VA

Robert C. Schenck, Jr., MD
Deputy Chairman,
Department of Orthopaedics,
University of Texas Health
Science Center,
San Antonio, TX

James R. Slauterbeck, MD
Associate Professor,
Department of Orthopedic
Surgery, Texas Tech University
Health Sciences Center,
Lubbock, TX

James P. Tasto, MD
Associate Clinical
Professor, Orthopaedic Surgery,
University of
California—San Diego, CA

Shrinking the ACL

ABSTRACT & COMMENTARY

Synopsis: Radiofrequency thermal shrinkage can weaken the ligament and predispose to rupture.

Source: Sekiya JK, et al. Autodigestion of a hamstring anterior cruciate ligament autograft following thermal shrinkage: A case report and sentinel of concern. *J Bone Joint Surg Am* 2000;82-A(10):1454-1457.

This case report by Sekiya and colleagues describes a 16-year-old female athlete who, five months after ACL reconstruction with semitendinosus-gracilis autograft, sustained a twisting injury to her knee. Clinical evaluation revealed laxity (2+ Lachman—i.e., 5-10 mm) consistent with a tear of the ACL graft as well as a probable medial meniscal tear. MRI imaging confirmed the medial meniscal tear but demonstrated the ACL graft to be intact. At the time of arthroscopy, a medial meniscal bucket-handle tear was resected, but since the ACL graft was intact, thermal shrinkage with the ORATEC device (ORATEC Interventions, Menlo Park, Calif.) was undertaken using 40 watts of energy and a temperature of 65°C as recommended by the manufacturer. Following shrinkage, the graft was probed and found to be intact with appropriate tension, and the Lachman test was comparable with the noninjured side.

Postoperatively, the patient underwent a rehabilitation program that emphasized graft protection for 12 weeks, after which the Lachman test was found to be 1+ and the pivot-shift test was negative. The athlete was released to full activity but sustained a non-contact reinjury to her knee one week later. Examination revealed significant laxity (3+ Lachman), and arthroscopy revealed no remnant of the previous hamstring autograft in the notch. An ACL revision procedure using bone-patella tendon-bone autograft was performed.

■ COMMENT BY LETHA Y. GRIFFIN, MD, PhD

This article reminds us that monopolar or bipolar radiofrequency thermal energy is just that, thermal energy, and in addi-

INSIDE

*Why doesn't
a torn
ACL heal?*
page 10

*Hamstring
ACLs in
females*
page 11

*Functional
knee braces*
page 12

*Surgical
repair of
acute patellar
dislocation*
page 13

*Nonoperative
treatment of
frozen
shoulders*
page 14

Volume 3 • Number 2 • February 2001 • Pages 9-16

NOW AVAILABLE ONLINE!

Go to www.ahcpub.com/online.html for access.

tion to shrinking tissue it can also destroy it. In 1998, Thabit, using a monopolar device, reported excellent results in 23 of 25 patients after thermal shrinkage of the anterior portion of the patient's lax ACL.¹ He recommended that the device be used only on the anterior fibers so that the posterior portion of the ligament could serve as a source of revascularization. However, in this case reported by Sekiya et al, no mention is made of whether the entire graft was thermally treated or only the anterior portion. The ultimate outcome was destruction of the graft despite the radiofrequency being used at the recommended settings. One must ask why? Is this case merely an outlier or might this complication be more common than initially thought?

A study of 13 patients reported by Thomas Carter² at the AOSM summer meeting (Sun Valley 2000) using the monopolar ORATEC probe for shrinking lax, previously normal ACLs (6) or lax, reconstructed ACLs (7) followed for an average of 17.8 months, had a failure rate of 69%. Perry and Higgins³ reported a case of a 31-year-old who ruptured both the anterior and posterior cruciate ligaments following minor knee trauma (pushing children on a sled) 10 weeks after treatment of these ligaments with the bipolar Arthro-

care thermal probe. The probe had been used to treat laxity found at the time of arthroscopy because of a one-year history of occasional swelling and posterior knee tightness. Perry and Higgins caution that the biomechanical characteristics of thermally treated tissues are still being defined. Recently, cautions have been issued regarding shoulder capsular shrinkage to avoid early mobilization, as this can stretch the heated tissue.⁴ Prolonged probe contact and high-energy settings also negatively influenced results. The ultimate power setting and duration of treatment is still yet to be determined, as are the long-term effects of the denaturation of the collagen microstructure caused by thermal energy. Until more is known, caution is recommended when using RF thermal energy to treat laxity, especially pathologic laxity of the cruciate ligaments. ❖

References

1. Thabit G. The arthroscopic monopolar radiofrequency treatment of chronic anterior cruciate instability. *Operative Techniques in Sports Medicine* 1998;6: 157-160.
2. Rapp SM. Thermal shrinkage has limited use for ACL laxity. *Orthopaedics Today* 2000;11:25.
3. Perry JJ, Higgins LD. Anterior and posterior cruciate ligament rupture after thermal treatment. *Arthroscopy* 2000;16(7):732-736.
4. Hecht P, et al. Monopolar radiofrequency energy effects on joint capsular tissue: Potential treatment for joint instability. An in vivo mechanical, morphological and biomechanical study using an ovine model. *Am J Sports Med* 1999;27:761-771.

Sports Medicine Reports, ISSN 1524-0991, is published monthly by American Health Consultants, 3525 Piedmont Rd., NE, Bldg. 6, Suite 400, Atlanta, GA 30305.
VICE PRESIDENT/GROUP PUBLISHER:
 Donald R. Johnston.
EDITORIAL GROUP HEAD: Glen Harris.
ASSOCIATE MANAGING EDITOR: Robin Mason.
ASSISTANT MANAGING EDITOR: Neill Larmore.
COPY EDITOR: Robert Kimball.
MARKETING PRODUCT MANAGER:
 Schandale Koregay.
GST Registration Number: R128870672.
 Periodical postage pending at Atlanta, GA.
POSTMASTER: Send address changes to **Sports Medicine Reports**, P.O. Box 740059, Atlanta, GA 30374.

Copyright © 2001 by American Health Consultants. All rights reserved. No part of this newsletter may be reproduced in any form or incorporated into any information-retrieval system without the written permission of the copyright owner.

Back issues: \$33. Missing issues will be fulfilled by Customer Service free of charge when contacted within one month of the missing issue's date.

This is an educational publication designed to present scientific information and opinion to health professionals, to stimulate thought, and further investigation. It does not provide advice regarding medical diagnosis or treatment for any individual case. It is not intended for use by the layman.

AMERICAN HEALTH CONSULTANTS
 THOMSON HEALTHCARE

Subscriber Information

Customer Service: 1-800-688-2421.

Customer Service E-Mail Address:
 customerservice@ahcpub.com

Editorial E-Mail Address: robert.kimball@ahcpub.com
World-Wide Web: http://www.ahcpub.com

Subscription Prices

United States
 \$249 per year (Student/Resident rate: \$100).
Multiple Copies
 1-9 additional copies: \$179 each. 10-20 copies: \$159 each.
Canada
 Add GST and \$30 shipping.
Elsewhere
 Add \$30 shipping.
Accreditation

American Health Consultants (AHC) designates this continuing medical education (CME) activity for up to 20 hours of category 1 credit toward the AMA Physician's Recognition Award.

Each physician should claim only those hours of credit that he/she actually spent in the educational activity.

This CME activity was planned and produced in accordance with the ACCME Essentials.

AHC is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education for physicians.

For CME credit, add \$50.

Questions & Comments

Please call **Robin Mason**, Associate Managing Editor, at (404) 262-5517; or e-mail: robin.mason@ahcpub.com or **Robert Kimball**, Copy Editor, at (404) 262-5513; or e-mail: robert.kimball@ahcpub.com between 8:30 a.m. and 4:30 p.m. ET, Monday-Friday.

Why Doesn't a Torn ACL Heal?

ABSTRACT & COMMENTARY

Synopsis: Unlike extra-articular ligaments that heal spontaneously, the torn ACL becomes covered with synovial myofibroblasts that cause retraction of the ends.

Source: Murray MM, et al. Histological changes in the human anterior cruciate ligament after rupture. *J Bone Joint Surg Am* 2000;82(10):1387-1397.

Unlike extra-articular ligaments, such as the UMCL, the ACL does not heal spontaneously after rupture. Furthermore, efforts at primary repair have

Statement of Financial Disclosure

In order to reveal any potential bias in this publication, and in accordance with Accreditation Council for Continuing Medical Education guidelines, we disclose that Dr. Diduch serves as a consultant to DePuy Orthotech. Dr. Tasto serves on the surgical advisory boards of Arthrocare, Orthopedic Biosystems Limited, and receives royalties from Don Joy Dr. Griffin, Dr. Gunther, Dr. Harner, Dr. Holmes, Dr. Miller, Dr. Perrin, Dr. Scherck, and Dr. Slaughterbeck report no consultant, stockholder, speaker's bureau, research, or other financial relationships with companies having ties to this field of study.

resulted in high failure rate because of the lack of ligamentous healing. The exact reasons why the ACL does not heal are speculative. Murray and colleagues have examined this issue by histologically inspecting both torn and intact ACL specimens retrieved at the time of surgery. Specimens were examined for cell and vascular density, collagen organization, and specifically for α -smooth muscle actin using immunohistochemical techniques with a mouse monoclonal antibody. Alpha-smooth muscle actin is present in contractile cells such as smooth muscle myofibroblasts.

Murray et al's initial hypothesis was that following rupture, there would be an increase in the density at the tear site of myofibroblast-like cells known to be present within the substance of the ligament. However, they found that there was an actual decrease in the density of these cells. Therefore, their hypothesis changed as they noted other observations that seemed to explain the lack of healing of the ACL.

Once torn, the ACL goes through four phases described by Murray et al based on the histology. Phase I involves inflammation with an exudate of inflammatory cells surrounding the "mop-end" of the torn ligament. Little clot formation is present on the surface, and no bridging clot or connection between the torn ends is evident. The epiligamentous regeneration phase occurs between three and eight weeks after rupture with migration and proliferation of synovial cells on the surface of the ligament that stain positively for α -smooth muscle actin. These myofibroblast-type cells appear to contract, round off, and retract the torn ends of the ligament. Unlike extra-articular ligaments, the proliferation phase—phase III—didn't begin until eight weeks following injury. Increased numbers of blood vessels as well as fibroblasts peaked at 20 weeks. The last phase involves remodelling and maturation of the ligament ends between one and two years after rupture.

■ COMMENT BY DAVID R. DIDUCH, MS, MD

This study helps us better understand cellular events associated with ACL rupture, the high rate of failure following primary repair, and opens doors for future interventions with biologics. Extra-articular ligament ruptures result in a bridging clot with rapid invasion by fibroblasts and gradual replacement by collagen fibers. This process occurs in the first few weeks following injury. Intra-articular ACL rupture does not follow with clot formation, as the presence of fibrinolytic enzymes in the synovial fluid keeps the hemarthrosis liquid. Thus, the normal healing response is blocked at the very beginning. Furthermore, the synovium migrates over the torn end of the ligaments, and the myofibroblast cells con-

tract and smooth off the ends to prevent any hope of end-to-end contact.

Finally, the proliferative phase for fibroblast and new vessel ingrowth does not occur until 8-20 weeks after injury, much later than the first few weeks seen for extra-articular ligament tears. This is far too long for immobilization to allow any primary repair to occur. Interestingly, this is in contrast to other intra-articular structures that also do not heal, such as the avascular portion of the meniscus or articular cartilage, which never show a proliferative phase following injury.

This paper effectively enhances our understanding of why the ACL does not heal after rupture or primary repair, and perhaps may open doors for future studies that biologically manipulate the environment to stimulate the process. ❖

Do Hamstring ACLs Have a Higher Failure Rate in Females?

ABSTRACT & COMMENTARY

Synopsis: *Quadruple hamstring ACL reconstruction resulted in a 23% failure rate for female patients vs. a 4% failure rate for male patients.*

Source: Noojin FK, et al. Clinical comparison of intraarticular anterior cruciate ligament reconstruction using autogenous semitendinosus and gracilis tendons in men versus women. *Am J Sports Med* 2000;28(6):783-789.

Hamstring acl grafts have been increasingly popular because of the more cosmetically appealing incision and also the decreased morbidity from graft harvest. In addition, patients who have pre-existing patellofemoral pain may benefit from a graft choice other than bone patella tendon bone. This study by Noojin and colleagues critically looks at whether there are differences in males vs. females for outcomes following ACL reconstruction with hamstring autografts. Over a six-year period, a single surgeon performed 130 ACL reconstructions using hamstring grafts, corresponding to about 20% of the ACLs he performed. A single incision technique was used with femoral fixation using the endobutton. Tibial fixation was performed with either sutures tied around a post with a spiked washer, or sutures tied over a button. Demographics, meniscal tears, and chondral pathology were similar between groups.

At an average follow-up of almost 3½ years, patients were evaluated by physical examination, KT1000 arthrometry, visual analogue scale, and with Tegner and Lysholm scores for activity level and subjective outcomes. There was a significant difference in the clinical failure rate with nine out of 39 (23%) female patients failing vs. just one out of 26 (4%) male patients suffering clinical graft failure. In addition, there was also a trend toward increased laxity in the female patients by KT1000 testing, with a mean side to side difference of 1.8 mm vs. 1.25 mm in the males. Furthermore, 21% of the females had a side-to-side difference greater than 3 mm vs. 12% of the male patients. The female patients tended to have a bit higher Tegner score indicating an increased activity level, but this did not reach significance. Interestingly, seven of the nine failures in the female patients occurred with button fixation on the tibia as opposed to the screw and washer construct.

■ COMMENT BY DAVID R. DIDUCH, MS, MD

Other studies have been performed that have documented a difference in injury incidence for the ACL in female patients. Theories have included hormonal changes affecting ligament laxity and stiffness, as well as anatomical differences in the size of the femoral notch and the diameter of the ligament. Also, neuromuscular differences have been postulated that may be amenable to changing with plyometric training techniques. This is the first paper that documents a difference in outcomes after reconstruction based on sex.

The strengths of this paper include that it involved a single surgeon and a minimum of two-year follow-up, and that the patients were objectively evaluated with KT1000 arthrometry as well as by clinical examination with well-validated scoring systems. Weaknesses include the tibial fixation methods that are somewhat outdated for hamstring autografts. Currently, most people use a combination of double fixation both within the tunnel as well as outside the tunnel on the tibial side to improve stiffness and pull-out strength. Fixation outside the tunnel at both ends of the graft has been noted to increase the risk of bungee cord effect or creep, possibly causing lengthening of the graft as well as a windshield wiper effect and tunnel widening. That being said, we are still left with the difference between the two groups based on sex. None of these theories explain why the males had tighter knees with fewer graft failures than the females. It is possible that females had a smaller hamstring graft diameter placed in tunnels that were otherwise drilled to the same size, coupled with differences in bone density. Slightly

increased generalized ligamentous laxity that has been noted in females vs. males may have also contributed, as well as neuromuscular differences or hormonal factors. We are still left with the failure rates that are quite different, and additional study will be needed on this very important topic. ❖

The Effects of Functional Knee Braces

ABSTRACT & COMMENTARY

Synopsis: *Functional or cruciate knee braces protect the ACL during anterior-posterior shear loads directed at the knee.*

Source: Fleming BC, et al. The influence of functional knee bracing on the anterior cruciate ligament strain biomechanics in weightbearing and nonweightbearing knees. *Am J Sports Med* 2000;28(6):815-824.

The purpose of this study was to test the strain in the ACL in the loaded and unloaded knee under different compressive loading conditions. This study addresses an important clinical concern: Does an off-the-shelf knee brace increase ACL strain under low loads?

Patients were included in this study if they had normal ACLs on routine arthroscopy for other pathology. The knee arthroscopy was performed under local anesthesia so that the patient could participate in the testing. Reproducible data were obtained from 11 of the 15 subjects. The Don Joy Legend functional knee brace was appropriately fit and placed onto the knee with the straps under uniform tension. Strain was measured using a differential variable reluctance transducer (DVRT), which was placed through the anterolateral portal into the ACL during the knee arthroscopy. The loading fixture was designed to apply anter-posterior (AP) forces, internal-external torques, and varus-valgus moments to the tibia under conditions with and without compressive load to the knee. A load cell was used to measure the forces placed on the knee.

The results for the AP load tests showed that the strain in the ACL was reduced in the braced knee for anterior sheer loads up to 130 N. For internal torque, the ACL strain was less than in the non-braced knee in the loaded condition. The brace did not reduce strain in the ACL under conditions of

external torque or varus-valgus moments.

■ **COMMENT BY JAMES R. SLAUTERBECK, MD**

This is another study by the Vermont group, which has capitalized on a clever intra-operative experimental model and has made several significant contributions to the orthopaedic literature. This article specifically tests the strain in the ACL under different loading conditions with and without a brace. The study concludes that the off-the-shelf Don Joy cruciate brace effectively reduces the strain on the ACL at low anterior-posterior loads.

Although the loads applied in this experiment were relatively low, they were similar to those loads applied to the ACL during a Lachman exam. However, one cannot extrapolate this information to higher applied loads, nor can one assume that if the strain increases in the ACL that the force in the ACL increases. However, this study does provide valuable information.

A design problem is inherent in this model. The strain measurements are reflective of the small area on the ACL where the strain gauge is in contact. Multiple DVRTs would increase the value of this information but the space in the notch is limited. Therefore, only one can be placed. The anatomy of the ACL is complex, and multiple bundles are present, which complicate the interpretation of the results. Little changes measured in the strain may be larger changes at other ACL locations. In my opinion, this is a design problem that cannot be overcome in this model, but the value of the information is paramount. Orthopaedic surgeons typically try to reconstruct the anteromedial bundle of the ACL, which is the bundle where the DVRT is placed. Fleming and colleagues make great effort to consistently place the DVRT in the same place in the ACL, which adds to the reproducibility of the results.

A 4-point functional brace like the Don Joy Legend reduces strain in the ACL. The opposite of this is also very important. The brace does not increase the strain in the ACL under the conditions in this experiment. This is very valuable information, especially for those who believe wearing braces may cause increased strain in the ACL. In my opinion, it is reasonable to assume that the ACL strain (change in length) must increase in order for significant injury to occur within the ligament. This study determined that ACL strain was not increased; therefore, ACL injury is not likely to occur with a properly fit functional knee brace at low loads. This study does not address improperly fitted braces. ❖

Surgical Repair of Acute Patellar Dislocation

ABSTRACT & COMMENTARY

Synopsis: *Excellent results are reported with surgical repair of acute patellar dislocations. Unlike previous reports, primary repair of not only the medial patellofemoral ligament, but also the origin of the vastus medialis obliquus at the adductor magnus tendon is emphasized.*

Source: Ahmad CS, et al. Immediate surgical repair of the medial patellar stabilizers for acute patellar dislocation. A review of eight cases. *Am J Sports Med* 2000;28(6):804-810.

Traditionally, acute patellar instability has been treated with prolonged immobilization, and more recently, with “functional” rehabilitation. Unfortunately, both of these treatment options are associated with recurrent instability and patellar pain. Recent studies have proven that the medial patellofemoral ligament (MPFL) is the primary stabilizer of the patella vs. lateral displacement. Surgical repair of this ligament, which is commonly ruptured with acute lateral patellar dislocation, has been proposed but is still not popular. Ahmad and colleagues of the current paper suggest that not only should the MPFL be addressed, but the origin of the vastus medialis obliquus along the adductor magnus tendon should also be repaired.

Eight consecutive patients with first-time acute patellar dislocations were evaluated with MRI scans. All scans demonstrated tears of the MPFL at the femoral epicondyle and injury to the vastus medialis obliquus (VMO). Operative repair consisted of primary repair of the MPFL to the adductor tubercle and the VMO to its tendinous origin. Patients were evaluated at an average of three years postoperatively with a special scoring questionnaire (Kujala system) developed specifically for evaluation of patellofemoral disorders. No patients had recurrent patellar dislocation, although two had subluxations, and the average Kujala score was 91.9. The average subjective satisfaction was 96%. Ahmad et al recommend primary repair of the MPFL and VMO origin in cases of acute patellar dislocation.

■ **COMMENT BY MARK D. MILLER, MD**

Recommending surgery for acute patellar dislocation is analogous to recent reports advocating surgery for acute shoulder dislocations. It is a new idea, and it will undoubtedly be met with initial skepticism before it

finds its proper place in the management of this disorder. This paper, like the ones before it, lends support to the novel concept of primary repair for acute patellar dislocation. What is perhaps more important, is that this paper also suggests that the VMO origin be evaluated and repaired with the MPFL repair.

Of course, we must all recognize that this paper reports on a small group of patients with no control group. There are limited clinical data regarding the presence of anatomic predisposing risk factors for patellar instability. VMO dysplasia is discussed but not well defined. Nevertheless, this paper does provide additional evidence that acute patellar dislocations may be best treated with primary repair. Further investigation into this exciting possibility may ultimately affect our treatment paradigm for acute patellar dislocation. ❖

Nonoperative Treatment of Frozen Shoulders

ABSTRACT & COMMENTARY

Synopsis: Phase II frozen shoulder can effectively be treated with a therapy program. However, significant differences persist in motion and pain compared to the unaffected shoulder.

Source: Griggs S, et al. Idiopathic adhesive capsulitis: A prospective functional outcome study of nonoperative treatment. *J Bone Joint Surg Am* 2000;82-A:1398-1407.

Griggs and colleagues evaluated 75 consecutive patients (77 shoulders), mean age 53 years, with idiopathic capsulitis (phase II) treated conservatively with a rehabilitation exercise protocol. The rehabilitation program consisted of structured home therapy, and for 91% of the patients, an associated in-house physical therapy program. To be included in this study, patients had to have no history of trauma, significant pain at all extremes of motion, marked loss of active and passive shoulder motion, globally limited glenohumeral translation and normal radiographs. Patients with systemic disorders (such as diabetes) or associated pathology (such as cervical spine arthritis) were included, but patients with glenohumeral arthritis or reflex sympathetic dystrophy were excluded. Posttreatment evaluation consisted of subjective and objective assessments including measurements of pain, range of motion, and function, as well as the Disability of the Arm, Shoulder, and Hand Questionnaire (DASH) and

the Short Form-36 Health Survey (SF-36).

Seven (10%) patients were not satisfied with their shoulders following treatment, and five (7%) required surgical intervention (manipulation or arthroscopic capsular release). Patients were candidates for surgical intervention only if they did not improve after at least three months of treatment. Griggs et al wrote, "Patients who had the worst perceptions of the shoulder before treatment tended to have the worst outcomes." Sixty-four (90%) patients were satisfied with their results. However, in these satisfied patients, DASH scores were not comparable with reported normals, although the SF-36 scores were.

Despite the program being rated a success based on patient self-assessment, Griggs et al report measurable objective differences between the affected and unaffected shoulders. Results in the satisfied group of patients demonstrated significant increases in all ranges of motion; however, at final evaluation the range of motion of the affected shoulder was significantly less than the unaffected shoulder ($P < 0.0001$). Moreover, even though patients at the final evaluation felt comfortable with their arm, 27% still reported mild to moderate pain with activity.

Nonetheless, Griggs et al felt that in this study, which defined outcome in terms of patients' self-assessment rather than "categorical ranking," the results demonstrated that the vast majority of patients with phase II idiopathic capsulitis can be effectively treated with a shoulder-stretching exercise program.

■ COMMENT BY LETHA Y. GRIFFIN, MD, PhD

Adhesive capsulitis is a poorly understood syndrome whose treatment remains controversial. Duplay, who initially described this syndrome in 1872, felt manipulation under anesthesia was necessary for successful treatment in most cases.¹ Codman, who in 1934 termed the condition "frozen shoulder," felt that most cases spontaneously resolve in two years.¹ Although Neviasser¹ used the term "adhesive capsulitis" to describe the increased vascularity and fibrosis, which he felt represented a reparative inflammatory process associated with this disease, Connolly¹ has stated that this is a misnomer. He felt the underlying pathophysiology is fibroplasia, not inflammation, resembling the fibroplasia of Dupuytren's contracture. He recommended a treatment regimen of physical therapy modalities and passive stretching exercises with closed manipulation or arthroscopic release when patients show no improvement after 6-8 weeks. In contrast, Rockwood and colleagues² believed the syndrome is self-limited and that the treatment of choice is a physician directed, self-administered, rehabilitation program

that they term “orthotherapy.” In their report of 50 patients treated with this program, functional motion returned at an average of 14 months.

Vad and Hannafin³ believe that this condition is both inflammatory and fibrosing depending on the stage of the disease as described by Neviasser: Stage I—hypervascular synovitis with little scarring; Stage II—hypervascular synovitis with a proliferative fibroblastic capsular response; Stage III—mild synovial hyperplasia with significant capsular fibrosis; Stage IV—the thawing stage where no pathologic specimens are available for review since patient’s symptoms are resolving and surgical intervention is not needed. These researchers have suggested, in addition to physical therapy, significant benefits are gained by the judicious early use of injectable steroids in stage one and two (i.e., the inflammatory stages).

In summary, adhesive capsulitis is a perplexing enigma with a myriad of suggested treatments including benign neglect, oral or injectable corticosteroids, non-steroid anti-inflammatory agents, physical therapy modalities, exercise, ultrasound, acupuncture, nerve stimulation, infiltration brisement, manipulation under anesthesia, and arthroscopic and open releases. Griggs et al highlight an intriguing concept: that is, success of treatment should be based on the patient’s self assessment of satisfaction rather than purely on an evaluator’s objective measurements. ❖

References

1. Connolly JF. Unfreezing the frozen shoulder. *Journal of Musculoskeletal Medicine* 1998;1:47-57.
2. Miller MD, Wirth MA, Rockwood CA, Jr. Thawing the frozen shoulder. *Orthopaedics* 1996;19:849-853.
3. Vad VB, Hannafin JA. Frozen shoulder in women: Evaluation in management. *Journal of Musculoskeletal Medicine* 2000;1:13-28

Ankle Bracing and Muscle Activity

ABSTRACT & COMMENTARY

Synopsis: Long-term ankle bracing does not affect peroneus longus muscle latency during sudden inversion.

Source: Cordova ML, et al. Long-term ankle brace use does not affect peroneus longus muscle latency during sudden inversion in normal subjects. *Journal of Athletic Training* 2000;35(4):407-411.

Competitive and recreationally physically active people commonly use prophylactic ankle

bracing. Cordova and colleagues sought to determine if long-term ankle bracing had a deleterious effect on peroneus longus muscle latency, and if bracing affected latency before a period of extended use. Subjects were 20 physically active, college-aged individuals free from history of ankle injury for 12 months prior to the study. Subjects were randomly assigned to wear the Active Ankle Training brace, McDavid 199 brace, or no brace for eight hours a day, five days a week for an eight-week period. Prior to group assignment, subjects were tested for peroneus longus muscle latency under all three conditions in counterbalanced order. Electrical activity of the peroneus longus muscle was measured during a sudden and randomly applied inversion movement on a custom-made inversion platform. Subjects assumed a double-leg stance with weight evenly distributed on the platform. Muscle latency was defined as the time between the initiation of the inversion movement and the first electrical activity of the peroneus longus muscle. The muscle latency testing procedures were repeated following the eight-week treatment period.

Analysis of variance found no differences in latency between the three test conditions (Active Ankle, McDavid, and no-brace), and no changes in latency were observed after the eight-week period of brace wearing. The range of latency values under all conditions was 41.0-56.0 ms, which is consistent with the spinal reflex.

■ COMMENT BY DAVID H. PERRIN, PhD, ATC

Many clinicians theorize that prolonged wearing of braces increases dependence on the external support. Cordova et al used a creative research design to test this unsubstantiated concern of many physicians and clinicians. Cordova et al hypothesized that if the bracing had a deleterious effect, it would be manifested through a neuromuscular remodeling of the peroneus longus muscle. The consequence of this remodeling would be an increase in latency with a sudden inversion. They did not find this to be the case.

Prophylactic ankle taping for competitive athletes is the practice of many certified athletic trainers. Some have a similar concern that the application of tape over the course of a season can increase an athlete’s dependence on the support. Although the design of this study did not incorporate ankle taping, it seems unlikely that the application of tape for a period of just several hours each day would have deleterious effects on the neuromuscular system.

It would be interesting to test the same hypothesis of this study in subjects recovering from acute ankle sprain or suffering from chronic functional ankle instability. It is possible that a neuromuscular system that has been

traumatized by excessive inversion with damage to associated structures might respond differently to the prolonged application of bracing.

The failure to find any effect of the bracing on latency of the peroneus longus muscle during pretesting suggests the value of prophylactic ankle bracing in healthy people may be questionable. The debate over the role of preventive ankle sprain bracing continues. Some contend the benefit is earlier feedback from the sensorimotor system during forced inversion, while others feel the brace provides a mechanical block to excessive inversion. The role of mechanical blockage is unclear, and this study would not seem to support the proprioceptive feedback model. Perhaps the amount of inversion was insufficient to activate a protective response from the wearing of braces. Further research is warranted to address the value of ankle orthoses in the prevention and rehabilitation of ankle injuries. ❖

Attention Readers

A special supplement to *Sports Medicine Reports* on Nutritional Supplements will be included in the March 2001 issue, as a bonus to our subscribers. This will include articles on ergonomic aids, banned and non-banned substances, drug testing, nutraceuticals, and more. The editorial team at *Sports Medicine Reports* will continue to provide cutting-edge analyses and updates on developments in sports medicine and orthopaedics. ❖

CME Questions

8. Surgical repair of acute patellar dislocations should address what structure(s)?

- The medial patellofemoral ligament only
- The vastus medialis obliquus origin only
- Both the medial patellofemoral ligament and the vastus medialis obliquus
- Lateral release only
- Distal realignment procedures only

9. Compared to males, female patients with hamstring grafts for ACL reconstruction were found:

- to have a higher failure rate.
- to have less laxity by KT-1000 arthrometry.
- to be less active in sports.

- to complain of more patellofemoral pain.

10. Radiofrequency thermal energy:

- may be delivered through monopolar probes.
- may be delivered through bipolar probes.
- may weaken ligaments and predispose to rupture.
- may weaken capsular tissue and predispose to stretch.
- All of the above

11. Compared to extra-articular ligament tears, ACL tears:

- result in early clot formation between the ligament ends.
- retract and round off at the ends due to covering with a layer of synovial myofibroblasts.
- heal spontaneously most of the time.
- show an early proliferative phase for fibroblast and new vessel ingrowth.

12. Compared to the nonbraced knee, cruciate braces, when worn properly, can effectively:

- decrease the force in the ACL with low applied anterior posterior shear loads.
- increase the force in the ACL with low applied anterior posterior shear loads.
- decrease the strain in the ACL with low applied anterior posterior shear loads.
- increase the strain in the ACL with low applied anterior posterior shear loads.

13. Adhesive capsulitis:

- has multiple stages.
- has also been termed "frozen shoulder syndrome."
- has many acceptable treatment options.
- may be slow to resolve.
- All of the above

14. The long-term use of ankle bracing in healthy subjects has been shown to:

- decrease strength of the peroneus longus muscle.
- increase latency of the peroneus longus muscle.
- decrease latency of the peroneus longus muscle.
- None of the above

Readers are Invited. . .

Readers are invited to submit questions or comments on material seen in or relevant to *Sports Medicine Reports*. Send your questions to: Robert Kimball, *Sports Medicine Reports*, c/o American Health Consultants, P.O. Box 740059, Atlanta, GA 30374. For subscription information, you can reach the editors and customer service personnel for *Sports Medicine Reports* via the internet by sending e-mail to robert.kimball@ahcpub.com. ❖

In Future Issues:

The Science of Chondroprotection with Glucosamine and Chondroitin Sulfate