ORTHOPAEDIC

Physical Therapy Practice

THE MAGAZINE OF THE
ORTHOPAEDIC SECTION, APTA

VOL. 17, NO. 4 2005

APTA
American Physical Therapy Association
The Science of Healing. The Art of Caring.

ORTHOPAEDIC

Physical Therapy Practice

VOL. 17, NO. 4 2005

inthisissue

regularfeatures

optpmission

The mission of the Orthopaedic Section of the American Physical Therapy Association is to be the leading advocate and resource for the practice of Orthopaedic Physical Therapy. The Section will serve its members by fostering quality patient/client care and promoting professional growth through:

- enhancement of clinical practice,
- advancement of education, and
- facilitation of quality research.

publicationstaff

Publication Title: *Orthopaedic Physical Therapy Practice* **Statement of Frequency:** Quarterly; April, June, August, and December
Authorized Organization's Name and Address: Orthopaedic Section, APTA, Inc., 2920 East Avenue South, Suite 200, La Crosse, WI 54601-7202

Orthopaedic Section Directory

officers

President:	Vice President:	Treasurer:	Director:	Director:
Michael T. Cibulka, DPT, MHS, OCS Jefferson County Rehab & Sports Clinic 1330 YMCA Drive, Suite 1200 Festus, MO 63028 (636) 937-7677 (Office) (636) 931-8808 (FAX) mcibulka@earthlink.net Term: 2004 - 2007	**Thomas G. McPoil, Jr, PT, PhD, ATC** 1630 W University Heights Drive South Flagstaff, AZ 86001 (928) 523-1499 (928) 523-9289 (FAX) tom.mcpoil@nau.edu Term 2004 - 2007	**Joe Godges, DPT, MA, OCS** Kaiser PT Residency & Fellowships 6107 West 75th Place Los Angeles, CA 90045-1633 (310) 215-3664 (Office) (310) 215-0780 (FAX) godges@msn.com Term: 2005-2008	**James Irrgang, PT, PhD, ATC** University of Pittsburgh Department of Physical Therapy Sennett at Atwood Streets Pittsburgh, PA 15260 (412) 432-1237 (Office) (412) 647-1454 (FAX) irrgangjj@msx.upmc.edu Term: 2003-2006	**William H. O'Grady, PT, DPT, OCS, FAAOMPT, AAPM** 1214 Starling St Steilacoom, WA 98388-2040 (253) 588-5662 (Office) w.ogrady@comcast.net Term: 2005-2008

chairs

MEMBERSHIP
Chair:
Scott Adam Smith, MPT
29 Lawrence Street
Hicksville, NY 11801
(516) 681-5647 (Office)
smittypt14@aol.com

Members: *Hunter Bowie, Julia Chevan, John Childs, Melissa Corriveau, Byron Russell, Terry Trundle*

EDUCATION PROGRAM
Chair:
Ellen Hamilton, PT, OCS
720 Montclair Road, Ste 100
Birmingham, AL 35213
(205) 298-9101
(205) 599-4535 (FAX)
ellen.hamiltonpt@charter.net

Vice Chair:
Beth Jones, PT, DPT, MS, OCS

Members: *Dee Daley, Bob Duvall, Deborah Gross-Saunders, Kristinn Heindrichs, Joe Kleinkort, Deborah Lechner, David McCune, Tara Manal, Cheryl Mauer, Stephen Paulseth, Chris Powers, Christopher Scott, Jeff Stenbach*

INDEPENDENT STUDY COURSE
Editor:
Mary Ann Wilmarth, DPT, MS, OCS, MTC, CertMDT
10 Nollet Dr
Andover, MA 01810-6312
(978) 682-8802
mwilmarth@comcast.net

Managing Editor:
Kathy Olson
(800) 444-3982, x213
kmolson@orthopt.org

ORTHOPAEDIC PRACTICE
Editor:
Christopher Hughes, PT, PhD, OCS
School of Physical Therapy
Slippery Rock University
Slippery Rock, PA 16057
(724) 738-2757
cjh@nauticom.net

Managing Editor:
Sharon Klinski
(800) 444-3982, x202
sklinski@orthopt.org

RESEARCH
Chair:
G. Kelley Fitzgerald, PT, PhD, OCS
University of Pittsburgh
Department of Physical Therapy
6035 Forbes Tower
Pittsburgh, PA 16260
(412) 383-6643 (Office)
(412) 383-6629 (FAX)
kfitzger@pitt.edu

Members: *Paul Beattie, Gregory Hicks, Lori Michen, Sheri Silfies*

ORTHOPAEDIC SPECIALTY COUNCIL
Chair:
Rob Landel, PT, DPT, OCS
Division of Independent Health Professions
University of Southern California
1540 E. Alcazaar St, CHP 155
Los Angeles, CA 90033
(323) 442-2912
(323) 442-1515 (FAX)
rlandel@hsc.usc.edu

Members: *Amice Klein, Robert Johnson*

PRACTICE
Chair:
Robert (Bob) H Rowe, PT, DMT, MHS, FAAOMPT
126 Oak Leaf Drive
Slidell, LA 70461-5006
(985) 645-9329
rrowe@lsuhsc.edu

Members: *Bill Boissonnault, Joe Farrell, Helene Fearon, Jay Irrgang, Aimee Klein, Stephen McDavitt, Ken Olson, Richard Smith, Debbie Todd*

PUBLIC RELATIONS/ MARKETING
Chair:
Richard Watson, PT
1266 Berkshire Lane
Barrington, IL 60010-6508
(847) 726-9181
(703) 935-4754 (FAX)
rick@mrpt.com

Members: *Amanda Adams, Cheryl Dimapasoc, Michelle Spicka, Michael Tollan*

FINANCE
Chair:
Joe Godges, DPT, MA, OCS
(See Treasurer)

Members: *John Childs, Steve Clark, Pam White*

AWARDS
Chair:
Thomas G. McPoil, Jr, PT, PhD, ATC
(See Vice President)

Members: *Gary Hunt, Susan Appling, Carl DeRosa, Dale Schuit*

JOSPT
Editor-in-Chief:
Guy Simoneau, PT, PhD, ATC
Marquette University
P.O. Box 1881
Milwaukee, WI 53201-1881
(414) 288-3380 (Office)
(414) 288-5987 (FAX)
guy.simoneau@marquette.edu

Executive Director/Publisher:
Edith Holmes
edithholmes@jospt.org

NOMINATIONS
Chair:
Leza Hatch, PT, MSPT, MA, OCS
leza_h_pt@yahoo.com

Members: *Pamela Duffy, Kyndall Boyle*

SPECIAL INTEREST GROUPS

OCCUPATIONAL HEALTH SIG
Deborah Lechner, PT, MS - President

FOOT AND ANKLE SIG
Stephen G. Paulseth, PT, MS, SCS - President

PERFORMING ARTS SIG
Susan Clinton, PT, MHS - President

PAIN MANAGEMENT SIG
Joe Kleinkort, PT, MA, PhD, CIE - President

ANIMAL PT SIG
Deborah Gross-Saunders, PT - President

APTA BOARD LIAISON
Stephen Levine, PT, DPT, MSHA
stevelevine@apta.org

2005 HOUSE OF DELEGATES REPRESENTATIVE
Bob Rowe, PT, DMT, MHS, FAAOMPT

Orthopaedic Section
Web site:
www.orthoopt.org
Bulletin Board feature also included.
Check it out soon.

officepersonnel

Terri DeFlorian, Executive Director ..... x204 ..... tdeflorian@orthopt.org
Tara Fredrickson, Executive Associate..... x203 ..... tfred@orthopt.org
Sharon Klinski, Managing Editor J/N ..... x202 ..... sklinski@orthopt.org
Kathy Olson, Managing Editor ISC ..... x213 .... kmolson@orthopt.org
Carol Denison, ISC Processor/Receptionist... x215 .... cdenison@orthopt.org

Christopher Hughes, PT, PhD, OCS
Editor, OP

Change and Opportunity

As we approach a New Year, we here at *OP* are busy trying to stay fresh with new ideas and also continue to meet the needs of the Section members. The one change we are excited about is our new cover.

As you probably have noticed, we switched from a green to blue cover recently, but we were still looking for a new dynamic design and layout. We wanted the design to reflect the progressive nature of the Section and also current practice. We at *OP* were very excited when the graphic artist, Tracey Armstrong of The Morgan Group, presented the design to us. In fact we were so excited with what she came up with that we decided to run it this issue rather than wait for the New Year. We hope that this cover change represents another step forward for *OP*.

On another note I am requesting that you the reader consider becoming a contributor to the 2006 *OP* special issue which will be publishing only case reports. Have you treated an interesting case that readers might not have seen or read about before? Have you seen a patient recently who presented with a unique problem? Have you been a rehabilitation provider for a patient who has undergone a unique surgery? If you have, then we would be interested in having you write up your case and sharing it with the readership. Case reports can make interesting reading and be a valuable activity in contributing to the professional growth of the author. For those who serve as clinical instructors to students on their affiliations this may also be a great project to work on collaboratively with the student to help mentor them through the process.

If you have ever had ambitions on writing for publication, case reporting can serve as that all important stepping stone to get you started in the right direction. Beginning writers may find the book by Irene McEwen[1] to be a useful guide to collecting and organizing the case report. The deadline for submission to meet our April publication date is March 3, 2006.

As always we look forward to the contribution of the readership in making *OP* the pulse of what is happening in the practice of orthopaedic physical therapy.

REFERENCE

1. *Writing Case Reports: A How to Manual for Clinicians.* 2nd ed. McEwen I, ed. Alexandria, Va: American Physical Therapy Association; 2001.

Christopher Hughes, PT, PhD, OCS
Editor, OP

president's message

Michael T. Cibulka, PT, DPT, MHS, OCS
President, Orthopaedic Section, APTA, Inc.

Today was one of those beautiful autumn days where the sky is deep blue, the air cool and crisp, the trees are just changing their colors, and football season is in full swing--my favorite time of the year. Carmel apples, pumpkin pie, chili along with sweaters, sweatshirts, and the chill in the air that goes with it. Speaking of chill I just got back from Lacrosse, WI where the weather was cool but the Orthopaedic Section's Board of Director's Meeting was not. We had a very busy and productive meeting. Things are really looking up right now, our Independent Study Courses continue to bring in considerable money, membership keeps climbing (15,156), a new Current Concepts Independent Study Course with a group of experienced clinician/writers is getting close to being released, and our Research Endowment Fund used to fund research continues to grow. We are also planning a number of new things that, although I can't tell you much yet, has the Board of Directors excited about the future. Hopefully, in my next President's Message I will be able to update you on an exciting new program we are planning. I will give you a clue—we are working on an approach that would give orthopaedic physical therapists help in guiding orthopaedic physical therapy practice.

On to sadder details I know most of you by now have probably heard that Jules Rothstein passed away. The Research Section at CSM on Saturday night is having a special celebration of Jules life. Because Jules' was also an Orthopaedic Section member and because so many of our members knew and respected Jules so much, we are going to delay the start of our Section Awards Celebration as well as shorten the time. I am sure that most members understand why we are doing this and hope that we can celebrate Jules' life along with those special recipients of Orthopaedic Section awards.

Being President of the Orthopaedic Section has been a most humbling and rewarding job. I am very thankful to have a great group of Board members and our great Section office staff in La Crosse, WI. Although I could spend this time on many other important issues, I am going to spend this time bragging on our staff at the Orthopaedic Section's office.

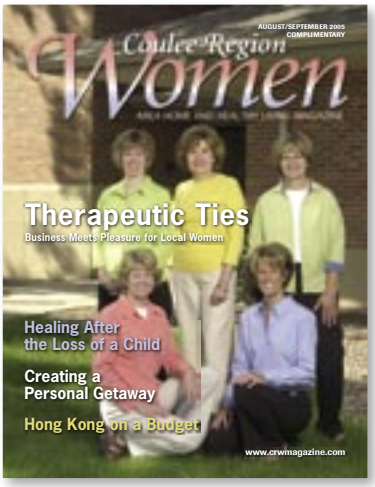
First our Executive Director, Terri Deflorian. Terri has been with the Section for 17 years. This last year when we were having some money problems, the Finance Committee suggested that Terri should take over the accounting and financial work for the Section (with some help). This was no easy task; however, Terri took it over and not only did she take it over but she has done an unbelievable job. This has saved the Section nearly $35,000 a year. Terri has also, with the help of the Board, updated and revised the Section's policies and procedures. This is no easy or fun task. Terri's approval rating by her own office peers and the Orthopaedic Section Board is at its highest level. This is at a time when Terri's personal life has been very demanding. Terri has 2 young children and a disabled husband. Just recently, Terri's husband had a major medical problem that put him in the hospital for some time. Terri, when most would probably give up, took care of her real family while also still taking care of her Orthopaedic Section family. I am extremely proud to work with Terri and I know her devotion, although first to her family, is also unswervingly to the Orthopaedic Section. She dedicates her time, her effort, and her heart to making sure things run well.

How can Terri juggle this? Well I must say she is very well organized but she also receives a lot of help from Tara Frederickson, the Executive Associate. Tara, like Terri has been with the Section for a long time. Tara has learned to juggle a number of jobs at the Orthopaedic Section office. Before, we had a full time person for CSM, now Tara does that along with many other jobs that include assisting SIGs, Education Groups, and managing the Orthopaedic Section website. Tara is the 'fall back' person, what ever needs to get done and someone else can't do it, Tara does it—from answering the Section phone to helping out one of the other office staff with their responsibility. Tara, like Terri, is both durable and dependable. Sounds like I am talking about a Maytag washing machine. Well Tara is definitely no Maytag, but she has all of the qualities of one. Hard working, a ubiquitous smile, more common sense than my Grandma, and nice as pie, that is Tara. People often ask me why we (the Orthopaedic Section) have stayed in Lacrosse after George Davies and Jim Gould (who started *JOSPT*) have left and I tell them it is because of the staff, hard working and consistent, nice, dependable people. That's why the Section office is still in La Crosse.

So is it just because of Terri and Tara? No I have not yet mentioned Sharon. Sharon Klinski is but another reason we have not left La Crosse. Sharon is like the other Nords we have at our office. Sharon not only edits and publishes *Orthopaedic Physical Therapy Practice* but also 8 other journal and newsletters. Recently two of the Journals—the *Journal of Neurologic Physical Therapy* and the *Journal of Geriatric Physical Therapy*—Sharon publishes were accepted in Index Medicus. She is a one woman working machine. Sorry Sharon that sounds too mechanical. Sharon is much more than just a great worker. She has saved the Orthopaedic Section thousands of dollars in production costs by how efficiently she manages the Journals and Newsletters she is responsible for publishing. Like the rest of the staff, Sharon is dependable, caring, and soft spoken, but don't be late for your President's Message. She is skillful and tactful in accomplishing the task of meeting her deadlines. Above all Sharon is a wonderful and loving mom, someone who cares deeply about her family. I am just happy that she considers the Orthopaedic Section part of her family.

I am not through bragging. Sorry for the prolix; however, I must go on I have 2 more people to brag about. Kathy Olson is the Managing Editor of Independent Study Courses (ISC). The ISC program is our 'bread and butter' when it comes to revenue. Without the ISCs our dues would be considerably higher than what they are. Also, the money made allows us to give to the Foundation for Physical Therapy, Diversity 2000, Research Grants, and much more. Thus, Kathy's job is vital. She has to balance the job of nurturing writers who are not being compensated much to finish their monograph without admonishing them off. This takes a special person. Kathy is that kind of special person, soft spoken and kind, sweet and sincere, Kathy has what it takes to do the job. Our ISC program has brought in $342,433 this year. Now I know this is not all just from Kathy, we have some really great ISC topics; however, Kathy is the office person who keeps things moving. Kathy works closely with Mary Ann Wilmarth, our ISC Editor, to try to keep things on time. This is an impossible task, but Kathy usually gets the job done. Kathy like a fine wine is slow to age and just keeps getting better with time.

Last but not least is Carol Denison, our newest employee. Carol has been with the Orthopaedic Section for only 8 months, however, she has settled in quite nicely. She is quiet, reserved, and I think a bit shy; however, that's probably because I just have not had the chance to get to know her like the other staff. What I do know about Carol is she is very nice, hard working (I think it's the Swede or German in all of them...I am not sure), and very dependable. Ya, Ya, das is gut, ein beir bitter, und ya ever watch Fargo, well that's La Crosse! Maybe one day I will learn the mixture of languages I hear. Oh Yah! Your darn tootin I will before I go!



The August/September 2005 issue of Coulee Region Women. Front: Terri and Tara. Back: Kathy, Carol, and Sharon.

I hope you did not mind that I talked about something more than just physical therapy in this President's Message. One thing I learned long ago is to give praise when it is due. Also, I don't like (no I hate) being considered obsequious nor do I fancy myself a sycophant by any stretch of the imagination but just someone who respects the hard work performed by our staff. Our Section's office staff rarely is given the praise or the limelight they deserve. It is not only the Orthopaedic Section Board that recognizes our staff but the region as they were just featured in the *Coulee Region Women* magazine. Without our staff there would be no Orthopaedic Section. So if you go to CSM, please say hi to them and tell them thank you for all that they do.

Posterior Heel Flare and Chronic Exertional Anterior Compartment Syndrome: A Case Study

Michael T. Gross, PT, PhD
Bing Yu, PhD
Robin M. Queen, PhD

INTRODUCTION

Chronic exertional anterior compartment syndrome is an entity characterized by pain localized to the anterolateral aspect of the leg with weight bearing exercise. The pain usually has an onset within the first few minutes of exercise[1] and typically occurs at the same time during the exercise session.[2,3] The pain usually subsides with rest and is minimal unless the exercise is resumed. Varying reports of incidence rates for chronic exertional anterior compartment syndrome have been reported.[4,5] Qvarfordt et al[4] reported on a series of 108 patients who complained of lower leg pain and were referred for intracompartmental pressure analysis. These investigators reported that 14% of their patients were diagnosed with chronic exertional anterior compartment syndrome based on intracompartmental pressures that were elevated during exercise and for as long as 40 minutes following exercise. Styf et al[5] reported that 27% of 98 patients with anterior leg pain were diagnosed with chronic exertional anterior compartment syndrome based on intracompartmental pressure measurements. Both groups of investigators reported that other common diagnoses for their series were tibial periostitis and compromise of the superficial peroneal nerve.[4,5]

One commonly accepted position regarding the pathophysiology of this condition suggests that pressure within the anterior compartment rises with exercise and may compromise arterial supply that enters the compartment[6] or vascular circulation within the compartment,[6,7] leading to ischemic conditions. Pressure elevation within the compartment has been attributed to the increase in the interstitial water volume in the muscle,[4,8] stiffness of the fascia that defines the anterior and lateral aspects of the compartment,[3,9-11] and the progressive development of muscle hypertrophy with regular exercise.[12] Pain typically has been associated with ischemia of tissues within the compartment.[3,11-13] Other competing explanations for the pain include stimulation of pressure receptors in the compartmental fascia and periosteum[14] or biochemical factors.[12,14]

The principle author's clinical experience suggests that mechanical movement factors may sometimes contribute to the development of chronic exertional anterior compartment syndrome. Several runners who were pronounced rearfoot strikers reported abatement of symptoms associated with chronic exertional anterior compartment syndrome after they had adopted a midfoot or forefoot foot strike pattern. Running with a rearfoot strike pattern down steep hills also has been associated in our clinic with chronic exertional anterior compartment syndrome. Both scenarios place increased demands on ankle dorsiflexor muscles within the anterior compartment. These muscles must produce appreciable dorsiflexion moment under these conditions to control ankle joint plantarflexion eccentrically during the initial portion of stance phase.

The purpose of this case study is to describe another mechanical factor that may be associated with increased demands for muscle tension from anterior compartment muscles and, therefore, the etiology of chronic exertional anterior compartment syndrome. This mechanical issue was first brought to our attention by a patient who reported experiencing symptoms consistent with chronic exertional anterior compartment syndrome when she ran with a particular pair of shoes. She also described feeling as though "my forefoot is being forcefully thrown to the ground whenever I walk or run in these shoes." The shoe in question (Adidas Response Trail; Adidas America; Spartanburg, SC) appeared to have a positive posterior flare, with the midsole material inclined away from the posterior aspect of the shoe (Figure 1). The outersole material also had a posterior extension from the midsole material. These shoe construction features would theoretically increase the moment arm ($d_{\perp}$) for the ground reaction force relative to the ankle joint axis (Figure 2) for a rearfoot strike pattern. This increase in moment arm would increase the plantarflexion moment caused by the ground reaction force, thereby increasing the dorsiflexion moment demands for anterior compartment muscles. The patient's symptoms of anterior leg pain with running disappeared as soon as she discontinued use of these shoes for running.

This initial clinical experience stimulated our interest in the possible link between posterior heel flare and chronic exertional anterior compartment syndrome. The experience also sensitized our clinic personnel to this possible relationship and enabled us to identify in the following case study another patient who demonstrated the possible link

Figure 1. Positive posterior flare of Adidas Response Trail (Adidas America; Spartanburg, SC) shoe. The midsole material under the heel is inclined away from the posterior aspect of the shoe and the outersole has a posterior extension.

between posterior heel flare and chronic exertional anterior compartment syndrome.

CASE REPORT

History

A 48-year-old woman was referred to our clinic for evaluation of left anterolateral leg pain. She reported that the onset of the pain occurred following completion of a marathon 3 years prior to her physical therapy visit to our clinic. The initial left anterolateral leg discomfort was minimal, and she was still able to run for exercise. She fell, however, 2 months later and incurred a contusion to the anterolateral aspect of the left leg. This incident resulted in increasing discomfort to the anterolateral leg over the next 3 months, at which time she stopped running because of the pain she was experiencing. She resumed running approximately 1 year later on a treadmill and experienced intermittent pain with treadmill running twice per week during the 18 months prior to her clinic visit.

Physical Examination

The principle author conducted a clinical examination for structural alignment and soft tissue extensibility that has been described in the literature.[15] The results of this examination were unremarkable in that the patient did not demonstrate any joint malalignment or soft tissue extensibility issue that could be linked to her anterolateral leg pain (eg, excessive pronation or tightness of the triceps surae muscle group). She reported mild discomfort with palpation of the anterior compartment of the left leg compared with the anterior compartment of the right leg, and the left anterior compartment appeared slightly more taut during palpation than the right anterior compartment.

An examination[15] of the patient's running shoes (Brooks Beast; Brooks Sports, Inc.; Bothell, WA) indicated that they had the following relative characteristics: straight last, stiff heel counter, and increased stiffness of the medial midsole materials. The midsole materials under the heel generally were stiff in response to manual compression. We also noted an appreciable positive flare of the midsole material posterior to the heel of the shoe. This became more noticeable when a vertically oriented goniometer was held against the most posterior aspect of the shoe's sole material, and the distance between the anterior ruler edge and the shoe's heel counter was appreciated (Figure 3).

The principle author then observed the patient's running gait on a flat level surface. The patient reported the onset of left anterolateral leg pain after approximately 2 minutes of running. None of the movement characteristics during her running appeared excessive or abnormal during this time.[16] Stance and swing times appeared symmetric and normal; as did rearfoot to leg orientation in the frontal plane and ankle, knee, and hip joint kinematics in the sagittal plane. A sagittal view of her running gait indicated that she used a rearfoot strike pattern for initial contact with the ground.

The patient had worn another pair of shoes (Asics 126; Asics Tiger Corporation; Irvin, Calif) to the clinic. She reported using these shoes for everyday walking. These shoes had a noticeably less pronounced posterior heel flare compared with the patient's running shoes (Figure 4). The patient was asked to run in these shoes over the same ground surface used for running gait observation for the first pair of shoes. She ran for 5 minutes and reported having no left leg pain during the running.

Laboratory Testing

The patient came to our motion analysis laboratory for kinematic and kinetic studies of her running gait with both pairs of shoes. We were specifically interested in the ground reaction force data and the ankle joint moment demands in the sagittal plane. The patient wore her own loose fitting running shorts and singlet. The authors applied retroreflective markers over the lateral tibial condyle, lateral malleolus, and a point on the lateral leg midway between the other two lateral leg markers. These markers were used to define 3-dimensional position of the leg in laboratory space.

A Bertec Model 4060A (Bertec Corporation, Worthington, OH) force plate secured to the ground via a concrete anchoring system was used to acquire ground reaction force data at a sampling rate of 1,000 Hz. Five S-VHS video cameras were used to acquire position data of retroreflective markers at a sampling rate of 60 frames/sec. Low power flood lights were used to illuminate the retroreflective markers. The cameras and force plate were time synchronized by a manually triggered light in the field of view of each camera and an electric impulse conducted to an additional analog channel in the analog data acquisition system.

Figure 2. Positive posterior flare tends to increase the moment arm distance ($d_{\perp}$) between the ground reaction force and the ankle joint at heel strike.

Figure 3. Qualitative assessment of the posterior heel flare for the Brooks Beast (Brooks Sports, Inc.; Bothell, Wash) running shoe. A straightedge is held perpendicular to the support surface against the most posterior aspect of the shoe. Space between the anterior edge of the ruler and the posterior aspect of the heel counter is noted.

Figure 4. Qualitative assessment of the posterior heel flare for the Asics 126 (Asics Tiger Corporation; Irvin, Calif) running shoe. A straightedge is held perpendicular to the support surface against the most posterior aspect of the shoe. The anterior edge of the ruler makes contact with the posterior aspect of the heel counter just above the shoe's midsole material.

The patient practiced self-selected velocity running trials over the force plate within the calibration volume until 5 successive trials result in acceptable footstrikes of the study lower extremity on the force plate. The approach distance in front of the force plate was 10 meters, and approximately 5 meters was available for deceleration following foot strike on the force plate. She rested for approximately one minute between all successive running trials. The patient performed 5 acceptable running trials with each of the two pairs of shoes. An acceptable running trial was defined as the entire test foot contacting the force plate, and no obvious targeting of the force plate evidenced by asymmetric step lengths during the approach leading up to foot strike on the force plate.

At the completion of the running trials, 2 additional retroreflective markers were placed on the patient's leg: the medial malleolus and the medial tibial condyle. The patient was videotaped in a standing position with these additional markers in place. The purpose of these additional markers was to determine during the running trials the location of the markers on the medial malleolus and medial tibial condyle relative to the tibial reference frame defined by the markers on the lateral malleolus, lateral aspect of the shank, and lateral tibial condyle. The additional markers were also used to determine the position of the knee and ankle joint centers during data reduction.

Data Reduction

The videotape records from each camera were digitized at a sampling rate of 60 Hz using the Peak Performance Motus videographic data acquisition system (Peak Performance, Englewood, CO). The two-dimensional digitized video coordinates of the reflective markers were synchronized and converted to real-life 3-dimensional coordinates using a direct linear transformation procedure instrumented in the MSDLT version 4.5 computer program package (MotionSoft, Chapel Hill, NC). The 3-dimensional coordinates were filtered using a recursive fourth-order Butterworth digital filter[17] with an estimated optimum off frequency of 7.14 Hz[18] in the MSDLT version 4.5 computer program package.

The locations of the medial malleolus and medial tibial condyle markers were estimated from the locations of the markers over the lateral malleolus, lateral tibial condyle, and lateral mid-shank in each frame of each trial. The location of knee joint center was determined as the mid-point of the line between the lateral and medial tibial condyle markers. The location of the ankle joint center was estimated as the mid-point of the line between the lateral and medial malleoli markers. The locations of the knee joint center, the ankle joint center, and lateral and medial malleoli were used to determine the frontal plane of the tibia and orientation of the tibial reference frame. The ground reaction force vector and moment vector were transferred to the ankle joint center and considered as the ankle joint resultant force vector and moment vector with an assumption that the mass of the foot and shoe was negligible. The ankle resultant force and moment vectors were then transformed to the tibial reference frame in terms of anterior-posterior, medial-lateral, and superior-inferior components and dorsiflexion-plantarflexion, inversion-eversion, and internal-external rotation components.

To enhance multiple trial comparisons, the ankle kinematics and kinetics were normalized to the duration of stance phase. Stance phase in each trial was divided into 100 equal time intervals with each interval representing 1% of the total duration of the stance phase. Each ankle kinematic or kinetic measure was then re-sampled from 0% to 100% of the stance phase using linear interpolation. This re-sampling also enabled the mean representation of 3 trials for each shoe condition for ground reaction force data and for dorsiflexion-plantarflexion moment requirements.

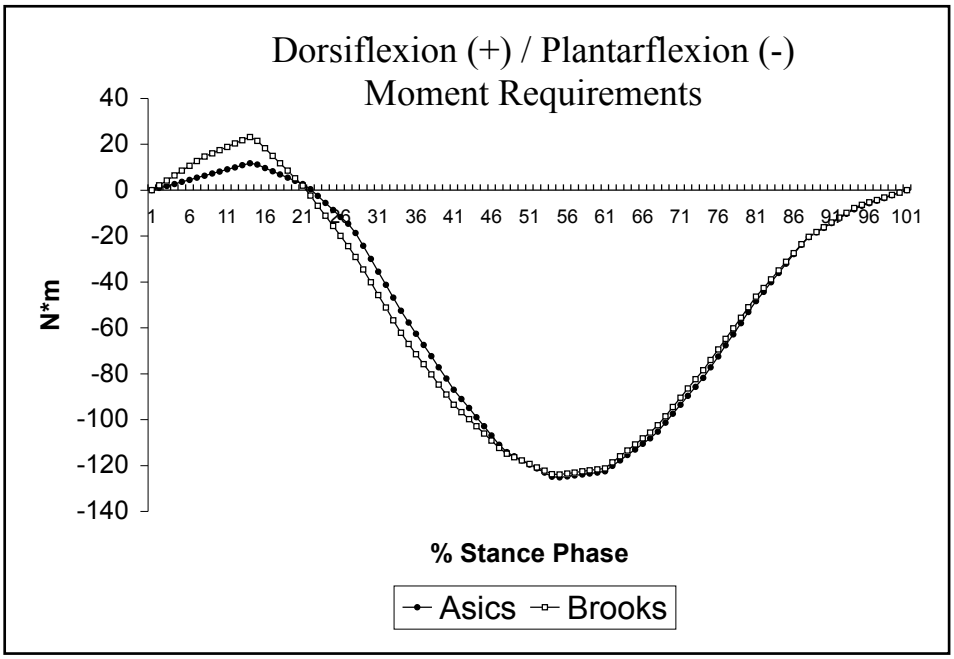


Figure 5. Mean dorsiflexion-plantarflexion moment requirements at the ankle during stance phase (normalized to % stance) of running gait for 3 trials for each study shoe.

RESULTS

Dorsiflexion-plantarflexion moment requirements for the 2 shoes during the entirety of stance phase are represented in Figure 5. Because the patient's complaint involved anterior compartment pain, we were interested in the data that involved dorsiflexion moment requirements for the two shoes. The peak dorsiflexion moment requirements were 23.1 N*m for the Brooks shoe and 11.7 N*m for the Asics shoe, with the peak for the Brooks shoe representing a 97% increase relative to the peak for the Asics shoe (Figure 6).

The peak ground reaction force during the portion of stance phase for which dorsiflexion moment was required was 860 N for the Brooks shoe and 804 N for the Asics shoe, representing only a 7% increase in peak force for the Brooks shoe relative to the Asics shoe (Figure 7). Anterior-posterior components of the ground reaction

force can also contribute to sagittal plane dorsiflexion-plantarflexion moment requirements. Posteriorly directed shear force on the foot causes plantarflexion moment about the ankle joint, requiring internal dorsiflexion moment production. Anterior-posterior components of the ground reaction force for the two shoe conditions, however, appeared very similar (Figure 8). The initial impact phase data for the Asics shoe appear slightly greater in magnitude in terms of posteriorly directed shear force compared to data for the Brooks shoe (Figure 8).

DISCUSSION

Our qualitative clinical observations and the laboratory kinetic data for this patient provide some preliminary evidence indicating that posterior heel flare may be a mechanism of injury for chronic exertional anterior compartment syndrome. The initial clinic visit revealed the patient's ability to run for 5 minutes without discomfort using a shoe with a less pronounced posterior heel flare. Running with shoes with a more pronounced heel flare resulted in the onset of pain within 2 minutes. Caution must be exercised in expressly implicating the differences in posterior heel flare, since these 2 shoes also differed with regard to other design features. The midsole material under the heel of the Brooks shoe was qualitatively stiffer to manual compression than the Asics shoe. The Brooks shoe also had stiffer reinforcement of the medial midsole and heel counter than did the Asics shoe.

The quantitative laboratory data, however, provide additional support for drawing a link between posterior heel flare and overload of the anterior compartment muscles. The peak dorsiflexion moment demand for the Brooks shoe was approximately double the peak dorsiflexion moment requirement for the Asics shoe. We assumed that the mass of the foot and shoe were negligible contributors to the dorsiflexion moment requirements. Given this assumption, moment demands are determined by the product of the sagittal plane ground reaction force resultant and the moment arm for this resultant force. The posteriorly directed component of the sagittal plane ground reaction force did not differ appreciably between the 2 shoes during the initial portion of running stance phase. The peak vertical component of the ground reaction force when a dorsiflexion moment was required for the Brooks shoe was 7% greater than the peak vertical force for the Asics shoe. This 7% increase, however, would not explain the nearly 100% increase in peak dorsiflexion moment requirement for the Brooks shoe. With the ground reaction force data being relatively equivalent between the 2 shoes, the data for dorsiflexion moment re-

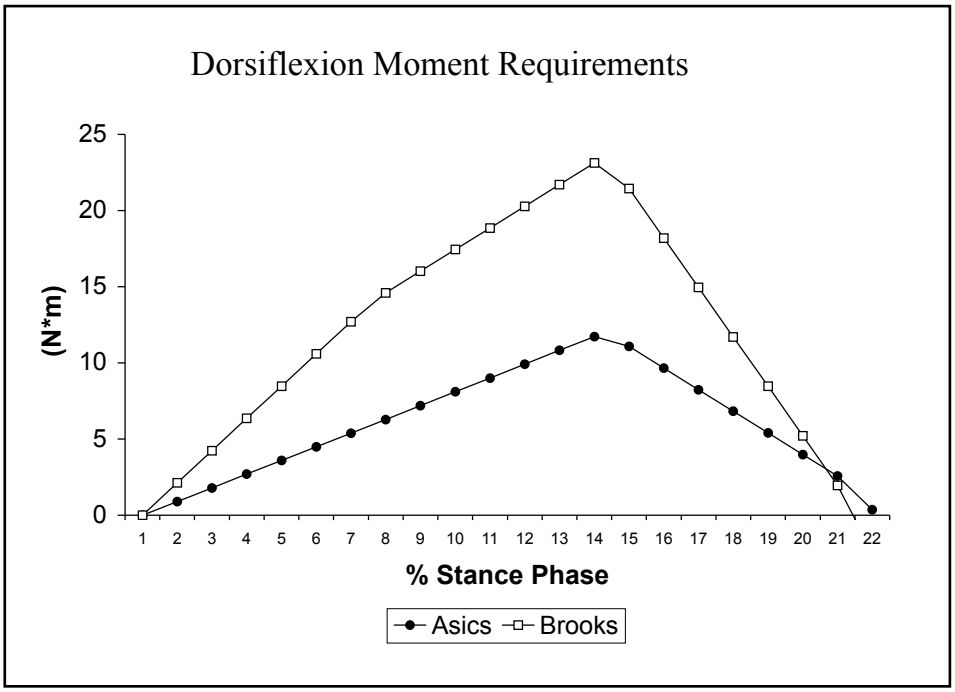


Figure 6. Mean dorsiflexion moment requirements at the ankle isolated from Figure 5. Peak dorsiflexion requirement of the Brooks shoe is nearly twice the dorsiflexion moment requirement for the Asics shoe.

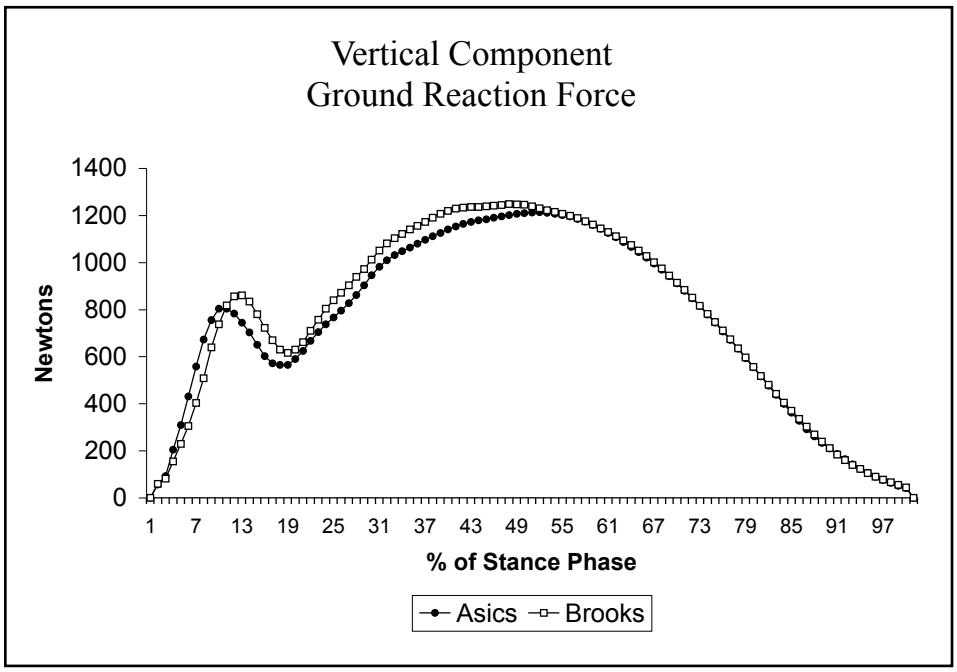


Figure 7. Mean data for vertical component of the ground reaction force during stance phase of running gait for 3 trials for each study shoe. Peak vertical force for the Brooks shoe is 7% greater than the peak dorsiflexion moment requirement for the Asics shoe during the time when dorsiflexion moment is required at the ankle (data to the left of the vertical line).

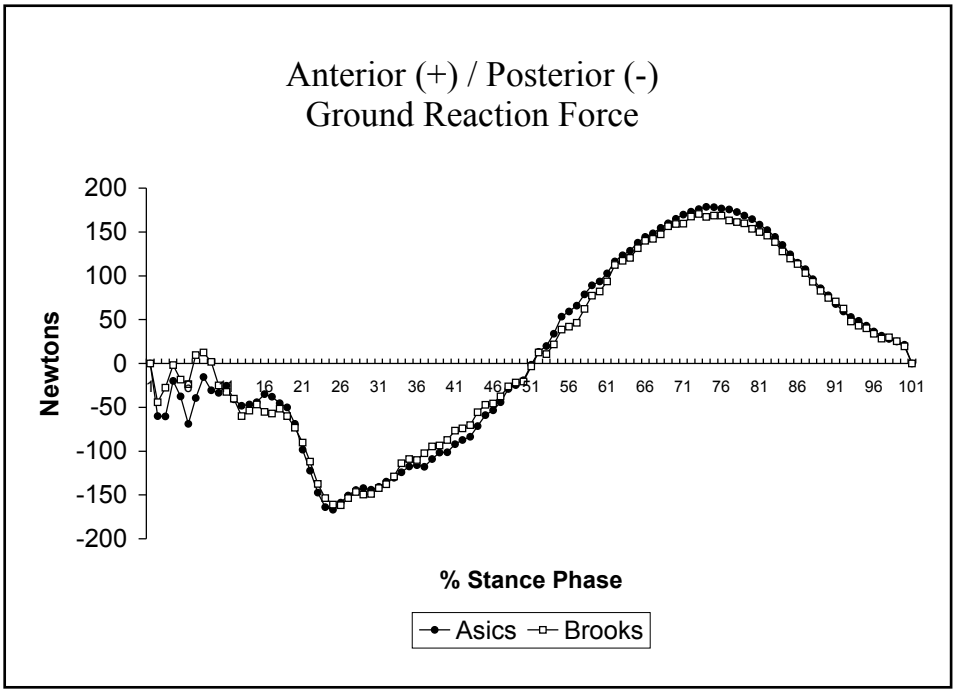


Figure 8. Mean data for anterior-posterior component of the ground reaction force during stance phase of running gait for 3 trials for each study shoe.

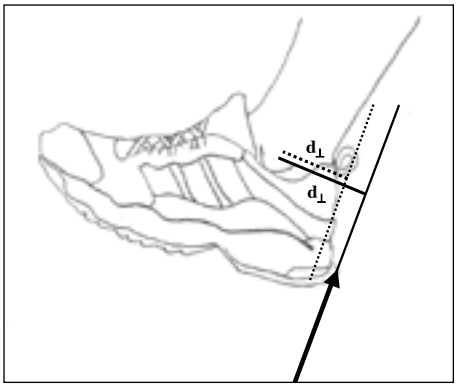


Figure 9. Compression of the midsole material under the heel at heel strike effectively moves the line of the sagittal plane ground reaction force anteriorly, thereby decreasing the moment arm distance for this force as it produces moment about the ankle joint.

quirement suggest that the ground reaction force moment arms were appreciably different between the 2 shoes.

Several factors may be involved in effecting a difference between the 2 shoes with regard to moment arm distances for the ground reaction forces. The 2 shoes had appreciably different posterior inclinations for the midsole and outersole materials as evidenced by Figures 3 and 4. The more posterior inclination of the Brooks shoe effectively moves the ground reaction force more posteriorly from the ankle joint axis for a runner who uses a rearfoot strike pattern. The 2 shoes also may have been positioned differently by the patient relative to the ground surface, placing the initial point of ground contact more posteriorly on the sole of the Brooks shoe than the Asics shoe. Finally, our qualitative impression during the clinical examination of the patient was that the midsole material under the heel for the Brooks shoe was appreciably stiffer than the midsole material for the Asics shoe. This difference in material properties may have resulted in greater compression of the Asics midsole material during initial contact at the heel of the shoe compared with compression of the stiffer midsole materials for the Brooks shoe. Compression of the midsole material at heel strike effectively moves the sagittal plane ground reaction force more anteriorly, thereby decreasing the moment arm for this force as it produces moment at the ankle joint (Figure 9). Greater compression of the heel midsole material for the Asics shoe, therefore, would also have resulted in decreased dorsiflexion moment requirement for this shoe compared with the Brooks shoe.

Although we were unable to identify any previous investigations pertaining to posterior heel flare, our results are consistent with previous work that involves an analysis of the effects of lateral heel flare. Running shoes with increased lateral heel flare have been associated with increased initial eversion and eversion velocity secondary to a longer moment arm for the ground reaction force.[19] These longer moment arms were thought to cause greater eversion moments, effecting greater magnitude eversion accelerations and velocities.

CLINICAL IMPLICATIONS

The results of this case study suggest that increased posterior heel flare may be associated with the development of chronic exertional anterior compartment syndrome. We suggest that clinicians inspect this aspect of shoe design for patients who have symptoms consistent with chronic exertional anterior compartment syndrome, and who walk or run using a rearfoot strike pattern. Use of shoewear with a less pronounced posterior heel flare may be an appropriate part of the intervention plan for these individuals.

REFERENCES

1. Blackman PG. A review of chronic exertional compartment syndrome in the lower leg. *Med Sci Sports Ex.* 2000;32(3Suppl):S4-10.
2. Black KP, Schultz TK, Cheung NL. Compartment syndromes in athletes. *Clin Sports Med.* 1990;9:471-487.
3. Martens MA, Moeyersoons JP. Acute and recurrent effort-related compartment syndrome in sports. *Sports Med.* 1990;9:62-68.
4. Qvarfordt P, Christenson JT, Eklof B, Ohlin P, Saltin B. Intramuscular pressure, muscle blood flow, and skeletal muscle metabolism in chronic anterior tibial compartment syndrome. *Clin Orthop Relat Res.* 1983;179:284-289.
5. Styf J. Diagnosis of exercise-induced pain in the anterior aspect of the lower leg. *Am J Sports Med.* 1988;16:165-169.
6. Matsen FA. Compartment syndrome: a unified concept. *Clin Orthop Rel Res.* 1975;113:8-14.
7. Reneman RS. The anterior and the lateral compartmental syndrome of the leg due to intensive use of muscles. *Clin Orthop Relat Res.* 1975;113:69-80.

8. Veith RG, Matsen FA, Newell SG. Recurrent anterior compartmental syndromes. *Physician Sportsmed.* 1980;8:80-88.
9. Detmer DE. Chronic shin splints. *Sports Med.* 1986;3:436-446.
10. Detmer DE, Sharpe EK, Sufit RL, Girdley FM. Chronic compartment syndrome: diagnosis, management, and outcomes. *Am J Sports Med.* 1985;13:163-170.
11. Martens MA, Backaert AM, Vermaut G, Mulier JC. Chronic leg pain in athletes due to a recurrent compartment syndrome. *Am J Sports Med.* 1984;12:148-151.
12. Amendola A, Rorabeck CH. Chronic exertional compartment syndrome. In: Welsh RP, Shepard RJ, eds. *Current Therapy in Sports Medicine.* Toronto: BC Decker; 1985:250-252.
13. Styf J. Chronic exercise-induced pain in the anterior aspect of the lower leg. *Sports Med.* 1989;7:331-339.
14. Balduini FC, Shenton DW, O'Conner KH, Heppenstall RB. Chronic exertional compartment syndrome: Correlation of compartment pressure and muscle ischemia utilizing P-NMR spectroscopy. *Clin Sports Med.* 1993;12:151-165.
15. Gross MT. Lower quarter screening for skeletal malalignment-Suggestions for orthotics and shoewear. *J Orthop Sport Phys Ther.* 1995;21:389-405.
16. Cavanagh PR, ed. *Biomechanics of Distance Running.* Champaign, Ill: Human Kinetics Publishers, Inc.; 1990:35-164.
17. Winter DA, Sidewall HG, Hobson DA. Measurement and reduction of noise in kinematics of locomotion. *J Biomech.* 1974;7:157-159.
18. Yu B, Andrews JG. The relationship between free limb motions and performance in the triple jump. *J Applied Biomech.* 1998;14:223-237.
19. Nigg BM, Morlock M. The influence of lateral heel flare of running shoes on pronation and impact forces. *Med Sci Sports Exerc.* 1987;19:294-301.

Michael Gross is Professor, Division of Physical Therapy, Program in Human Movement Science, University of North Carolina at Chapel Hill; Bing Yu is Associate Professor, Division of Physical Therapy, Program in Human Movement Science, University of North Carolina at Chapel Hill; and Robin Queen is Director of the Michael W. Krzyzewski Human Performance Lab and Department of Surgery, Duke University, Durham, NC.

Anterior Cruciate Ligament Reconstruction: Surgical Management and Postoperative Rehabilitation Considerations

Marie-Josée Paris, PT
Reg B. Wilcox III, PT, DPT, MS
Peter J. Millett, MD, MSc

INTRODUCTION

Surgical techniques for anterior cruciate ligament (ACL) reconstruction have progressed in the past 20 to 30 years. In the 1970s, ACL reconstructions were done through large arthrotomies, using non-anatomic, extra-articular reconstructions, with long postoperative periods of immobilization.[1,2] In the 1980s, large arthrotomies were replaced by arthroscopic, anatomic, intra-articular reconstructions. Arthroscopy eliminated the need for prolonged postoperative immobilization, and accelerated rehabilitation protocols were established. In the 1990s, the rehabilitation protocols were advanced further to allow athletes an early return to sports.[2] Today, while there is less variability in the surgical techniques used, there remains variability in the types of surgical grafts used. The most commonly used grafts for ACL reconstruction are the bone-patellar-tendon-bone autograft, semitendinosus autograft, and the semitendinosus/gracilis autografts and allografts.[3,4] The success of a patient's recovery who has undergone an ACL reconstruction is predicated on several factors including surgical technique, graft selection, prevention of postoperative complications, patient compliance, and postoperative rehabilitation.[4,5] The postoperative rehabilitation regimen must be guided by principles such as the early return of knee range of motion (ROM), especially extension, while obtaining and maintaining a relatively stable physiological state of the knee joint (homeostasis). Strengthening, proprioception exercises, and early weight bearing have also become guiding principles.[2] The purpose of this paper is to outline current surgical and postoperative factors that should be considered when establishing the rehabilitation program for a patient following ACL reconstruction.

BASIC ANATOMY AND FUNCTION

The ACL restrains anterior translation of the tibia, and prevents tibial rotation and varus/valgus stresses to the knee. Participating in sports and activities in which pivoting occurs where the foot is planted, the knee is flexed, and a change in direction is needed puts one at a higher risk for an ACL injury. Basketball, skiing, and football are examples of sports in which a high number of ACL injuries occur.[6] The ACL is also very susceptible to injury in contact sports. It can be damaged along with the medial collateral ligament when there is an associated valgus stress. A force that results in the tibia being driven forward, the femur being driven backward, or in the knee joint being severely hyperextended may also result in damage to the ACL.

The ACL does not heal well without surgery.[7] This is most likely due to the amount of force involved in the injury, the lack of blood supply to the ligament, and its intra-articular location. However, about one-third of all patients can expect a fair to good outcome without surgery.[8] Typically, these patients who do well without surgery are older or less active, and modify their activity level following injury, including avoiding pivoting sports/activities. Generally, younger and/or active individuals do not do well with nonoperative treatment. This is due to the expectation of continuing to participate in sports that require high levels of pivoting. Active patients with an ACL deficiency are at risk for reinjury, including meniscal tears and/or articular damage, leading to subsequent degenerative changes in the knee. Patients who opt for surgical reconstruction of the ACL can expect restored stability of the knee and return to preinjury levels of activity.[9] Over the past 20 years, advances have been made with respect to graft choice and fixation, and perioperative management, including rehabilitation. These advances have led to increased functional outcomes and early return to activity.[10]

ADVANCEMENTS IN SURGICAL TECHNIQUES

Over the past 20 years, multiple scientific and empirical studies on ACL reconstruction have been completed, leading to a greater understanding of factors influencing postsurgical outcome, including patient selection and graft selection.[4,5,7,10-21] When it comes to patient selection for operative and nonoperative management, the most important factor that may lead to graft failure is noncompliance with the postoperative regimen.[4] Other factors that impact patient selection and the surgical decision-making process are the patient's physiological age, occupation, symptomatology, and desired activity level, as well as the presence of associated collateral ligament insufficiency, the presence of generalized ligamentous instability, open growth plates, or the need for rapid rehabilitation.[4,5]

The most commonly used grafts for ACL reconstruction are the bone-patellar-tendon-bone autograft, semitendinosus autograft, and the semitendinosus/gracilis autografts and allografts.[4] Using an autograft eliminates the risk of disease transmission, but can cause donor site morbidity.[18]

Bone-Patellar Tendon-Bone Autograft

The ipsilateral bone-patellar-tendon-bone autograft has been considered the gold standard graft for ACL reconstruction since it was described by Jones in 1963.[4,18] The advantages of this graft include its high ultimate tensile strength and stiffness, rapid

bone to bone interface healing (6-8 weeks)[22] and revascularization, which can allow the patient to initiate an accelerated rehabilitation program and in turn, decrease risk of postsurgical morbidity.[20] Disadvantages and complications include anterior knee pain, extensor mechanism dysfunction, patellar fractures, patellar tendon ruptures, and arthrofibrosis.[9,23,24,26] Complications during graft fixation include inappropriate patellar tendon length, poor femoral fixation, poor tibial fixation, graft disruption, and femoral wall disruption.[25] Contralateral patellar tendon autografts are also used, but there is a risk of donor site morbidity in the uninvolved knee.[18,20]

Semitendinosus/Gracilis Tendon Graft

The use of hamstring autografts has become more common due to the evolution of surgical techniques, including the use of the four strand, quadruple loop combination of semitendinosus and gracilis tendons, and due to the advancement in graft fixation options. The advantages of this graft include decreased risk of postsurgical complications found with bone-patellar tendon-bone autografts. The morbidity from harvesting the semitendinosus and gracilis tendons is minimal because flexion strength returns completely. The hamstring tendons regenerate, and extensor mechanism problems, such as anterior knee pain, kneeling pain, quadriceps weakness, patellar fracture, and patellar tendon rupture are less common and severe.[27-33] The principal disadvantage of the hamstring autograft compared to the bone-patellar tendon-bone autograft is increased anterior knee laxity, but its correlation with any functional deficits remains unclear.[5,18,21] Other disadvantages include lower returns to preinjury levels of activity and increased healing time of soft tissue to bone interface.[18,22] Surgical complications during harvesting include inadequate length or width and transection of the tendons.[25]

In 2002, Shaieb et al[21] completed a prospective, randomized study to compare the overall outcome at a minimum of 2 years after single-incision ACL reconstruction. Seventy patients, with either autogenous patellar tendon graft or hamstring tendon autografts, were studied. Both grafts were fixed with interference screws by the same surgeon using the same surgical technique with notchplasty. In addition, the same aggressive postoperative rehabilitation protocol[10,34,35] was instituted for both groups. They reported no significant difference between patellar tendon and hamstring tendon grafts with respect to the Lysholm score,[36] Lachman and pivot shift test results, thigh circumference, return to sports, reduction in activity, jumping, and ability to do hard cuts and pivots 2 years after surgery. In 2003, Feller and Webster[5] completed a prospective randomized clinical trial of 65 patients to compare both grafts as well as to assess the functional outcome at 3 years postoperatively. In this study, the same surgeon performed the procedures, but different graft fixation methods were used. They found that at 3 years after surgery, there was no significant difference between bone-patellar tendon-graft (31 patients) and combined semitendinosus and gracilis hamstring tendon grafts (34 patients) in terms of functional outcome. However, patients who had the patellar tendon graft reported pain on kneeling and had increased extension deficits compared to the patients who had the hamstring graft. In the group of patients who had the hamstring graft, there was an increase in anterior knee laxity as measured by the KT-1000 arthrometer and radiological evidence of widening of the femoral tunnel, but this did not translate into decreased function. These authors suggested that hamstring tendon grafts might be indicated for patients who still have open growth plates, whereas the patellar tendon grafts may be more suitable in a 'loose' knee. Furthermore, a patient whose occupation or sport involves kneeling may have a better long-term outcome with the hamstring graft.

Allografts

The advantages of allograft tissue are that there is no donor site morbidity and that the tissue is readily available, thus eliminating the step of graft harvesting during surgery. As a result, the patient does not experience any of the postsurgical deficits associated with either patellar or hamstring tendon harvesting. The greatest disadvantage to allograft use is the potential risk of disease transmission.[4,18,20,37] However, with proper precautions and adequate laboratory studies, the theoretical risk of processing bone from an unrecognized carrier of the human immunodeficiency virus is one in more than one million.[38] Since 1985, the Food and Drug Administration has mandated screening of all allograft tissue for viruses. Another potential disadvantage of allografts include greater failure or delay of biologic incorporation than with autografts, in turn delaying the return to activity in order to protect the graft.[18] Graft selection in practice is often based on patients' activity levels, needs, and age. Most surgeons tend to use patellar tendon autografts for patients with high-demand activities such as cutting, pivoting or jumping sports, or skiing. For patients who are older or have lower demand activities, the hamstring grafts are used. Finally, allografts may be preferred by patients who elect to have transplanted tissue, or for patients over age 45, for patients with arthritis, evidence of instability, or for patients who do not have any donor tissue.

In 2001, a survey of the American Orthopaedic Society for Sports Medicine[3] regarding current practices and opinions in ACL reconstruction yielded responses from 855 members (76% response rate). Seventy-eight percent of members preferred bone-patellar tendon-bone grafts. The respondents had an average of 17 years experience in orthopaedic practice. Of the surgeons who used multiple graft types, 75% preferred using hamstring autografts for patients with open physes around the knee, for patients with patellofemoral pathology, and in patients undergoing revision ACL reconstruction surgery. Only 3 of the respondents used allografts exclusively, but no description of the graft selection criteria was given in this case. Other allograft tissue options include the Achilles, anterior tibialis tendon, and posterior tibialis tendons.[18] No use of synthetic grafts was documented in this survey.

Synthetic Grafts

In the late 1970s and early 1980s, synthetic materials were used to substitute tissue grafts with an objective of developing a graft that would be stronger, more rigid, and therefore would allow early mobilization and rapid return to sports. These synthetic materials included permanent (true), scaffold (ingrowths), and stents (augmentation devices).[20,37] In 1997, Frank et al[15] reported that 40% to 78% of the 855 synthetic ligaments tracked over a period of 15 years had failed over time. They failed secondary to debris, tissue reactions, and mechanical

limitations of the grafts. The Gore-Tex ACL is a true prosthetic that was designed to allow immediate fixation, therefore accelerate mobilization and weight bearing, leading to earlier return to activity. It failed because of lack of tissue ingrowth, fraying at the bone tunnels, and chronic effusions. The Dacron ligament was developed as a scaffold prosthesis intended to prevent problems with stiffness that had been associated with other materials. However, complications from this prosthesis included rupture of the femoral or tibial insertion of the ligament, rupture of the central body of the prosthesis and elongation of the ligament.[39] The Kennedy Ligament Augmentation Device (LAD) was designed to provide protection to a primary ACL repair or to a patellar tendon graft while it healed. In 2002, Weitzel et al[37] stated that the LAD was predominantly of historic interest because primary repair of the ACL is not routinely performed. Kumar and Maffulli[40] note that excellent results can be obtained in primary ACL reconstructions without LAD.

TREND TOWARDS ACCELERATED REHABILITATION PROTOCOLS

Rehabilitation following ACL reconstruction is very important to restore range of motion, strength, proprioception, and function to allow return to preinjury levels of activity. In the 1970s and early 1980s, postsurgical rehabilitation for patients recovering from ACL reconstruction consisted of immobilization in long leg casts for 2 to 4 weeks, followed by the use of a postoperative knee brace. Weight bearing was restricted for approximately 6 weeks, followed by a gradual progression from partial weight bearing to weight bearing as tolerated, with the use of a brace. By 12 to 14 weeks after surgery, patients were allowed to progress to full weight bearing. Typically, the postoperative brace was not discontinued for daily activities until 4 months. Isokinetic evaluations began at 6 months postoperatively and continued through the 9th to 12th months.[41,42] It was typically the standard for patients to be released to full, unrestricted activity once they had full ROM, no pain or swelling, had completed a very structured functional progression including agility drills, and their quadriceps strength was greater than 80% of the uninvolved knee. In 1983, Shelbourne and Nitz[10] discontinued the use of rigid immobilization and began using continuous passive motion immediately postoperatively. They began to note that patients who were advancing or progressing their activities earlier than recommended (and therefore were noncompliant with the rehabilitation protocol), were actually demonstrating improved functional outcomes without an increase in knee instability compared to the patients who had been compliant with the recommended rehabilitation protocol. Follow-up of the noncompliant patients over a 2-year period revealed that there were no long-term adverse consequences of early weight bearing and full extension ROM. As a result, they developed the first accelerated rehabilitation protocol by the end of 1986.

REHABILITATION

Basic Principles

The rehabilitation process for patients having undergone ACL reconstruction is multifaceted. It includes patient education, pain control, edema management, ROM, strengthening exercises, gait training, agility drills, sport-specific drills, proprioception, and endurance exercises. The goal of these interventions is to restore the patients' preinjury levels of function. Tissue healing stages and graft fixation protection must be very carefully considered, especially in the early postoperative phase.

The speed at which the above interventions are progressed depends on a number of basic principles. In the immediate postoperative period (0-2 weeks), emphasis is placed on patient education, edema and pain control, early protected weight bearing, and ROM. In order to decrease the risk of arthrofibrosis and extensor mechanism dysfunction, full extension (equal to that of the uninvolved knee) and 90° of flexion should be achieved by 7 to 10 days following surgery.[2] Range of motion goals are achieved with the use of continuous passive motion (CPM), passive and active-assisted ROM exercises, active ROM exercises (with early activation of the quadriceps and hamstring muscles), patellar mobilizations and mobilization of the soft tissues, and weight bearing. In some cases, the use of a brace is recommended to assist in achieving full extension. Early recognition and management of motion deficits are crucial to prevent the sequelae of arthrofibrosis such as patella baja and progressive joint degeneration.[24] Once motion has been restored and knee homeostasis has been controlled, strength training can be progressed as tolerated. Electrical stimulation can be used to facilitate the active contraction of the quadriceps.[2,24,26,43-46]

It is crucial to initiate proprioception exercises once pain and swelling are controlled. Neuromuscular re-education is essential in the prevention of knee injuries and in the protection of the ACL graft.[47] Muscular endurance is important and can be addressed with the use of a stationary bicycle, elliptical trainer, treadmill, and aquatherapy for long durations with low resistance.[24]

As the patient advances through the weeks following ACL reconstruction surgery, the loads being applied to the knee can be gradually increased through the progression of therapeutic exercises, providing that knee homeostasis is maintained. There are several post-ACL rehabilitation protocols in the literature.[2,10,26,48]

Factors that Guide Rehabilitation

Patellar tendon autografts

A number of prospective and retrospective studies have demonstrated the success of accelerated rehabilitation protocols for patients who have undergone an ACL reconstruction with a patellar tendon autograft.[2,10,26,41] Clinical pathways or protocols have been developed because of these studies, but the clinician must also consider the underlying pathology and modify the pathway accordingly, while respecting basic rehabilitation principles (Table 1).

Hamstring tendon autografts

Howell and Taylor[49] demonstrated the safety of an accelerated rehabilitation protocol, without the use of a brace, for patients with a hamstring tendon autograft. As described earlier, the hamstring autografts have been associated with increased anterior-posterior laxity compared to patellar tendon grafts, but this increased laxity has not been correlated to decreased function or increased pain. The patients in this study returned to sports at 4 months after brace-free rehabilitation. Stability was measured at 4 months, prior to patients returning to sports, and

Table 1. Treatment Parameter based on Graft Type

Graft Type	Weight-bearing (WB) status	Use of Postoperative brace	Passive range of motion (PROM) and active range of motion (AROM)	Strength training/ proprioception exercises	Return to running/sports
Patellar tendon (accelerated rehab protocol); Wilk et al[95]	Progression to full WB without crutches by 10-14 days.	Immobilizer locked at 0° ext during ambulation for 2-3 weeks.	0°-100° PROM in week 1; 0°-115° PROM in week 3; 0°- 125°AROM by week 10.	Isometric knee extension and closed kinetic chain and proprioception exercises as of week 1. Progressive resistance extension exercises as of week 2.	Backward running as of week 4. Forward running as of week 6. Gradual return to sports as of weeks 16-22.
Hamstring Tendon; Wilk et al[95]	Progression to full WB without crutches by 10-14 days.	Immoblizer locked at 0° ext for ambulation until week 3. Then unlocked to 0°-125° until weeks 4-7.	0°-90° PROM in week 1; 0°-105° PROM in week 2; 0°-115° PROM in week 3; 0°-130° PROM by weeks 4-7; 0°-125°AROM by weeks 7-12.	Delay hamstring strengthening until 4 weeks after surgery. At 5-6 weeks, start submaximal isometric hamstring contractions. At 6-8 weeks, start light resistance exercises. At 8 weeks, start progressive resistance exercises.	No running for 12 weeks, no jumping for 12-14 weeks, no twisting and hard cutting for 16 weeks and return to sports in 5.5-6 months.
Hamstring Tendon; Howell and Taylor[36]	Restricted WB with crutches for 3 weeks, with progression to full WB without crutches by 6 weeks.	None.	Cited Shelbourne and Nitz's[79] accelerated protocol: 0°-110° AROM in weeks 2-3; 0°-130° AROM in weeks 5-6.	Unrestricted open and closed kinetic chain exercises started at week 4.	Running in a straight line at 8-10 weeks. Return to to sports by 4 months.
ACL reconstruction with meniscal repair; Brotzman & Wilk, Wilk et al[13,95]	Immediate WB	Hinged brace or immobilizer locked in full extension during ambulation until weeks 2-3.	Flexion ROM: Peripheral tears: 90°-100° by week 2; 105°-115° by week 3; 120°-135° by week 4; Complex tears: 90°-100° by week 2; 105°-110° by week 3; 115°-120° by week 4.	No isolated hamstring contraction for 8-10 weeks. No squatting past 60° of knee flexion for 8 weeks. No squatting with rotation or twisting for 10-12 weeks. No lunges past 75° knee flexion for 8 weeks.	5-7 months.
ACL reconstruction with articular cartilage pathology; Wilk et al[95]	Microfracture Technique: Non-WB or toe-touch WB for 2-4 weeks; 50% WB in weeks 5-6; 75% WB in weeks 7-8.	No Recommendation specified.	ROM goals same as with accelerated rehab protocol for isolated ACL reconstruction.	No excess loading for 3-4 months.	6-9 months.
ACL reconstruction with articular cartilage pathology; Wilk et al[95]	ACI Technique: NWB for 2 weeks. Toe-touch WB weeks 3-6. 50% WB by week 6. Progression to full WB by week 8	Locked in extension for 2 weeks.	0°-90° in week 2; 0°-105° by week 4; 0°-125° by week 6; 0°-135° by week 8.	Open kinetic chain exercises including proprioception, closed chain exercises and aquatherapy by week 6.	Low-impact activities by 8 months. High-impact activities by 12 months.
Combined ACL-MCL injuries/ repair; Irrgang & Fitzgerald[41]	Partial WB to full WB within 6 weeks.	Locked in extension for week 1, then unlocked for ambulation. Discontinue after 4-6 weeks when 90°-100° of flexion.	Full AROM and PROM extension by weeks 1-2. 90°-100° flexion by week 4. Full flexion by week 8.	Closed kinetic chain exercises performed in 0°-45° of flexion. Medial hamstring to increase anteromedial stability of knee. Caution with hip adduction exercises (i.e. valgus stress imposed on the MCL)	Running at 6 months. Return to sports by 9-12 months.
Combined ACL-MCL injuries/repair; Wilk et al[95]	Full WB by week 2	No postoperative brace. Functional brace in presence of varus movement during gait.	No Recommendation specified.	No Recommendation specified.	No Recommendation specified.
Combined ACL/LCL injuries/repair; Irrgang & Fitzgerald[41]	Partial WB for 6 weeks	Locked in extension for 6 weeks.	0° knee ext week 1(avoid hyperextension); 0°-90° for weeks 1-6; at week 6: full AROM.	Quad sets and straight-leg raises for 6 weeks. Progress to open and closed chain exercises-caution with hip abduction exercises.	Running by 6 months. Return to sports by 9-12 months.
Combined ACL/PCL reconstruction; Irrgang & Fitzgerald[41]	Partial WB in week 1. WB as tolerated in week 2.	Locked in extension weeks 1-4. Unlocked for gait training weeks 5-8.	0°-90° for 4-6 weeks. Passive knee flexion by lifting proximal tibia. Full flexion ROM by weeks 8-10.	No active hamstring contraction for 6 weeks. Quad sets and straight-leg raises. Open kinetic chain exercises from 75°-60° knee flexion. Closed kinetic chain exercises from 0°-45° knee flexion. Stationary bike-no toe clips.	Walking program weeks 8-12. Running by 6 months. Return to sports by 9-12 months.
Combined ACL/PCL reconstruction; Wilk et al[95]	50% WB on day 7; 75% WB day 12; Full WB by week 4.	Used for 7-8 weeks, then may need functional brace.	0°-65° on day 5; 0°-75° on day 7; 0°-90° on day 10; 0°-100° week 2; 0°-115° week 6; 0°-125° week 7.	Closed kinetic chain exercises in week 3. Leg press week 4.	Walking program week 12. Light running week 16. Agility drills by 5 months.

then at 2 years following surgery. The 2-year evaluation revealed that 90% (37/41) of patients' knees were stable and functional. The authors state that an increase in instability between 4 months and 2 years would have implied that the composite hamstring graft was not mature enough to tolerate the early return to sports and work activities. The 4 patients' knees that were unstable had been detected at the 4-month follow-up evaluation. The authors were unable to determine a specific cause of graft failure for these cases (Table 1).

Allografts

A comparison studies of nonirradiated, fresh-frozen patellar tendon autografts and patellar tendon autografts has revealed few differences in outcomes using similar rehabilitation protocols.[2]

ACL reconstruction with meniscal repair

Meniscal injuries are commonly seen in combination with ACL injuries. The rehabilitation protocol should be modified based on whether the meniscus was surgically repaired or if a partial menisectomy was performed. In the presence of a partial menisectomy, Wilk et al[26] suggest that running and jumping be delayed to protect the healing meniscus. With a meniscal repair, modification of the rehabilitation protocol is more important. Range of motion is progressed more slowly with complex tears than with peripheral tears. In some large meniscal repairs, where the posterior horn is involved, it may be preferable to limit flexion for 4 to 6 weeks in order to avoid excessive load on the posterior horn of the meniscus. As with the standard rehabilitation protocol, full passive extension is crucial in the early postoperative period (Table 1).

Articular cartilage pathology

Articular cartilage defects occur very commonly in the setting of an ACL injury. Johnson et al[50] reported an incidence of up to 80%, with most defects presenting as bone bruises. It is important to delay high shear or repetitive loading exercises to protect the healing tissue. Patients with bone bruises also demonstrate antalgic gait for longer periods, and may complain of more pain and swelling than patients with isolated ACL injuries. It is important to obtain and maintain knee homeostasis prior to progressing activities.

Some patients with this injury may undergo a procedure involving microfracture or autologous chondrocyte implantation (ACI). The goal of these procedures is to stimulate healing and repair. After the procedure involving the microfracture, the ROM goals remain the same as with the standard rehabilitation protocol, with emphasis on early return of passive knee extension. When the cartilage defect is on the load bearing surface of the femur or tibia, weight bearing is delayed to decrease the compression forces on the healing articular tissues (Table 1).

ACL RECONSTRUCTION IN SETTING OF MULTILIGAMENT INJURIES

Combined ACL-MCL Injuries

Patients with a combination ACL-MCL (medical collateral ligament) injury may or may not require repair of the MCL to restore knee stability and function. Reconstruction of the ACL alone may provide adequate knee stability to allow the MCL to heal. It has been reported that individuals who underwent ACL reconstruction and conservative management of the MCL had superior ROM and faster strength gains in the short-term compared to those who had both ligaments repaired. Long-term follow-up revealed that patients with ACL reconstruction and conservative management of MCL tear had excellent knee stability and functional outcomes.[51] The timing of ACL reconstruction has been a controversial subject. The standard of care has been to delay ACL reconstruction for 3 weeks postinjury in order to decrease the incidence of postoperative arthrofibrosis, one of the most common complications following this surgery.[24,52-54] In 2004, Millett et al[55] reported on their retrospective study of early ACL reconstruction in combined ACL-MCL injuries in 19 knees. Early reconstruction was defined as being within 3 weeks of the initial injury. The candidates for this early reconstruction had to meet certain preoperative criteria, such as 0-120° knee ROM, good quadriceps control (as measured by the ability to perform a straight leg raise), and near-normal appearance of the knee.[56] Early reconstruction of the ACL in these injuries facilitates the healing of the MCL by decreasing valgus instability. In this study, the rate of subsequent surgery was 5.2%, where only 1 out of 19 knee surgeries needed a second intervention for arthroscopic debridement and lysis of adhesions. A study by Peterson and Laprell[57] in 1999 had revealed a 15% rate of subsequent surgery for arthrofibrosis or cyclops lesions. Millett et al[55] believe that their preoperative protocol, which involves restoring motion, quadriceps control, and appearance of the knee may exclude patients who would be at risk of developing motion problems.

If medial laxity is still present after ACL reconstruction, a MCL repair may be warranted.[48] Combined ACL-MCL injuries are often managed postoperatively with a brace to limit valgus rotation forces, whether or not a MCL repair has been performed. The risk of postoperative loss of motion and excessive scar tissue formation is greater following MCL injuries due to the increased effusion that occurs with combined tissue damage and with extra-articular vascularity. Therefore, range of motion exercises should be progressed more rapidly providing that homeostasis of the joint is maintained. The use of the continuous passive motion machine may also be especially beneficial in these cases. Strengthening of the medial hamstrings is crucial for anteromedial stability of the knee, but hip adduction exercises should be performed with caution because of the valgus stress imposed on the MCL, especially if the resistance is placed distal to the knee joint.

Shelbourne and Patel[51] suggest that the location of the injury along the MCL should also be considered during the rehabilitation process. The MCL tears at the proximal origin or within the midsubstance of the ligament tend to heal without residual laxity but with increased stiffness. However, MCL injuries at the distal insertion site tend to have a lesser healing process and residual valgus laxity. In this case, rehabilitation should be progressed more slowly to allow for tissue healing. In the former case, the ROM exercises should be accelerated to prevent excessive scar tissue formation and stiffness (Table 1).

Combined ACL/LCL Injuries

An injury to the LCL (lateral collateral ligament) may result in varus instability, and the LCL may be reconstructed using an Achilles tendon graft. Irrgang and Fitzgerald[48] propose guidelines outlined in Table 1.

Combined ACL/PCL Injuries

Irrgang and Fitzgerald[48] describe rehabilitation following a PCL (posterior cruciate ligament) reconstruction using an Achilles tendon graft and they suggest that the same guidelines should be used in the combined ACL/PCL reconstructions. In 2000, these authors stated that the maturation process of the PCL graft and the loads that it can withstand remain unclear. They have based their rehabilitation protocol on known knee biomechanics to incorporate exercises that would reduce the strain on the PCL with respect to tibial translation. For example, they recommend that open kinetic chain knee flexion and hip extension exercises be avoided in the early postoperative period because of the posterior translation of the tibia during unopposed hamstring contraction and the associated strain on the healing PCL. In the event of a combined ACL/PCL reconstruction, they recommend that open kinetic chain knee extension exercises be limited to the range of 75° to 60° of flexion. In contrast, closed kinetic chain exercises are indicated because compression forces on the joint and co-contraction of the hamstring and quadriceps decrease tibial translation (Table 1). Following surgery in the setting of single or multiligament injury, it is crucial to restore full extension that is symmetrical to the uninvolved knee. Irrgang and Fitzgerald[48] indicate that caution must be taken with respect to gaining gross hyperextension in the PCL reconstructed knee because this can lead to elongation or failure of the graft and repair. They suggest a goal of 0° of extension for the patients having undergone this type of surgery, even if the extension ROM of the uninvolved knee is greater.

POTENTIAL COMPLICATIONS FOLLOWING ACL RECONSTRUCTION

As previously mentioned, problems can occur during the surgical procedure. In addition, there are numerous potential complications that are commonly seen by physical therapists during the rehabilitation process, such as anterior knee pain, arthrofibrosis, quadriceps weakness, extensor mechanism dysfunction, and donor site pain. Early motion and decreased restrictions on weight bearing are now being advocated to prevent the risk of arthrofibrosis. Arthrofibrosis can be caused by a variety of factors other than immobilization, such as infection and graft malpositioning. Physical therapists play an important role in the early detection of motion loss in the immediate postoperative phase. Possible causes of motion loss are the presence of ACL nodules, fat pad scarring, and/or adhesions. In some cases, motion loss can be managed with conservative, nonoperative treatment such as physical therapy and possibly manipulation of the knee under anesthesia. Millett et al[24] have outlined the risks and complications associated with manipulation under anesthesia, such as articular damage and fracture due to excessive joint compression forces during the proce-

dure. Because of these risks, the surgical author prefers to treat the majority of patients with knee arthrofibrosis with arthroscopic surgery to release adhesions and distend the capsule as indicated. However, Dodds et al[58] reported success in managing knee arthrofibrosis with manipulation. They stated that manipulation might prevent the deterioration of articular cartilage that can be caused by gait deviations associated with persistent flexion contractures. The majority of the 42 patients studied experienced hemarthrosis following the manipulation, but this did not delay the initiation of physical therapy. Whether they've undergone manipulation under anesthesia or arthroscopic release of adhesions, patients should initiate or resume physical therapy in order to ensure good functional outcomes and return to preinjury levels of activity.

FUTURE DIRECTIONS OF ACL RECONSTRUCTION AND REHABILITATION

New Approaches in ACL Reconstruction

Quadriceps tendon graft

Bone-patellar-tendon-bone and hamstring autografts are the most used autografts for ACL reconstruction at this time.[3,4,5,14,17,59] Another autograft that is gaining popularity is the quadriceps tendon graft, with 1 bone plug. Fu et al[7] described donor site morbidity with quadriceps tendon grafts to include quadriceps muscle atrophy, articular surface damage at harvesting, scar size, and location. In 2003, Theut et al[59] reported on the use of a central quadriceps free tendon graft (CQFT), without a patellar bone plug, for both primary and revision ACL reconstruction. This graft is sometimes augmented and fixed by various methods, including bone disk taken from the tibia. An advantage of this graft is its cross-sectional area that is nearly double the central third of the patellar tendon. In addition, biomechanical studies have shown that its mechanical properties are similar to that of the patellar tendon.[60-62] Theut et al[59] report that they use the CQFT graft because it is easily harvested and seems to cause very little morbidity. Their retrospective postoperative assessment of 29 patients who had undergone ACL reconstruction with CQFT graft, with a minimum follow-up of at least 2 years, revealed that these patients had good knee stability as assessed by Lachman, pivot shift tests and single leg hop tests. They had 25 patients complete the 1999 International Knee Documentation Committee (IKDC) Subjective Knee Evaluation Form[63] to assess symptoms of instability, activity level, and overall knee function. They also used the visual analog score to document preinjury and postoperative pain. Eighty-four percent of these patients reported tolerating very strenuous activities without 'giving way' of the knee. Seventy-two percent of these patients reported being able to perform strenuous or very strenuous activities such as basketball, soccer, skiing, tennis, or heavy physical work. No patients in the study had signs or symptoms of patellofemoral pain.

These positive findings led to the development of a second study to assess the postoperative stability of the knee more specifically. This was done using the KT-1000 arthrometer on 45 patients at a mean of 20 months (range 12-29 months) following ACL reconstruction with CQFT graft. Twenty-three patients were excluded from the study for reasons including concomitant injuries, lack of normal contralateral knee for comparison, known graft failures prior to their study, or inability to participate in the testing at the time. The goal was to objectively measure anterior tibial translation on both knees. The acceptable range in side-to-side difference of a fully functional graft was defined as 0 to 3 mm.[59,64] A value of more than 3 to 5 mm defined a partially functional graft. Values greater than 5 mm were defined as arthrometric failure.[59] They found that 84% of patients presented with a side-to-side difference of –2 to 3 mm, and 16% presented with a difference of more than 3 mm but less or equal to 5 mm. No patients had a side-to-side difference greater than 5 mm, therefore there were no patients with an arthrometric graft failure. The authors state that these values are comparable with other KT-1000 values at a minimum of 2 years following surgery as documented in the literature.[12,17,19,34,49,65] Theut et al concluded that their patients with CQFT ACL reconstructions had stable, highly-functional knees with little morbidity such as patellofemoral pain 2 years following surgery, leading to a high rate of patient satisfaction.

Double Bundle ACL

There is growing interest in this technique with an attempt to recreate anatomy more precisely. This technique involves placing femoral tunnels at the insertions of both the antero-medial and postero-lateral bundles of the ACL with separate grafts. This placement could restore knee kinematics and in situ force of the ACL reconstructed graft to approximate those of an intact ACL.[66] Therefore, anatomical double-bundle reconstruction may have biomechanical advantages over the single ACL graft used today.[67]

Bioengineered ACL

As previously discussed, prosthetic grafts have had high failure rates. In order for the next generation of prosthetic grafts to achieve long-term success, many factors need to be considered. The prosthesis should cause minimal patient morbidity and no risk of infection or disease transmission. It should produce and maintain immediate stabilization of the knee to allow aggressive rehabilitation and rapid return to preinjury levels of function. It should support and direct host tissue ingrowth but also biodegrade at a rate that will still provide mechanical stability as the extra-cellular matrix is laid down. This tissue ingrowth and organization should also lead to maintaining the mechanical integrity of the ACL for the patient's lifetime.[37] The use of silk as a biomaterial for use in ACL tissue bioengineering is now being studied. Its advantages include low manufacturing costs, availability, high mechanical strength, and slow biodegrading rate. The immune response becomes negligible once the sericin, a gelatinous protein, is removed. The use of such a prosthetic graft would eliminate some of the morbidity and complications associated with autogenic and allogenic grafts. The use of bioengineered grafts should therefore allow for more aggressive rehabilitation and early return to sports, especially in high-level athletes, if the mechanical tensile strength and viability of these grafts can be optimized at the time of surgery.

ACL Repair

There is also a growing interest in primary repair of the injured ACL. Improved arthroscopic surgical techniques and a better understanding of the ACL's healing process

may contribute to the development of procedures which may effectively help the native ACL 'heal' into a functionally significant ligament.

CLINICAL OUTCOMES AND COST-EFFECTIVENESS

The success of ACL reconstruction surgery depends on many variables. Surgical variables include graft selection, and the proper harvesting, positioning, tensioning, and fixation of graft.[4,15,18,20,25] Rehabilitation constitutes a very important perioperative variable. Several postoperative protocols have been published in the literature[2,10,26,48] but much controversy remains regarding frequency and duration of physical therapy visits following ACL reconstruction.[26,68-71]

This has become increasingly apparent in the setting of reimbursement issues/constraints and of managed care costs. In the past, it was common for patients to attend physical therapy sessions weekly for as long as 4 to 6 months following ACL reconstruction.[69] Such close monitoring by physical therapists was crucial in order to decrease the high incidence of postoperative complications. The incidence of these complications has been decreasing with the advancements of surgical techniques and with the development of accelerated rehabilitation protocols. The question should then arise as to how physical therapy clinical practices should be revised to optimize patients' postoperative function in the most cost-effective manner. Several studies have looked at the outcomes of home-based versus clinic-based rehabilitation programs for patients having undergone ACL reconstruction with patellar tendon autografts or allografts.[68-70,72] Since there are countless variables that influence outcomes, no conclusion can be made with respect to the optimal number of physical therapy visits for either group.

The randomized prospective study by Fischer et al[70] revealed that the patients in the home-based program had an average of 5 physical therapy visits in a 6-month period, whereas the clinic-based group had an average of 20 visits. At the 6-month follow-up, no statistical differences were found between the 2 groups with respect to range of motion, thigh atrophy, stability tests, KT-1000 values and overall functional impact on health status as assessed by general health-status questionnaires. However, the rehabilitation protocols and exercise instructions weren't reported in detail; hence it would be difficult for clinicians to model their practice after either group. Other studies[68,69,72] have better outlined the rehabilitation protocols that were followed. They all differ slightly in terms of the rate of progression of ROM, weight bearing, strengthening, and return to sports activities. Nevertheless, there is consensus that in properly selected groups of patients, a well planned, home-based rehabilitation program should yield excellent clinical and functional outcomes. The challenge resides in the selection of these patients and in the development of a home exercise program. A goal-based approach to rehabilitation would most likely simplify this process. These goals include restoration of ROM, progressive strengthening and proprioception, and improvement of agility to facilitate early return to preinjury levels of function, while maintaining knee homeostasis. Periodic reassessments by physical therapists are imperative for exercise progression and modification as indicated. Physical therapists' clinical judgment, knowledge of rehabilitation guidelines, and ongoing communication with the patient and surgeon are key elements to the success of such programs.

CONCLUSION

We recommend that clinicians consider the vast array of principles and factors that affect the success of ACL reconstruction when developing patients' treatment plans. For example, the indications and timeframes for initiating open kinetic strengthening exercises vary based on the type of graft used and/or the presence of concomitant injuries. Structured, individually based programs will contribute to the patients achieving an expeditious return to preinjury levels of function, while protecting the integrity of the grafts in the early postoperative stages and preventing complications such as patellofemoral pain.

Collaboration between surgeons and physical therapists in setting up clinical trials and/or in investigating the optimal postoperative care is essential in the quest for maximizing patients' function in a cost-effective manner. This collaboration is especially important in the setting of ever evolving surgical procedures, societal expectations for the early return of function and return to sports, and managed care constraints.

REFERENCES

1. Blackburn TA,Jr. Rehabilitation of anterior cruciate ligament injuries. *Orthop Clin North Am.* 1985;16:241-269.
2. Wilk KE, D'Amato M, Bach BR Jr. Knee Injuries. In: Brotzman SB, Wilk KE. *Clinical Orthopaedic Rehabilitation.* Philadelphia, Pa: Mosby; 2003.
3. Delay BS, Smolinski RJ, Wind WM, Bowman DS. Current practices and opinions in ACL reconstruction and rehabilitation: Results of a survey of the american orthopaedic society for sports medicine. *Am J Knee Surg.* 2001;14:85-91.
4. Jaureguito JW, Paulos LE. Wh grafts fail. *Clin Orthop Related Res.* 1996;1:25-41.
5. Feller JA, Webster KE. A randomized comparison of patellar tendon and hamstring tendon anterior cruciate ligament reconstruction. *Am J Sports Med.* 2003;31:564-573.
6. Miyasaka KC, Daniel DM, Stone ML, Hirshman P. The incidence of knee ligament injuries in the general population. *Am J Knee Surg.* 1991;4:3-8.
7. Fu FH, Bennett CH, Lattermann C, Ma CB. Current trends in anterior cruciate ligament reconstruction. part 1: Biology and biomechanics of reconstruction. *Am J Sports Med.* 1999;27:821-830.
8. Daniel DM, Stone ML, Dobson BE, Fithian DC, Rossman DJ, Kaufman KR. Fate of the ACL-injured patient. A prospective outcome study. *Am J Sports Med.* 1994;22:632-644.
9. Aglietti P, Buzzi R, Bassi PB. Arthroscopic partial meniscectomy in the anterior cruciate deficient knee. *Am J Sports Med.* 1988;16:597-602.
10. Shelbourne KD, Nitz P. Accelerated rehabilitation after anterior cruciate ligament reconstruction. *Am J Sports Med.* 1990;18:292-299.
11. Aglietti P, Buzzi R, Zaccherotti G, De Biase P. Patellar tendon versus doubled semitendinosus and gracilis tendons for

anterior cruciate ligament reconstruction. *Am J Sports Med.* 1994;22:211-217.
12. Aune AK, Holm I, Risberg MA, Jensen HK, Steen H. Four-strand hamstring tendon autograft compared with patellar tendon-bone autograft for anterior cruciate ligament reconstruction. A randomized study with two-year follow-up. *Am J Sports Med.* 2001;29:722-728.
13. Beynnon BD, Johnson RJ, Fleming BC. The science of anterior cruciate ligament rehabilitation. *Clin Orthop Related Res.* 2002:9-20.
14. Corry IS, Webb JM, Clingeleffer AJ, Pinczewski LA. Arthroscopic reconstruction of the anterior cruciate ligament. A comparison of patellar tendon autograft and four-strand hamstring tendon autograft. *Am J Sports Med.* 1999;27:444-454.
15. Frank CB, Jackson DW. The science of reconstruction of the anterior cruciate ligament. *J Bone Joint Surg-Am.* 1997;79:1556-1576.
16. Lawhorn KW, Howell SM. Scientific justification and technique for anterior cruciate ligament reconstruction using autogenous and allogeneic soft-tissue grafts. *Orthop Clin North Am.* 2003;34:19-30.
17. Marder RA, Raskind JR, Carroll M. Prospective evaluation of arthroscopically assisted anterior cruciate ligament reconstruction. patellar tendon versus semitendinosus and gracilis tendons. *Am J Sports Med.* 1991;19:478-484.
18. Miller SL, Gladstone JN. Graft selection in anterior cruciate ligament reconstruction. *Orthop Clin North Am.* 2002;33:675-683.
19. Noyes FR, Barber-Westin SD. A comparison of results in acute and chronic anterior cruciate ligament ruptures of arthroscopically assisted autogenous patellar tendon reconstruction. *Am J Sports Med.* 1997;25:460-471.
20. Ritchie JR, Parker RD. Graft selection in anterior cruciate ligament revision surgery. *Clin Orthop Related Res.* 1996:65-77.
21. Shaieb MD, Kan DM, Chang SK, Marumoto JM, Richardson AB. A prospective randomized comparison of patellar tendon versus semitendinosus and gracilis tendon autografts for anterior cruciate ligament reconstruction. *Am J Sports Med.* 2002;30:214-220.
22. Rodeo SA, Arnoczky SP, Torzilli PA, Hidaka C, Warren RF. Tendon-healing in a bone tunnel. A biomechanical and histological study in the dog. *J Bone Joint Surg-Am.* 1993;75:1795-1803.
23. Allum, Robin. Complications of arthroscopic reconstruction of the anterior cruciate ligament. *J of Bone Joint Surg - Br.* 2003;85-B:12-16.
24. Millett PJ, Johnson B, Carlson J, Krishnan S, Steadman JR. Rehabilitation of the arthrofibrotic knee. *Am J Orthop.* 2003;32:531-538.
25. Sekiya JK, Ong BC, Bradley JP. Complications in anterior cruciate ligament surgery. *Orthop Clin North Am.* 2003;34:99-105.
26. Wilk KE, Reinold MM, Hooks TR. Recent advances in the rehabilitation of isolated and combined anterior cruciate ligament injuries. *Orthop Clin North Am.* 2003;34:107-137.
27. Anderson AF, Snyder RB, Lipscomb AB, Sr. Anterior cruciate ligament reconstruction using the semitendinosus and gracilis tendons augmented by the losee iliotibial band tenodesis. A long-term study. *Am J Sports Med.* 1994;22:620-626.
28. Eriksson K, Larsson H, Wredmark T, Hamberg P. Semitendinosus tendon regeneration after harvesting for ACL reconstruction. A prospective MRI study. *Knee Surg Sports Traumatol Arthrosc.* 1999;7:220-225.
29. Papandrea P, Vulpiani MC, Ferretti A, Conteduca F. Regeneration of the semitendinosus tendon harvested for anterior cruciate ligament reconstruction. evaluation using ultrasonography. *Am J Sports Med.* 2000;28:556-561.
30. Rispoli DM, Sanders TG, Miller MD, Morrison WB. Magnetic resonance imaging at different time periods following hamstring harvest for anterior cruciate ligament reconstruction. *Arthroscopy.* 2001;17:2-8.
31. Simonian PT, Harrison SD, Cooley VJ, Escabedo EM, Deneka DA, LarsonRV. Assessment of morbidity of semitendinosus and gracilis tendon harvest for ACL reconstruction. *Am J Knee Surg.* 1997;10:54-59.
32. Yasuda K, Ohkoshi Y, Tanabe Y, Kaneda K. Quantitative evaluation of knee instability and muscle strength after anterior cruciate ligament reconstruction using patellar and quadriceps tendon. *Am J Sports Med.* 1992;20:471-475.
33. Yasuda K, Tsujino J, Ohkoshi Y, Tanabe Y, Kaneda K. Graft site morbidity with autogenous semitendinosus and gracilis tendons. *Am J Sports Med.* 1995;23:706-714.
34. Shelbourne KD, Gray T. Anterior cruciate ligament reconstruction with autogenous patellar tendon graft followed by accelerated rehabilitation. A two- to nine-year followup. *Am J Sports Med.* 1997;25:786-795.
35. Shelbourne KD, Wilckens JH, Mollabashy A, DeCarlo M. Arthrofibrosis in acute anterior cruciate ligament reconstruction. the effect of timing of reconstruction and rehabilitation. *Am J Sports Med.* 1991;19:332-336.
36. Lysholm J, Gillquist J. Evaluation of knee ligament surgery results with special emphasis on use of a scoring scale. *Am J Sports Med.* 1982;10:150-154.
37. Weitzel PP, Richmond JC, Altman GH, Calabro T, Kaplan DL. Future direction of the treatment of ACL ruptures. *Orthop Clin North Am.* 2002;33:653-661.
38. Buck BE, Malinin TI, Brown MD. Bone transplantation and human immunodeficiency virus. an estimate of risk of acquired immunodeficiency syndrome (AIDS). *Clin Orthop.* 1989;(240):129-136.
39. Lopez-Vazquez E, Juan JA, Vila E, Debon J. Reconstruction of the anterior cruciate ligament with a dacron prosthesis. *J Bone Joint Surg - Am.* 1991;73:1294-1300.
40. Kumar K, Maffulli N. The ligament augmentation device: An historical perspective. *Arthroscopy.* 1999;15:422-432.
41. De Carlo MS, Shelbourne KD, McCarroll JR, Rettig AC. Traditional

versus accelerated rehabilitation following ACL reconstruction: A one-year follow-up. *J Orthop Sports Phys Ther.* 1992;15:309-316.
42. Paulos L, Noyes FR, Grood E, Butler DL. Knee rehabilitation after anterior cruciate ligament reconstruction and repair. *Am J Sports Med.* 1981;9:140-149.
43. Delitto A, Rose SJ, McKowen JM, Lehman RC, Thomas JA, Shively RA. Electrical stimulation versus voluntary exercise in strengthening thigh musculature after anterior cruciate ligament surgery. *Phys Ther.* 1988;68:660-663.
44. Paternostro-Sluga T, Fialka C, Alacamliogliu Y, Saradeth T, Fialka-Moser V. Neuromuscular electrical stimulation after anterior cruciate ligament surgery. *Clin Orthop.* 1999;(368):166-175.
45. Snyder-Mackler L, Delitto A, Stralka SW, Bailey SL. Use of electrical stimulation to enhance recovery of quadriceps femoris muscle force production in patients following anterior cruciate ligament reconstruction. *Phys Ther.* 1994;74:901-907.
46. Snyder-Mackler L, Ladin Z, Schepsis AA, Young JC. Electrical stimulation of the thigh muscles after reconstruction of the anterior cruciate ligament. effects of electrically elicited contraction of the quadriceps femoris and hamstring muscles on gait and on strength of the thigh muscles. *J Bone Joint Surg Am.* 1991;73:1025-1036.
47. Lephart SM, Pincivero DM, Giraldo JL, Fu FH. The role of proprioception in the management and rehabilitation of athletic injuries. *Am J Sports Med.* 1997;25:130-137.
48. Irrgang JJ, Fitzgerald GK. Rehabilitation of the multiple-ligament-injured knee. *Clin Sports Med.* 2000;19:545-571.
49. Howell,Lieutenant Colonel Stephen M., Taylor CMA. Brace-free rehabilitation, with early return to activity, for knees reconstructed with a double-looped semitendinosus and gracilis graft. *J Bone Joint Surg - Am.* 1996;78-A:814-825.
50. Johnson DL, Urban WP,Jr, Caborn DN, Vanarthos WJ, Carlson CS. Articular cartilage changes seen with magnetic resonance imaging-detected bone bruises associated with acute anterior cruciate ligament rupture. *Am J Sports Med.* 1998;26:409-414.
51. Shelbourne KD, Patel DV. Instructional course lectures, the american academy of orthopaedic surgeons. management of combined injuries of the anterior cruciate and medial collateral ligaments. *J Bone Joint Surg - Am.* 1995;77-A:800-806.
52. Graf B, Uhr F. Complications of intra-articular anterior cruciate reconstruction. *Clin Sports Med.* 1988;7:835-848.
53. Hughston JC. Complications of anterior cruciate ligament surgery. *Orthop Clin North Am*. 1985;16:237-240.
54. Shelbourne KD, Johnson GE. Outpatient surgical management of arthrofibrosis after anterior cruciate ligament surgery. *Am J Sports Med.* 1994;22:192-197.
55. Millett PJ, Pennock AT, Sterett WI, Steadman JR. Early ACL reconstruction in combined ACL-MCL injuries. *J Knee Surg.* 2004;17:94-98.
56. Sterett WI, Hutton KS, Briggs KK, Steadman JR. Decreased range of motion following acute versus chronic anterior cruciate ligament reconstruction. *Orthopedics.* 2003;26:151-154.
57. Petersen W, Laprell H. Combined injuries of the medial collateral ligament and the anterior cruciate ligament.early ACL reconstruction versus late ACL reconstruction. *Arch Orthop Trauma Surg.* 1999;119:258-262.
58. Dodds JA, Keene JS, Graf BK, Lange RH. Results of knee manipulations after anterior cruciate ligament reconstructions. *Am J Sports Med.* 1991;19:283-287.
59. Theut PC, Fulkerson JP, Armour EF, Joseph M. Anterior cruciate ligament reconstruction utilizing central quadriceps free tendon. *Orthop Clin North Am*. 2003;34:31-39.
60. Harris NL, Smith DA, Lamoreaux L, Purnell M. Central quadriceps tend for anterior cruciate ligament reconstruction. part I: Morphometric and biomechanical evaluation. *Am J Sports Med.* 1997;25:23-28.
61. Staubli HU, Schatzmann L, Brunner P, Rincon L, Nolte LP. Mechanical tensile properties of the quadriceps tendon and patellar ligament in young adults. *Am J Sports Med.* 1999;27:27-34.
62. Staubli HU, Schatzmann L, Brunner P, Rincon L, Nolte LP. Quadriceps tendon and patellar ligament: Cryosectional anatomy and structural properties in young adults. *Knee Surg Sports Traumatol Arthrosc.* 1996;4:100-110.
63. Irrgang JJ, Anderson AF, Boland AL, et al. Development and validation of the international knee documentation committee subjective knee form. *Am J Sports Med.* 2001;29:600-613.
64. Daniel DM. Assessing the limits of knee motion. *Am J Sports Med.* 1991;19:139-147.
65. O'Neill DB. Arthroscopically assisted reconstruction of the anterior cruciate ligament. A prospective randomized analysis of three techniques. *J Bone Joint Surg - Am.* 1996;78:803-813.
66. Yamamoto Y, Hsu WH, Woo SL, Van Scyoc AH, Takakura Y, Debski RE. Knee stability and graft function after anterior cruciate ligament reconstruction: A comparison of a lateral and an anatomical femoral tunnel placement. *Am J Sports Med.* 2004;32:1825-1832.
67. Yagi M, Wong EK, Kanamori A, Debski RE, Fu FH, Woo SL. Biomechanical analysis of an anatomic anterior cruciate ligament reconstruction. *Am J Sports Med.* 2002;30:660-666.
68. Beard DJ, Dodd CA. Home or supervised rehabilitation following anterior cruciate ligament reconstruction: A randomized controlled trial. *J Orthop Sports Phys Ther.* 1998;27:134-143.
69. De Carlo MS, Sell KE. The effects of the number and frequency of physical therapy treatments on selected outcomes of treatment in patients with anterior cruciate ligament reconstruction. *J Orthop Sports Phys Ther.* 1997;26:332-339.
70. Fischer DA, Tewes DP, Boyd JL, Smith JP, Quick DC. Home based rehabilitation for anterior cruciate ligament reconstruction. *Clin Orthop.* 1998;(347):194-199.
71. Timm KE. The clinical and cost-effec-

tiveness of two different programs for rehabilitation following ACL reconstruction. *J Orthop Sports Phys Ther.* 1997;25:43-48.
72. Treacy SH, Barron OA, Brunet ME, Barrack RL. Assessing the need for extensive supervised rehabilitation following arthroscopic ACL reconstruction. *Am J Orthop*. 1997;26:25-29.

Marie-Josée Paris is a Senior Physical Therapist of Outpatient Services, Department of Rehabilitation Services at Brigham and Women's Hospital in Boston, MA. Reg B. Wilcox III is the Clinical Supervisor at Outpatient Services, Department of Rehabilitation Services and Fellow, Center for Evidence Based Imaging, Department of Radiology at Brigham and Women's Hospital. Peter J. Millett is an associate surgeon at Steadman Hawkins Clinic in Vail, CO.

Comparison of Standard Blood Pressure Cuff and a Commercially Available Pressure Biofeedback Unit While Performing Prone Lumbar Stabilization Exercise

Ward Mylo Glasoe, PT, MA, ATC
Reginald R. Marquez, MPT
Whittney J. Miller, MPT
Anthony J. Placek, MPT

INTRODUCTION

Biofeedback is used to complement stabilization exercises for patients suffering back pain.[1] The pressure biofeedback unit (PBU) developed by the Chattanooga Group in Hixson, TN is a commercial device for which exercise protocols are described.[2-4] The PBU is a 3-chamber air filled bladder with attached gauge (Figure 1) that indirectly measures movement during exercise through changes in bladder pressure. One protocol recommends the action of 'hollowing' the abdomen to recruit the transversus abdominus muscle (Figure 2).[4] The bladder of the PBU is inflated and placed under the lower abdomen. The individual contracts the muscles of the lower abdomen with intent to reduce the pressure registered by the PBU. The principle underlying the biofeedback is that isolation in the recruitment of the transverse abdominus occurs when the hollowing contraction drops the pressure of biofeedback between 6 to 10 mmHg. Unwanted substitution by other muscles is inferred if the pressure increases or if the pressure drops by more than 10 mmHg.[4,5]

Blood pressure cuffs are required equipment in all clinics. Like the PBU, the pressure cuff is an inflatable bladder with an attached gauge (Figure 1). Since clinics already have a blood pressure cuff, perhaps this instrument might be adequate to provide pressure feedback to individuals performing stabilization exercise in prone. The purpose of this study was to examine whether cuff pressure measurements correlate with PBU measures obtained during the performance of prone stabilization exercise.

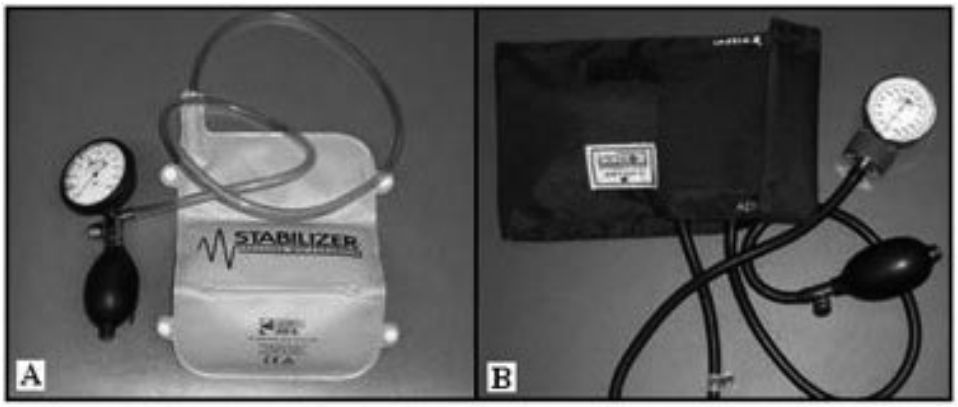


Figure 1. Pressure measurement devices used in this study. (A) Pressure Biofeedback Unit. (B) Standard blood pressure cuff.

Figure 2. Prone exercise with pressure biofeedback monitoring spinal movement.

METHODS

Subjects

The Institutional Review Board of Northern Illinois University approved this study and informed consent was obtained. Eighteen college students, 9 male and 9 female, were tested. Age ranged from 20 to 30 years. Each volunteer completed the Oswestry disability questionnaire to assess the degree of functional impairment associated with low back pain.[6] Oswestry scores averaged 4% (range 0 to 23%) indicating minimal disability. Ten of the 18 subjects scored themselves as having 0% disability. Excluded were subjects with severe spinal disability as identified by Oswestry scores greater than 60%, and subjects who were pregnant.

Procedures

Subjects underwent a session of training using the PBU. Subjects were positioned prone on a firm mat. The PBU was placed beneath the abdomen just proximal to a line running between the anterior iliac crests and centered relative to the naval.[4] Subjects practiced drawing the abdomen up-and-in

towards the spine under the guidance of an instructor self-trained in the prone hollowing regimen of exercise. The session concluded when the instructor was satisfied that the subject could perform the hollowing exercise while breathing normally and without substitutionary co-contraction of the gluteus maximus and erector spinae muscles.

Subjects rested for 30 minutes and were then randomly assigned to each of the 2 test conditions (PBU vs. Cuff). The prone stabilization exercise technique used in this study has been described elsewhere.[4,5] The device placed beneath the abdomen was inflated to baseline pressure. The PBU was inflated to 70 mmHg of pressure, the value displayed with 2 mmHg resolution on a dial gauge (Figure 1).[4] Based on subject experience, the cuff inflated to 40 mmHg of pressure felt similar to the PBU. Subjects performed 10 repetitions, holding each hollowing contraction for 8 seconds. A 10-minute rest was given between test conditions.

Two examiners worked together to collect the data. One examiner gave commands to the subject, the other recorded the mean drop in mmHg pressure registered on the device.

Data Analysis

Converting the data to percentage of pressure decrease allowed the PBU and cuff measurements to be statistically compared to assess agreement. An intraclass correlation coefficient (3,1) and their 95% confidence interval (CI),[7] and standard errors of the measurement (SEM) were calculated.

RESULTS

Table 1 shows the descriptive statistics for the recorded data. An ICC of 0.67 was the level of agreement between the 2 methods of pressure measurement. The 95% CI limits around the ICC point estimate ranged from 0.29 to 0.86. The SEM value for percentage of pressure decrease was 3%, indicating consistency between measures occurred in a small range.

DISCUSSION

Results of this experiment support the use of a standard blood pressure cuff to provide biofeedback for prone stabilization exercise. An ICC of 0.67 shows there was fair agreement for the percentage of pressure decrease between methods. Figure 3 scattergram data pattern is offset, and shifted above the line of identity towards the 'y' axis representing the cuff. This indicates that the percentage drop registered with the cuff was consistently larger but related. The drop in actual pressure recorded by the examiner for the two methods was remarkably similar (see Table). These findings suggest that the prone hollowing protocol advocated by the manufacturer of the PBU can be replicated using a standard blood pressure cuff inflated to 40 mmHg.

The authors recognize several limitations of the study. Examiners were not blinded, the devices were not calibrated nor were reliability of the measures assessed, and without concurrent EMG data the suggested relationship between biofeedback and muscle activation is speculation. Furthermore, few subjects had back pain. While the subjects tested represent a younger population that

Table 1. Descriptive Statistics of Drop in Pressure Recorded with the Cuff and PBU (N = 18)

Measurement	Mean	Range	SD
Cuff inflated to 40 mmHg Drop in pressure Percent drop in pressure	2.7 mmHg 6.7 %	1 to 6 mmHg	2.0
PBU inflated to 70 mmHg Drop in pressure Percent drop in pressure	2.6 mmHg 3.7 %	1 to 7 mmHg	1.8

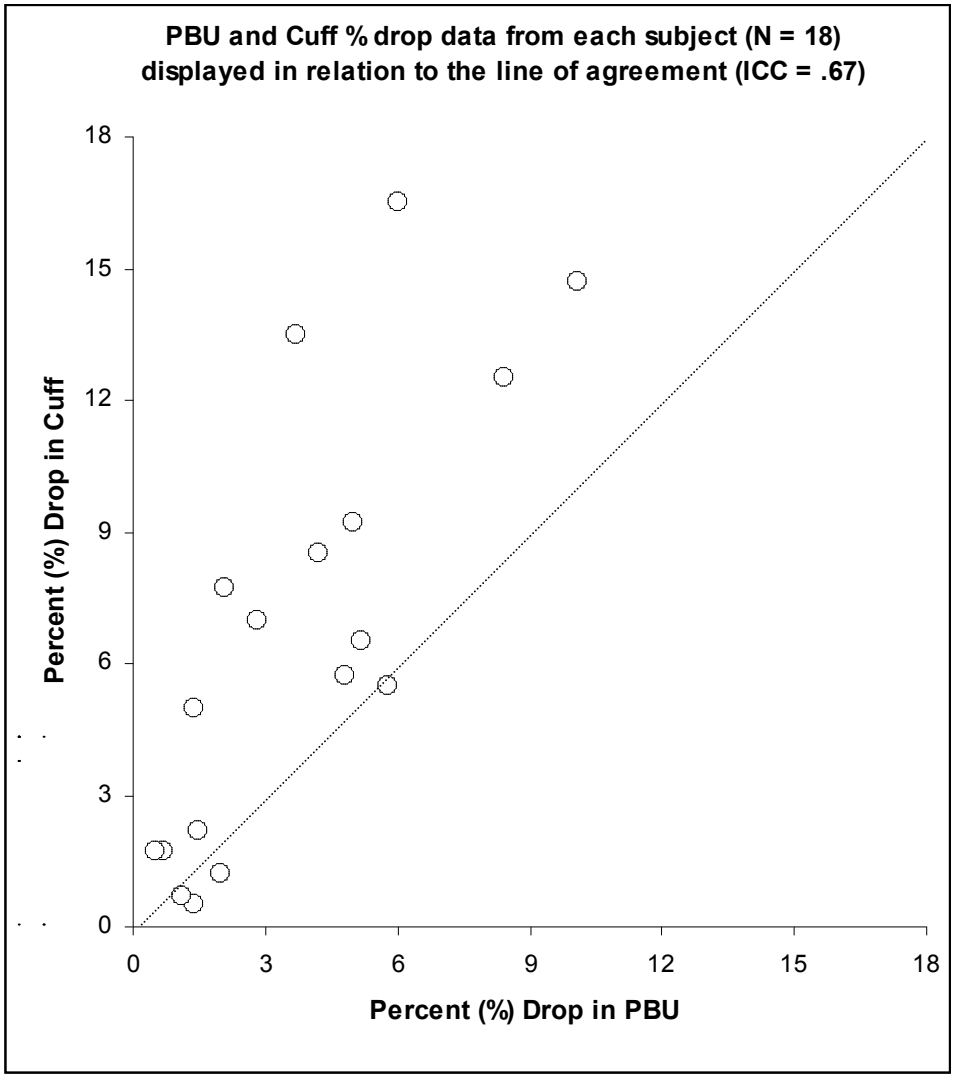


Figure 2. The percent (%) drop in the PBU and cuff displayed in relationship to the line of identity with the calculated intraclass correlation coefficient.

could develop back pain, a larger more diverse sample would facilitate the generalizability of the data. Results could differ for other varied patient populations.

Difference in the material design of the devices in conjunction with the prone test position may have affected readings. Materials used to construct the PBU are nonelastic. By contrast, the blood pressure cuff is built from materials that expand when inflated. In prone the contour of the spine and abdomen flattened the cuff, and in effect, prevent it from expanding when inflated. Other stabilization exercise protocols[2,3] that incorporate measures of pressure biofeedback require the individual to lie supine with the PBU placed beneath either the low back or neck. We did attempt to monitor cuff pressure while the individual exercised in supine. However, highly variable readings were found because the cuff inflated and rounded into the curvatures of the spine.

CONCLUSION

Stabilization exercises are a popular treatment for patients with back pain. The PBU is the common pressure biofeedback instrument for which exercise protocols are described. Data presented in this work suggest that a blood pressure cuff may be used as an acceptable alternative to provide biofeedback when performing prone lumbar stabilization exercise.

REFERENCES

1. Asfour SS, Khalil TM, Waly SM, Goldberg ML, Rosomoff RS, Rosomoff HL. Biofeedback in back muscle strengthening. *Spine.* 1990;15:510-513.
2. Jull GA, Barrett C, Magee R, Ho P. Further clinical clarification of the muscle dysfunction in cervical headache. *Cephalalgia.* 1999;19:179-185.
3. Richardson CA, Jull GA. Muscle control-pain control. What exercises would you prescribe? *Man Ther.* 1995;1:2-10.
4. Storheim K, Bo K, Pederstad O, Jahnsen R. Intra-tester reproducibility of pressure biofeedback in measurement of transversus abdominis function. *Physiother Research Int.* 2002;7:239-249.
5. Richardson CA, Jull GA, Hodges PW, Hides J. *Therapeutic Exercise for Spinal Segmental Stabilization in Low Back Pain: Scientific Basis and Clinical Approach.* London: Churchill Livingstone; 1999.
6. Fairbank JC, Couper J, Davies JB, O'Brien JP. The Oswestry low back pain disability questionnaire. *Physiother.* 1980;66:271-273.
7. Shrout PE, Fliess JL. Intraclass correlations: uses in assessing rater reliability. *Psychol Bull.* 1979;86:420-428.

Ward Mylo Glasoe is an Instructor at the Program in Physical Therapy at the University of Minnesota in Minneapolis, MN. Reginald R. Marquez, Whittney J. Miller, and Anthony J. Placek were (at the time of the study) Physical Therapy Students at Northern Illinois University in DeKalb, IL.

Curtis KA, Newman PD.
The PTA Handbook*: Keys to Success in School and Career for the Physical Therapist Assistant.
Thorofare, NJ: Slack, Inc.; 2005, 306 pp.

What can Physical Therapist Assistant's do? Can they progress exercises? Can they take measurements? Can they discharge patients? These are only some of the questions that physical therapists have asked me. Even with 12 years of experience as a physical therapist assistant, I sometimes find it challenging to answer them. I inform them of my education, clinical experience, continuing education courses, company policies, and the laws regarding supervision of a PTA under the direction of a Physical Therapist. Developing a strong relationship of communication and trust between the PT and PTA is essential to providing quality, cost-effective physical therapy care.

These questions, as well as the PTA's role in physical therapy are clearly explained by specific examples in this volume. The book also demonstrates how PTAs can develop a successful partnership with the physical therapist.

Two experienced and credible authors wrote this book. Dr. Curtis' background includes a wide variety of experiences in clinical practice, staff development and supervision, clinical research, and clinical and academic teaching in physical therapy. Her academic teaching experience includes graduate courses in physical therapy professional issues, research methods, communication, health education, career development, and psychosocial considerations in health care. Ms. Newman is a physical therapist assistant program director, and served as invited project reviewer of the PT-PTA Collaboration Module developed by the National Assembly of Physical Therapist Assistants.

This comprehensive text was written as a guide for physical therapist assistant students in making choices as they progress through the educational program. The information is presented in 6 organized sections with a 'Putting into Practice' exercise at the end of each chapter to apply the information in the PTA program or clinical setting.

The first section provides an introduction to physical therapy and how it will change in the future. A description of the PT-PTA preferred relationship, and the changing roles of the physical therapist and the physical therapist assistant in the health care environment.

The next 3 sections are a guide for the physical therapist assistant student through the educational program. Included are financial aspects of the PTA program, codes of conduct, student expectations, as well as legal and ethical issues in physical therapy. Strategies are provided to aid the PTA student in the learning process, test taking, and preparing papers. There are also chapters providing helpful information to students with disabilities, and career transition students.

Section 5 emphasizes the importance of evidence-based practice in physical therapy, and describes the role of the PTA in gathering and communicating information while delivering the established plan of care. There is a chapter on how to collect and to use appropriate clinical information. With all of the resources available to us today, I found this to be very helpful. The section concludes with the benefits of membership of the APTA and the advantages of attending conferences.

The last section prepares the PTA student for entering the job market, including taking the national exam in states where required, and developing a resume. Samples of cover letters and tips for interviewing are also included in this section. The final chapter stresses the importance of communication in developing successful relationships with the PTA's supervising PT. What can you do to promote a successful PT-PTA preferred relationship?

Each chapter is presented in an easy-to-read format. Specific examples and tables are used to reach objectives. References, recommended reading, and links to web sites are included. Each chapter ends with helpful 'Putting it into Practice' exercises.

The end of the book has several appendices that the physical therapist assistant student can refer to regarding APTA Code of Ethics and Guide to Professional Conduct, Standards of Practice for Physical Therapy, Direction and Supervision of the Physical Therapist Assistant, Levels of Supervision, and Provision of Physical Therapy Interventions and Related Tasks.

The PTA Handbook: Keys to Success in School and Career for the Physical Therapist Assistant is a complete, easy-to-use resource for the physical therapist student who want to achieve the most out of their education and career. I would highly recommend this book for any PTA student, PT, PTA, or clinic manager.

Andrew MacFarlane, PTA

Shultz SL, Houglum PA, Perrin DH.
***Examination of Musculoskeletal Injuries.* 2nd ed. 2005, Champaign, Ill: Human Kinetics; 698 pp., illus.**

This text is 1 of 5 in the Athletic Training Education Series written primarily for athletic training students and as a reference for practicing athletic trainers. This text is entirely devoted to examination principles and procedures. Treatment and management techniques are presented in the other textbooks in the series referenced above. Additionally, the aim of the text is to reflect the competencies required for certification by the National Athletic Trainers Association (NATA). Examination of Musculoskeletal Injuries 2nd ed. is a revision of the text *Assessment of Athletic Injuries,* published in 2000.

The text is divided into 3 parts. Part I

presents principles of examination which includes chapters on nomenclature and injury classification, observation, palpation; examination of motion, strength, neurological status; cardiovascular; and respiratory status. Part II discusses region specific examination strategies for cervical, thoracic, lumbar spine; shoulder and arm, elbow and forearm; leg, ankle and foot, knee, and thigh; hip, pelvis and groin; head and face; thorax and abdomen. Part III describes the recognition of general medical conditions. The information is presented on a body-system basis and discusses common medical diagnoses seen by athletic trainers.

Each section that deals with examination principles begins with chapter objectives that reflect the competencies within the chapter. Sections begin with brief introductory case presentations. Didactic information is then developed. Where appropriate, the text describes how examination procedures are altered and prioritized due to acute or emergent situations and onsite examination situations versus clinic situations. Examination checklists are provided in all areas in an easily read format and are comprehensive. Printable versions of the checklists are available online on the publisher's web site. All examination procedures including special tests are effectively demonstrated through photos, illustrations, and tables.

At the end of each chapter a summary, review questions, and critical thinking questions are presented to help the reader to integrate chapter constructs. A reference section for each chapter is provided. The text references mostly other texts on examination procedures.

Overall, the text accomplishes the goal of providing relevant examination principles and procedures for musculoskeletal injuries in a sequential and logical format. Constructs are developed at a level consistent with an entry level or intermediate level curriculum course for student athletic trainers. This text is clearly geared for the developing athletic trainer and will likely be viewed as a necessary resource for instruction and review prior to certification examination. Experienced physical therapists might find this text somewhat cursory as this is an entry-level text that covers many regions of the body and other region specific texts are more exhaustive. Although, therapists working in primary care settings may find the emergent examination procedures presented useful in prioritizing of procedures. The presentation of initial first responder examination procedures for a variety of diagnoses is not a subject often presented in physical therapy texts and was interesting. The checklists provided in the text would also be helpful for entry-level physical therapists in order to be inclusive and thorough in their examination procedures. I would highly recommend this text for student athletic trainers or physical therapists that are interested in developing athletic training skills or certification through the NATA.

Timothy J. McMahon, MPT, OCS

Solomon R, Solomon J, Minton S, eds. *Preventing Dance Injuries,* 2nd ed. Champaign, Ill: Human Kinetics; 2005, 243 pp, illus.

This book was originally published in 1990 and was considered the initial text in its field. In this revision, the book is separated into 4 parts: Screening for Common Dance Injuries; Diagnosing, Treating, and Rehabilitating Dance Injuries; Preventing Dance Injuries through Biomechanically Efficient Training; and lastly, Psychological Concerns.

The first chapter discussed the epidemiology of dance injuries. It is the author's belief that to prevent injuries, a clinician must understand the what, when, where, and how an injury occurs. A sample of an intake survey is provided. Physical screening procedures are discussed in the second chapter and are conducted by various professionals: kinesiologist, physician, athletic trainer, and physical therapist. A discussion of the somatic screening procedure using Bartenieff Fundamentals is reviewed in chapter 3. The fundamentals identify inefficient motor function and the potential for chronic injury.

Part 2 of the textbook discusses common foot and ankle injuries, knee problems (medial knee strain, patellofemoral pain, tendonitis, torn ligaments/menisci and subluxing and dislocating patellae), iliopsoas tendonitis, stress factures, and spinal problems in dancers. Spinal problems emphasized are overuse injuries, spondylolysis, scoliosis, disc herniation, and mechanical low back pain. Each chapter presents an anatomical review, etiology, signs and symptoms of the disorder, and treatment of the condition.

Preventing dance injuries through biomechanically efficient training is the scope of part 3 of the textbook. Chapters 9 through 12 include a discussion of efficient warm-up, a biomechanical approach to injuries and consideration of the turnout position, flexibility exercises, strengthening and stretching of the muscles of the ankle and talus, and pronation as a predisposing factor of overuse injuries. The last portion of the text discusses psychological concerns related to stress and performance, prevention of eating disorders, and the female athlete triad in dancers.

This book also supplies recommended readings by the author and editors to support the discussions. A dance glossary and a medical glossary are provided to assist the reader with the information presented.

Dancers do have a unique set of issues different from other athletes. It is helpful to understand the expectations of a dancer and the susceptibility they have towards particular injuries. This text is a very good reference for those clinicians who evaluate and treat dancers.

Sylvia Mehl, PT, OCS

Perrin DH. *Athletic Taping and Bracing,* 2nd ed. Champaign, Ill: Human Kinetics; 2005, 122 pp., illus.

Athletic Taping and Bracing, 2nd edition was written to serve as a guide for athletic training instructors and an aid to students to help them understand and master the art and science of athletic taping and bracing. The author, David H. Perrin, PhD, ATC, a highly respected athletic trainer and educator, published the first edition of this book in 1995.

The book is comprised of 7 chapters. Chapter 1 provides an introduction and overview to taping and bracing within the context of the practice of athletic training. Chapters 2 through 7 take a regional approach to describing 36 different taping and bracing techniques; each chapter also pro-

vides outstanding anatomical illustrations, relevant discussions of injury mechanisms, and basic stretching and strengthening exercises that can help the athlete who has completed a rehabilitation program maintain strength and flexibility. The following regions of the body are covered by individual chapters within the book: (1) the foot, ankle, and lower leg; (2) the knee; (3) the thigh, hip, and pelvis; (4) the shoulder and arm; (5) the elbow and forearm; and (6) the wrist and hand.

Chapters 2 through 7 begin with regional range of motion and anatomical descriptions and are then organized according to common injuries that occur at that body region that can benefit from taping or bracing. For example, for the chapter on the foot, ankle, and lower leg, the author describes injury mechanisms, appropriate taping and bracing techniques, and basic exercises for ankle sprains, Achilles tendon strains and tendonitis, arch strains and plantar fasciitis, Morton's neuroma, great-toe sprains, heel contusions, and shin splints. The text is routinely supplemented by high quality color illustrations and photographs. In the foot, ankle, and lower leg chapter alone, for example, 12 different taping and bracing techniques are described in great detail with 133 color illustrations and photographs supplementing the text.

The taping sequences presented in this book are very thorough and are presented in a clear and understandable manner. An excellent feature of the second edition of this text is that the photographs that illustrate taping sequences use tape with darkened edges that allow readers to differentiate layers and patterns of tape applied in each step of the procedure. Other improvements to this edition include the use of highly detailed color illustrations and photographs and the inclusion of key palpation and surface anatomy landmarks. This book also contains a glossary of relevant terms and a brief list of suggested readings. Future editions of this book could be improved by discussing the efficacy of taping and bracing and including a CD-ROM, demonstrating some of the more complex techniques.

Overall, this is an outstanding book that is well organized, easy to understand, and clinically oriented. Although the stated audience for this book is athletic training instructors and students, this book is highly recommended for physical therapists or physical therapist students who would like to improve their taping and bracing skills or who use taping and bracing techniques as part of their treatment plans.

Michael D. Ross, PT, DHS, OCS

Standring S, ed. *Gray's Anatomy: The Anatomical Basis of Clinical Practice,* 39th ed. Edinburgh: Elsevier Churchill Livingstone; 2005, 1627 pp, illus, with accompanying CD ROMs.

Minimum system requirements for CD-ROMs:

Windows: Windows 98 or higher, Pentium processor-based PC, 32 MB RAM (64 MB recommended), 10 MB of available hard-disk space, 2x or faster CD-ROM drive, 800 x 600 resolution VGA monitor supporting thousands of colors (16 bit or greater), Internet connection

Macintosh: Mac OS9 or higher, 64 MB RAM or greater, 10 MB of available hard-disk space, 2x or faster CD-ROM drive, 800 x 600 resolution VGA monitor supporting thousands of colors (16 bit or greater), Internet connection

Gray's Anatomy has been an accepted classic since it was first published in 1858. As the information and anatomical knowledge has increased over the years, Gray's Anatomy has also grown in size and depth.

The entire text is now available on line with the purchase of the book. This site includes many options including weekly updates, related web sites, and all of the images from the book, which can be downloaded into PowerPoint for presentation purposes. There are links to Medline for some of the references, which can be viewed. There are links to similar articles, which can also be accessed. One of the CD-ROMs also contains all of the images from the text. The reader has permission to use these for presentations and the other CD-ROM has anatomical models that can be manipulated and displayed in layers. There are also tests that the reader can take to test their anatomical knowledge. The web site and CD-ROMs are navigated easily, even for a novice computer user.

The text has been rearranged by body region instead of by body systems as in previous editions. The book is richly illustrated with almost 2,000 photos and illustrations. The book also contains the latest imaging technology to further enhance the material. Clinically relevant information is included such as placement for the needle for caudal epidural injections, posture and ergonomics, EMG studies from gait analysis, etc. The 116 chapters are divided into 8 sections. Sections are color-coded to allow for quick reference to specific sections. The sections include Introduction and Systemic Review, Neuroanatomy, Head and Neck, Back and Macroscopic Anatomy of the Spinal Cord, Pectoral Girdle and Upper Limb, Thorax, Abdomen and Pelvis, and Pelvic Girdle and Lower Limb. Descriptive references follow each chapter.

The use of illustrations of imaging makes this book unique. There are electron microscope pictures showing different tissues to the use of CT scans and MRI showing normal and abnormal anatomy and pathology. The book is logically organized, making it easy for the reader to find information. This latest edition makes a valuable reference for any physical therapist regardless of the setting in which they work.

Jeff Yaver, PT

2005 Clinical Research Grant Recipients Include:

John P. Gerber, PT, DSc, ATC, SCS
Eccentric resistance following ACL reconstruction: Can improvements inmuscle size, strength, and function be amplified in the early postoperative period?
Amount granted: $9,500.00

Angela Tate, PT, MS
Identification of scapular dysfunction in overhead athletes
Amount granted: $2,214.00

orthopaedicnews

Congratulations Newly Orthopaedic Certified Specialists! All 451 of You!!

Adam Phillips Rufa, PT, MPT
Aimee Catherine Guarriello, PT, MPT
Alan A. Budnick, PT, MPT, OCS
Alex Michael Koszalinski, PT, DPT
Amanda Smith-Socaris, PT, OCS
Amy Elizabeth Hilbert, PT, MPT
Amy L. Mobius, PT, MSPT
Amy Selinger, PT, MS, OCS
Amy Sorg Bencic, PT, DPT
Amy Woods-Welsh, PT, MS, OCS
Andrea E Naso McCuskey, PT, MS, OCS
Andrea M Byrne, PT, OCS
Andrew Clifton Bennett, PT, DPT
Andrew J Tatom, III, PT, DPT, OCS
Annette Quijada Jones, PT, OCS
Annie Christine Raymond, PT, MPT
Barbara Tortora Grochowski, PT, MS, OCS
Barry John Morin, PT, MSPT
Bartholome Joseph Horrigan, PT, OCS
Becky J Rodda, PT, MHS, OCS
Ben Waide, PT, OCS
Bernardine Rene Thomas, PT, OCS
Beth Ann Wieber, PT, OCS
Betina Bishop Bain, PT, BA
Betsy P. Kelley, PT, OCS
Betty Misao Shiba Shaw, PT, BS
Beverly J Klug Parrott, PT, MS, OCS
Biagio D. Mazza, PT, MPT
Boyd Joseph Bender, PT, OCS
Brendan John Toner, PT, OCS
Bret Edward McLeod, PT, MPT
Brett Alan Peterson, PT, MPT
Brett Allen Altman, MPT, OCS, SCS, ATC
Brett L. Bishop, PT, OCS
Brian A. Gilbert, PT, OCS
Brian Dale Elza, PT, DPT
Brian Emmett Dougherty, PT, OCS
Brian John Eckenrode, PT, MSPT, OCS
Brian L Beaulieu, PT, MPT
Brian Randall Duncan, PT, MSPT
Brian Scott Jennings, PT, OCS
Brian T. Swanson, PT, OCS
Brian Thomas Taylor, PT, MPT
Brian Thomas Wessel, PT, MPT
Bruce Boswell Inniss, PT, MS, OCS
Bruce R. Applegate, PT, OCS
Bruce Randolph Snow, PT, MSPT
Bryan Alexander Regar, PT, OCS
Bryan Allison Kirkpatrick, PT, MSPT
Bryan M. Downs, PT, MS
Burt Richard Reed, PT, OCS
Camilla Darrow Fortune, PT, OCS
Cara Luree Wendel Wurst, PT, OCS
Carl J Mangione, PT, DPT
Carol D. Blair, PT, OCS, SCS
Carol Griggers Johnston, PT, MPT
Carolyn Wadsworth, PT, MS, OCS
Carrol Anne Esterhuizen, PT, MHS, OCS, CPI
Carroll E Brown, PT, MS, OCS
Catherine M. Barry, PT, MS, OCS
Cathleen A Latoof, PT, OCS
Chad T. Durboraw, PT, MPT, OCS
Chantal M. McDonald, PT, MS, OCS
Charles T Hanson, PT, OCS
Cheryl B. Howard, PT, MS, OCS
Chesson Paul Clement, PT, BS
Chris Adam Burmaster, PT, BSPT, OCS
Chris Steven Custer, PT, BS
Christianne Marie Misetich-Hippe, PT, OCS
Christie Diane Karle, PT, OCS
Christina Patricia Machielson, PT, MSPT
Christine M. Vincek, PT, DPT, OCS
Christine Marie Fissel, PT, MSPT, OCS, CSCS
Christopher A. LeVan, PT, OCS
Christopher Daniel Gray, PT, OCS
Christopher G. Rosado, SPT, MPT
Christopher Glynn Alligood, PT, MS, OCS
Christopher J. Stott, PT, BS
Christopher James Izu, PT, MPT
Christopher John Dahm, PT, MSPT
Christopher John Linson, PT, OCS
Christopher M Bajema, PT, MS, OCS
Christopher M. Kaczmarek, PT, OCS
Christopher Paul Derosa, PT, BS
Christopher S Ficke, PT, OCS
Christopher Schoolfield, PT, MSPT
Christy Alliese Murr, PT, OCS
Cindy Ann Martin, PT, OCS
Cindy J Benson, PT, MPT, OCS
Cindy Yi-hang Chu, PT, MPT
Clare Monica Jones, PT, OCS
Clarke Douglas Brown, PT, DPT, ATC, OCS
Clover Afton Farr, PT, MPT
Colleen Danielle Johnson, PT, OCS
Colleen Marie Liaga, PT, OCS
Colleen S McClain, PT, OCS
Connie Lynn Bowin, PT, MA
Corey Paul Arcement, PT, OCS
Cori Marie Rowe, PT, OCS
Cory Jonathan Middel, PT, MPT
Cory W. Peed, PT, OCS
Courtney L. Hamilton, PT, OCS
Craig Arthur Reeder, PT, BS
Craig Kurtis Carlson, PT, MPT
Craig Whitney O'Neil, PT, OCS
Crispino Abad Luzano, Jr., PT, BS
Cristina Ann Neuwirth, PT, MPT
Curtis Joseph Goodwin, PT, OCS
Cynthia Ann Maurer, PT, DPT, OCS
Cynthia Dew Card, PT, MOMT, OCS
Cynthia Louise McLean, MPT
Dale Richard Corum, II, PT, OCS
Damien Thomas Scott, PT, MS
Daniel Chesley Kirk, PT, MPT
Daniel Morgan Johnston, PT, OCS
Daniel Paul Bien, PT, MSPT
Daniel Paul Fisher, PT, OCS
Daniel Pauley, PT, OCS
Daniel Roger Poulsen, II, PT, MA, OCS
Danny Joe Hollingsworth, PT, MPT
Darlene M. Harmon, PT, MS
Darlene Marie Eubanks, PT, OCS
Darren Mathew Heer, PT, MPT
David A Boyce, PT, EdD, OCS, ECS
David A. West, PT, OCS
David Anthony James, PT, MSPT
David Bertone, PT, OCS
David Cameron, PT, OCS
David Dean Van Zant, PT, DPT
David O'Connor Dinn, PT, MS
David P. Sucato, PT, MSPT, OCS
David Scott McIntosh, PT, OCS
David Scott Overby, PT, MHS
Dawn Bauer Underwood, PT, OCS
Dawn Elizabeth Sitler, PT, OCS
DeAnn Vandebogart Lee, PT, OCS
Deborah A Hawke-Headley, PT, OCS
Deborah Ann Grange, PT, OCS
Deborah Charmaine Oickle, PT, MHSc
Deborah Nannette Wendt, PT, OCS
Debra J Alviso, DPT, OCS
Debra L Shaw-Davis, PT, DPT, MS, OCS
Debra L. Powell, PT, BSPT
Della Lee, PT, DPT
Dennis Roger Blomberg, PT, BA
Derek Robert Castonguay, PT, BSPT
Diane Cordeiro, PT, MPT, OCS
Diane L. Piekara, PT, OCS
Diane Santos Lantagne, PT, MPT
Don Alexander Padick, PT, MPT
Donald Olsen, PT, EdD, OCS
Douglas James Rich, PT, OCS
Duane Scott Davis, PT, OCS
Dwight L. Baldoman, PT, OCS
Edie Knowlton Benner, PT, MA, OCS
Edward Otto Hauschka, PT, MS
Eileen M. O'Neill, PT, MPT
Elaine Anderson, PT, MPT, OCS
Elissa Driban, PT, OCS
Elizabeth Ailene Mason, PT, MSPT
Elizabeth Evie Smith, PT, MSPT
Elizabeth K Corpuz, PT, MSPT
Elizabeth S. Norris, PT, MS, OCS, PhD
Ellen S. Pescosolido, PT, MPA
Emile Ignatius Yacoub, PT, DPT
Emily J. Ladd, PT, OCS
Emily Rae Pomeroy, PT, OCS
Eric Scott Grenier, PT, MPT
Erika Luise Wilbur, PT, MSPT
Evan R Jones, PT, OCS
Farzana Anjum, PT, OCS

Frances A Hansen, PT, OCS
Francine Noel-Ford, PT, DPT, OCS, MBA
Gail Ellen Maciejewski, PT, OCS
Gary S. Struble, PT, DPT, OCS, MDT
Geoffrey Michael Kandes, PT, OCS
George Alan Summers, PT, OCS
George S Young, DPT, OCS
George T. Edelman, PT, OCS
George Waldrip Birdsong, PT, OCS
Gilbert A Schoos, PT, MA, OCS
Glenda K Maines, PT, OCS
Greg Alan Harada, PT, DPT
Gregory Adrian Todd, PT, OCS
Gregory T. Peake, PT, OCS
Gregory Zevin, PT, OCS, MTC
Gretchen A. Seif, PT, MHS
Haideh Victoria Plock, PT, MSPT
Halle L. Wilson, PT, DPT
Heather Ann Milligan, PT, MSPT
Heather L. Jurca, PT, OCS
Heather Matheson Shanahan, PT, MSPT
Heidi Ozawa Contractor, PT, ATC, CSCS
Heidi Theresa Pickering, PT, MPT
Holly Christine Tanner, PT, MA
Holly E. Mrazek, PT, BS
Ian F. Hazelton, PT, MSPT
Inna Keselman, PT, MPT
Irene F. Blehein, PT, OCS
Iulian Mihai Lugoj, PT, MS
Jack Lee Ryals, Jr., PT, ATC
Jacqueline H. Randa, PT, OCS
Jacqueline Lynn Pollock, PT, OCS
Jacquelyn Hoagland Lockwood, PT, OCS
Jacques Leslie Beauchamp, DPT, SCS, OCS, ATC
James A. Dronberger, PT, DPT
James Allen Kirk, PT, OCS
James D. Foltz, PT, MPT
James Daniel McCallum, PT, OCS
James Richard Caron, PT, OCS
James T. Henricksen, PT, OCS
James W Moore, PT, OCS
Jane Groeneweg Keehan, PT, MEd, OCS
Jane Helmeczi, PT, MPT, OCS
Janet Maria Caputo, PT, OCS
Janet Marie King, PT, OCS
Janice L Volk, PT, OCS
Janine E Nesin, DPT, OCS
Janine Mary Moore, PT, MS
Janna Elyse Woodrich, PT, OCS, Cert MDT, C
Jarol Lyn Baumann, PT, OCS
Jason Alden Winburne, PT, MPT
Jason Dean Gauer, PT, MPT
Jason Ellis Mattox, PT, OCS
Jason Patrick Reiss, PT, MPT
Jason Quentin Avakian, PT, OCS
Jason W. Matthews, PT, MSPT
Jason William Bruns, PT, OCS
Jay A Bernasconi, PT, MS, OCS
Jay A. Smith, PT, OCS
Jay Lamble, PT, MS, OCS, NCS
Jeanie Jong-Mi Kim, PT, MPT
Jeanna-Marie Barsamian, PT, DPT, OCS, ATC
Jeanne Kowal Smith, PT, MPA, OCS, DPT
Jeff Giulietti, MPT, ATC, OCS, COMT
Jeff T. Busha, PT, OCS
Jeffery Kyle Bradley, PT, MPT
Jeffrey M. Hetrick, PT, OCS
Jennifer Anne Manning, PT, OCS
Jennifer Cooper, PT, OCS
Jennifer Dean Malecki, PT, OCS
Jennifer Elizabeth Halvaksz, PT, MPT
Jennifer Erin Penrose, PT, OCS
Jennifer Gayda Zoller, PT, OCS
Jennifer H Hill Ryan, PT, MS, OCS
Jennifer Lynn Janes, PT, BA
Jennifer M. Masterson, PT, OCS
Jennifer Marie Batchelor, PT, OCS
Jenny Marie Braddock, PT, OCS
Jeremy Logan Schafer, PT, OCS
Jeremy Shane Angaran, PT, DPT
Jessica R Nelsen, PT, OCS
Jill Elizabeth Solon, PT, MPT
Jill Joanna Tillman, PT, OCS
Jill Michele Tomasello, PT, OCS, FABDA
Jiten Bhupendra Bhatt, PT, MPT, OCS
Joanne Macza, PT, BScPT
Joanne Zrenda Moore, PT, DHSC, OCS
Jodi Llacera Klein, PT, DPT, MS, OCS
Jodi Marie Boyd, PT, MSPT
Jody Christine Dexter, PT, MPT
Joel Matthew Long, PT, OCS
Joey Edward Harbison, PT, BS
Johanna Gabbard, PT, OCS
John Alan Kangas, PT, MPT
John Bradley McAlister, PT, BA
John Charles Pearson, PT, OCS

John Frederick Nelson, PT, BS
John G Annes, PT, MS
John G Campbell, PT, MS, OCS
John Gregory Hogue, PT, OCS
John Keith Obsenares, PT, OCS
John Kyle Gibson, PT, OCS
John L. R. Gillanders, PT, OCS
John Lennox Echternach, Jr., PT, MS
John Lockard, PT, OCS
John Mason Somerndike, PT, MPT
John Owen Tunnell, PT, OCS
John P Storck, PT, MPT
John P. Dennis, PT, OCS
John R. Martin, PT, OCS
John R. Ragonese, PT, MPT
John Randal Celestino, PT, GCS, MTC
John Russell Astrab, PT, MSPT
John Todd Mansfield, PT, OCS
John Vincent Marrujo, PT, OCS
Johnnie Brooks Burnett, PT, OCS
Jolene L. Bennett, PT, MA, OCS
Jonathan Chad Moore, PT, OCS
Jonathan David Keller, PT, MPT
Jonathan Robert Zecher, PT, OCS
Jonathan Wade Erhardt, PT, OCS
Jose Antolin Dominguez, PT, MPT
Joseph C. Whelan, PT, OCS
Joseph D. Chanoi, PT, OCS
Joseph G. Montalto, PT, MSPT
Joseph Rahmon Kardouni, PT, OCS
Josephine J. Park, PT, MSPT
Joshua Casey Richling, PT, OCS
Judith A D'Annunzio, PT, OCS, MTC
Judith R Gale, PT, DPT, MPH, OCS
Julia C. Gorman, PT, OCS
Julie A Pryde, PT, MS, OCS, SCS
Julie Chita, PT, BA
Julie L. Green, PT, MSPT
Justin Barber Gornell, PT, DPT, OCS
Justin Dennis Eisenhofer, PT, MPT
Justin Zebulon Laferrier, PT, MSPT
Karan W. Kelly, PT, OCS
Karen Anne Northrop, PT, OCS
Karen Holtgrefe, PT, OCS
Karen Louise Greeley, PT, OCS
Karen O Granato, PT, MPT
Kari L. Sturtevant, PT, OCS
Karyn Lynn Staples, PT, MPT
Kathleen Anderson, PT, MBA, OCS
Kathleen M Flanagan Stupansky, PT, OCS
Kathleen Tierney Geist, PT, OCS
Kathryn Ellen Rittenberg, PT, OCS
Kathryn P. Hemsley, PT, OCS
Kay Scanlon, PT, OCS
Kayla Marie Smith, PT, OCS
Keith Maderazo Ancheta, PT, DPT
Kelli A. Goedde, PT, OCS
Kelly A. Hensler, PT, OCS
Kelly Emma Reed, PT, OCS
Kenneth George Shok, PT, OCS
Kenneth Wayne Roberts, Jr., PT, OCS
Kevin Keith Dean, PT, OCS
Kevin Michael McClenahan, PT, BS
Kevin O'dell McAlister, PT, OCS
Kevin Wong, PT, OCS
Kimberley Anne Kules, PT, OCS
Kirsten Gaines Transue, PT, MPT
Kirti Malik, PT, OCS
Kristen Elise Brehm, PT, OCS
Kristen Stairs Corderman, PT, OCS
Kristin Kirk Sheehan, PT, MPT
Kristina M. Welsome, PT, CFMT, MSPT, OCS
Kyle Alan Watterson, PT, MS, ATC, OCS
Kyle Owen Fleischmann, PT, MS
Kyle Robert Adams, PT, MPT, CSCS
L.N. Shankarkrishnan, PT, OCS
Lance D Smith, PT, OCS
Laura Ann Iverson, PT, OCS
Laura Hagan, PT, MS
Laura Jean Homer, PT, OCS
Laura Kenny, PT, OCS
Lauren Susan Yee, PT, OCS
Laurie Kathleen Barnum, PT, MPT
Leigh Stalker deChaves, PT, OCS
Lenore Esther Filler, PT, OCS
Linda Jo Patterson, PT, OCS
Linda Monroe, PT, MPT, OCS
Linda T O'Connor, PT, MS, OCS
Lisa A. Grieco, PT, OCS
Lisa Jean Shepard, PT, DPT
Lisa K Davis, PT, OCS
Lisa Marie Sottung, PT, OCS
Lois Louise Michaelis Goode, PT, OCS
Lori Ann Loveday, PT, OCS
Lori J. Hogan, PT, MSPT
Lori J. Monson, PT, MPT, OCS
Lorraine L. Mathieu, PT, OCS
Lynn H. Watkins, PT, BS
Malisa Teresa Tantraphol, PT, DPT, OCS
Marc David Cavallino, PT, OCS
Marcie Harris Hayes, PT, DPT
Margaret I Bradley, PT, MS, OCS
Margaret M Hopson, PT, MA, OCS
Marianne C. Ryan-Swanson, PT, BS, OCS
Mark Alan Peterson, PT, OCS
Mark Daniel Thomson, PT, FAAOMPT
Mark E Howard, PT, OCS
Mark Edward Deysher, PT, MPT
Mark Eric Lester, PT, MPT
Mark Herbert Blakely, PT, OCS
Mark L Marchino, PT, MHS, OCS
Mark R Langenbach, PT, MBA
Mark R. Disalvo, PT, OCS
Mark Richard Siegel, PT, BS
Mark S. McConnell, PT, MPT, OCS
Mark T Kalinowski, PT, OCS
Marlon Kim Trespeses Borbon, PT, OCS
Marnie Z. Clemens, PT, OCS
Marshall A. Hagins, PT, OCS
Martin J. Kelley, PT, DPT, OCS
Mary Ellen Shanahan, PT, BA
Mary Lynn Wilson, PT, BS
Mary S. Stanford, PT, MPT
Matthew Albert Rogers, PT, DPT
Matthew J. Smelas, PT, OCS
Matthew Joseph Armentano, PT, MPT
Matthew V Zurek, PT, OCS
Maureen M. Clancy, PT, DPT
Megan Gillespie Yount, PT, OCS
Meghan Mulholland, PT, MPT, OCS
Melanie F Reid, PT, OCS
Melissa Catherine Kolski, PT, OCS
Melissa Merritt, PT, OCS
Melodie Mattson-Bell, PT, OCS
Michael Allan Andersen, PT, MS
Michael B. Woody, PT, OCS
Michael Brian Hoag, PT, MBA, OCS
Michael C. Knob, PT, MSPT
Michael Charles Gayle, PT, MA
Michael David Pile, PT, MSPT
Michael Edward Zahn, PT, OCS
Michael Gene Jacketta, PT, OCS
Michael James Cabiro, PT, BS
Michael Paul Quesnell, PT, MPT
Michael T. Cibulka, PT, MHS, OCS
Michele Susan Townshend, PT, OCS
Michelle H. Cameron, PT, OCS
Michelle Katreen Spicher, PT, OCS
Michelle R Steinhagen, PT, DPT, OCS, CSCS
Mitchell T. Maione, PT, DPT, OCS, MTC
Mohammad Reza Nourbakhsh, PT, PhD
Myra L Pumphrey, PT, OCS
Nancy Galloway Droege, PT, OCS
Nancy Jane Platt, PT, MS, OCS
Nathan James Lilley, PT, MPT
Neil Scott Chernick, PT, MSPT
Neil Scott Dreben, PT, MPT
Nicholas Alan Austin, PT, MSPT, OCS
Nichole Michelle Chennault, PT, OCS
Nicole Marie Marcelli, PT, BS
Nicole Michelle Haas, PT, MPT, OCS
Pamela Sue Knickerbocker, PT, MS, OCS
Patricia Anne Rouleau, PT, OCS
Patricia Anne Thoma, PT, OCS
Patricia Joy Doyle, PT, OCS
Patricia Lamas Beers, PT, OCS
Patricia Lynn Jakobi-Stopper, PT, OCS
Patricia R. Nelson, PT, OCS
Patricia Sulita, PT, OCS
Patricia Wells Ireland, PT, MS, OCS
Patrick A Dillon, PT, OCS
Patrick B Zell, PT, OCS
Patrick John Fox, PT, OCS
Paul Anthony Norquist, PT, MPT
Paul Durant Stoneman, PT, MPT, OCS
Paul Eric Anderson, PT, OCS
Paul Ernest Mintken, PT, OCS
Paul Fohrman, PT, OCS
Paul J. Salvi, PT, BS
Paul L Christensen, PT, DPT, OCS, ATC
Paul Michael McGhee, PT, OCS
Paula D Levinson, PT, OCS
Paula Marie Fulgham, PT, OCS
Pauline R Patterson, PT, BS
Peter Barnett, PT, DPT, OCS
Peter R Ouellette, PT, MEd, OCS
Peter Richard Deffner, PT, OCS
Philip James Anderson, PT, OCS
Philip Molina, PT, DPT, OCS
Phillip Matthew Edwards, PT, BS
Phillip Sebastian May, PT, OCS
R. Dennis Leighton, PT, MS, OCS
Randal Norman Denton, PT, OCS, MS

(Continued on page 36)

Randy Don Castleman, PT, MSPT, OCS
Rebecca Ann Davidson, PT, BS
Rebecca Fishbein Guttentag, PT, OCS
Rebecca L Kern-Steiner, PT, OCS
Rennie Maeda, PT, MS, OCS
Rhodri L. Purcell, PT, OCS
Rhonda Sherwood Cornwell, PT, MPT
Richard Anthony Linkonis, PT, OCS
Richard Anthony Tubre, PT, OCS
Richard David Clubb, PT, MS
Richard David Holcombe, PT, BS
Richard Dean Maas, PT, OCS
Richard F. Haydt, PT, OCS
Richard Kent Kurfman, PT, DPT, OCS, MTC
Richard P. Friscia, PT, MS, OCS, CSCS
Richard Perry Hopson, PT, BSPT
Richard T Danielson, PT, MSPT
Robert F. Crawford, PT, BS
Robert M. Snow, PT, DPT
Robert Marston Barnes, DPT
Robert Nici, PT, MHS, OCS
Robert S. Cheng, PT, OCS, COMT
Robin Evans Galley, PT, OCS
Robin Litteral McCollough, PT, MSPT
Rodman McHenry, PT, ATC, OCS, CSCS
Roger D Robinson, Jr., PT, OCS
Ronald T Satow, PT, OCS
Russell Shawne Biggers, PT, MPT
Ryan David Klement, PT, BS
Ryan T. Girrbach, PT, OCS
Sally A. Trilli-Coll, PT, OCS
Sally J. Barnette, PT, BS
Samuel T Anaya, PT, DPT, OCS, MTC
Sara A. Rogers, PT, MS, OCS
Sara Michelle Grannis, PT, DPT
Sarah DeWit Lusk, PT, OCS
Sarah Jane Waters, PT, OCS
Sarah Kathryn Anderson, PT, OCS, DPT, MTC
Scott A. Steenhard, PT, MPT
Scott Adam Smith, PT, OCS
Scott James Pringle, PT, MPT
Scott O'Neal Normile, PT, MS
Sean Patrick Easley, PT, OCS
Shan M. Teixeira, PT, MOMT
Shari L. Min, PT, OCS, ATC
Shari Walters, PT, OCS
Sharon Marion, PT, OCS
Shawna Ling Yee, PT, DPT
Shelley Lynn Budnick, PT, BSPT, OCS
Sherron Lorraine McGowan, PT, M.Ed
Solomon Medrano Caddauan, PT, OCS
Staci Anne Grueber Wietfeld, PT, OCS
Staci Leigh Cost, PT, OCS
Stefany Dianne Spears, PT, DPT
Stella Dejesa Mendoza, PT, MPT
Stephanie Frances Raefski, PT, MSPT
Stephanie Kay Carter, PT, PhD
Stephanie Nicole Maxfield, PT, MPT
Stephanie R. Metz, PT, MSPT
Stephen W Bannister, PT, EdD, OCS
Steven R. Verhaaren, PT, OCS
Steven Solomon Nieto, PT, DPT, OCS
Sundi M. Hondl, PT, OCS
Susan Coel Clinton, PT, MHS, OCS
Susan Kay Kanai, PT, OCS
Susan Keller Reischl, PT, OCS
Susan Slater, PT, MPT, OCS
Susan W. Priestman, PT, OCS
Suzanne Renee Johnson, PT, OCS
Swati M. Patel, PT, MSPT
Sylvia A Horton Mehl, PT, MS, OCS
T. Kevin Robinson, PT, DSc, OCS
Tamara Lee Perrine, PT, DPT, ATC
Tammara Jo Moore, PT, OCS
Tarri Ann Randall, PT, OCS
Terri Lynn Welby-Zajec, PT, OCS
Terry L. Cox, PT, OCS
Thomas A. Peters, PT, MPT, OCS
Thomas Allen Buches, PT, MS, OCS
Thomas Edward Bezemer, PT, MSPT
Thomas G Sutlive, PT, OCS
Thomas J. Curtis, PT, MS, DSc
Thomas Joseph Milucci, PT, BSPT
Thomas W. Henry, PT, OCS

webwatch

http://vh.org/index.html

According to information posted on the website, Virtual Hospital (VH) has been in existence since 1992 and originates from the University of Iowa. VH is a digital health sciences library designed to meet the needs of health care providers and patients.

The library contains thousands of textbooks and booklets as well as Continuing Education (CE) information to health care providers. The consumer/patient portion of the site is easily navigated and offers expansive topical index. There is also a separate section dedicated solely to children's health issues.

A unique aspect of the site allows for language translation with a simple mouse click into Spanish, German, Portuguese, Russian, or Islandic language.

The website is well organized. Each article link shows a stamp that identifies the peer review status, creation date, and last revision date of the material.

The primary goal of the Virtual Hospital digital library is to make the Internet a useful venue for the sharing of medical information for health care providers and patients. The site offers much to both consumers and providers alike.

FROM THE
education chair

We are busy planning for CSM 2006 in San Diego.

Please plan to join us for some great programming. Our preconference course is

"Ergonomic Tools - Helping Clients and Your Business Everyday"

on Wednesday Feb. 1. We have multiple programs Thursday through Saturday- please check our Section web page or the APTA web page. We have also changed the format of the Black Tie and Roses reception on Saturday night so that is an informal event with a disc jockey.

Please come!

Thomas William Janik, PT, OCS
Timothy Gerard Weinzapfel, PT, OCS
Timothy J. Barnett, PT, MSPT
Timothy John Atkinson, PT, OCS
Timothy L Ainslie, PT, MS, OCS
Timothy Richard Waters, PT, OCS
Tobi Gwendolyne Fox, PT, DPT
Todd Eldon Davenport, PT, OCS
Todd Gibbons Miller, PT, OCS
Tonya Kehn Clines, PT, OCS
Tracey Cosgrove, PT, OCS
Traci L. Hazelton, PT, OCS
Tracy L. Carter, PT, OCS
Trenton Joe Shumway, PT, MPT
Tricia Joyce Altoonian, PT, MSPT
Tuan Minh Nguyen, PT, MPT
Tyler Emerson Pomeroy, PT, MSPT, OCS, FAAOM
Vincent M. Whalen, PT, MS, OCS
Virama Annegret Schmitten, PT, OCS
Virginia Norene Christensen, PT, MS, OCS
Wendy Sewell Byrd, PT, OCS
Wendy W. Schoenewald, PT, OCS
William Bryant Miller, PT, OCS, CMPT
William Jonathan Wilbur, PT, MSPT, OCS
William Lee Confer, PT, OCS
William Philip Slaughter, PT, OCS
Wing Sze Fu, PT, PCS
Wolfgang J.A. Oswald, PT, OCS
Younghoon Kim, PT, MPT, OCS, CSCS

2005 APTA Mandatory Bylaws Changes

Compliance Change #1
ARTICLE XV. AMENDMENTS
Section 2: Amendments Necessitated by Association Action
ADD THE FOLLOWING:
If the intent of an amendment is editorial or to bring the Section's bylaws into agreement with those of the Association, the amendment shall be made as required by the Bylaws Chair and shared with the Board of Directors. The Bylaws Chair shall notify the Section's membership that such amendments have been made.

Compliance Change #2
ARTICLE XII. FINANCE
Section 3: Dues
A. Annual dues for members shall be as follows:

~~Active (other than Active-Student) - $50.00~~
~~Active-Student - $15.00~~
~~Retired Active~~
~~Life – zero dollars~~
~~Affiliate - $30.00~~
~~Retired Affiliate - $30.00~~
~~Life Affiliate – zero dollars~~
~~Student - $15.00~~
~~Student Affiliate - $15.00~~

REPLACE WITH THE FOLLOWING:
Physical Therapist and Physical Therapist – Post-Professional Student: $50.00
Physical Therapist Assistant, Retired Physical Therapist and Retired Physical Therapist Assistant: $30.00
Student Physical Therapist and Student Physical Therapist Assistant: $15.00
Life Physical Therapist: zero dollars
Life Physical Therapist Assistant: zero dollars
Corresponding: zero dollars

C. CHANGE AS FOLLOWS:
All dues changes approved by the Section membership and approved by the Associations' Board of Directors before the Association's deadline will become effective on the first of the ~~Section's~~ **Association's** next fiscal year.

BOARD OF DIRECTOR'S MEETING MINUTES

OCTOBER 6-8, 2005

DRAFT==========MINUTES==========DRAFT

Michael Cibulka, President, called the Fall Meeting of the Board of Directors of the Orthopaedic Section, APTA, Inc. to order at 6:30 PM Central Standard Time on Thursday, October 6, 2005.

Present:

Michael Cibulka, President
Tom McPoil, Vice President

Joe Godges, Treasurer
Jay Irrgang, Director
Bill O'Grady, Director
Kelley Fitzgerald, Research Chair
Ellen Hamilton, Education Chair
Bob Rowe, Practice Chair

Steve Levine, APTA Board Liaison
Tara Fredrickson, Executive Associate
Terri DeFlorian, Executive Director

Absent:

None

The August 23, 2005 Board of Directors conference call meeting minutes were approved as written.

The meeting agenda was approved as amended.

=MOTION 1= Mr. McPoil moved that the Board of Directors create a task force to examine the structure of SIGs and Education Groups on Thursday, October 12, 2006 (the day before the strategic planning meeting) with a report back to the Board of Directors on October 13. ADOPTED (unanimous). The task force will include Joe Godges, Bill O' Grady, Ellen Hamilton, and a representative from each SIG.

The Executive Committee discussed employee bonuses and a decision was made to grant bonuses in 2005.

The Executive Committee agreed that the Board of Directors meeting at CSM 2006 will be held on Friday, February 3 from 6:00–10:00 PM. There will be no Thursday night meeting and no Sunday meeting of the Board.

The Executive Committee discussed several items related to the Independent Study Courses.

=MOTION 2= Mr. McPoil moved that the Board of Directors write a letter to the Sports Physical Therapy Section inquiring about the Sports Section publishing an international Journal of Sports Physical Therapy with the Canadian physiotherapy association. ADOPTED (unanimous)

=MOTION 3= Mr. Irrgang moved to amend the Section bylaws as follows:

ARTICLE VIII. COMMITTEES

Section1: Standing Committees

A. Names

The standing committees shall be the following:
Finance Committee
Nominating Committee
Education Program Committee
Orthopaedic Physical Therapy Practice Committee
Research Committee
Orthopaedic Specialty Council
Practice Committee
Public Relations Committee
Awards Committee
Membership Committee
Home Study Course Committee

MOVE TO AMEND ARTICLE VIII. COMMITTEES, SECTION 1.A. BY SUBSTITUTION:
SECTION 1: STRIKE
SECTION 2: RENUMBER SECTION 1
SECTION 3: FINANCE COMMITTEE
A. COMPOSTION
THE FINANCE COMMITTEE SHALL HAVE A LEASET THREE (3) MEMBERS IN ADDITION TO THE TREASURER, WHO SHALL BE CHAIR. EACH OF WHOM SHALL BE A CURRENT SECTION MEMBER IN GOOD STANDING.
B. FUNCTION
TO ADVISE THE BOARD OF DIRECTORS ON MATTERS PERTAINING TO FINANCIAL NEEDS, GROWTH AND STABILITY, RESENTATION OF AN ANNUAL BUDGET TO THE BOARD OF DIRECTORS, INVESTMENT POLICIES, AND COMPLIANCE WITH FINANCIAL OBLIGATIONS TO APTA.
C. APPOINTMENT
REMAIN THE SAME
D. TERM
REMAIN THE SAME
SECTION 3: RENUMBER SECTION 2

SECTION 4: RENUMBER SECTION 3 – OTHER COMMITTEES
SUCH OTHER COMMITTEES, STANDING OR SPECIAL, SHALL BE ESTABLISHED BY THE BOARD OF DIRECTORS AS DEEMED NECESSARY TO CARRY ON THE WORK OF THE SECTION. MEMBERS OF APPOINTED COMMITTEES SHALL BE CURRENT SECTION MEMBERS IN GOOD STANDING.

The Executive Committee discussed a name change for the Black Tie and Roses Reception. The name selected was the Rose Award Celebration.

The Executive Committee discussed working on trying to combine the SIG receptions with the Rose Award Celebration to cut down on total cost of receptions.

=MOTION 4= Mr. Cibulka moved to allow our corporate attorney to examine the CSM contract and financial information to determine if the CSM contract is being executed properly and within the scope of the law and to determine if any recourse is possible to recoup past income. ADOPTED (unanimous)

=MOTION 5= Mr. Cibulka moved to have the Orthopaedic Section donate $1,000 out of their benevolent giving fund to the Red Cross Hurricane Katrina relief fund. ADOPTED (unanimous)

=MOTION 6= Mr. Fitzgerald moved to approve the addition of Linda Van Dillen, PT, PhD as a member to the Research Committee effective at the end of CSM 2006. ADOPTED (unanimous)

=MOTION 7= Mr. Fitzgerald moved to approve the appointment of Lori Michener as Chair of the Research Committee, effective at the end of CSM 2006. ADOPTED (unanimous)

=MOTION 8= Mr. Fitzgerald moved to allow Lori Michener to attend the Board of Directors Meeting at CSM 2006. ADOPTED (unanimous)

=MOTION 9= Ms. DeFlorian moved that the Orthopaedic Section reimburse $50 per day for meals ($10 for breakfast, $15 for lunch, $25 for dinner) to individuals who are eligible to receive a reimbursement from the Section after their attendance at the meeting. ADOPTED (unanimous)

=MOTION 10= Mr. Cibulka moved that the Orthopaedic Section submit an NC-1 form for the nomination of Joan Bohmert, PT, MS for APTA Vice President in the 2006 election. ADOPTED (unanimous)

The Board of Directors discussed the following issues related to JOSPT; increase in cost to the Section for 2006, partnering with individuals who are not eligible to become members, and

the potential new journal to be published by the Sports Physical Therapy Section.

=MOTION 11= Mr. McPoil moved that the Orthopaedic Section form a task force to explore the options for improving the transition from one president to another and report back to the Board of Directors by CSM 2006. ADOPTED (unanimous)

The Board of Directors discussed liaison activity associated with exhibiting at outside meetings and charged Rick Watson, Public Relations/Marketing Committee Chair, to discuss this with his committee members and bring back to the CSM 2006 Board of Directors meeting.

The Board of Directors discussed sending a Section designee to the 2006 Student Conclave to present. Bob Rowe was asked to be that designee.

The Board of Directors discussed putting forth names to the APTA Appointed Groups. The following individuals will be sent the APTA link with the appointed group form for them to complete: Bob Rowe, Advisory Panel on Practice; Rick Watson, Advisory Panel on Public Relations, Kelley Fitzgerald, Advisory Panel on Research, and Tara Ridge, Committee on Clinical Residency and Fellowship Program Credentialing.

The Board of Directors discussed possible nominees for APTA Awards. Tom McPoil will spearhead gathering information and submitting to APTA.

The To Be Completed items from the August 23 Board of Directors conference call were discussed and updated.

=MOTION 12= Mr. O'Grady moved to amend the bylaws of the Orthopaedic Section, Article VIII by substitution:

The Board of Directors discussed the ICF conference to be held at CSM 2006. Attendance will be by invitation only.

=MOTION 13= Mr. McPoil moved to charge the Orthopaedic Section President to draft a letter to ABPTS and copy the OSC. The letter will include a list of questions the Orthopaedic Section Board of Directors have regarding the Orthopaedic Specialist exam by the November Board of Directors conference call meeting. ADOPTED (unanimous)

=MOTION 14= Mr. McPoil moved to charge the Orthopaedic Section Delegate to communicate through appropriate channels concerns regarding clarification to the House of Delegate P06 position on specialization. ADOPTED (unanimous)

=MOTION 15= Mr. Godges moved that the Board of Directors accept the following Finance Committee recommendations:

- Accept the Section's 2004 audit
- Do not increase Section dues at this time
- Review the CSM disbursement received from APTA
- Decide whether or not to hold the 2006 Fall Strategic Planning meeting at the Section office or at a hotel
- Approve the updated Finance Committee policies
- Appoint Steve Clark to a second term on the Finance Committee beginning June 2006
- Adopt the 2006 budget

ADOPTED (unanimous)

=MOTION 16= Mr. McPoil moved to approve the Board of Directors policy document and cover page. ADOPTED (unanimous)

=MOTION 17= Mr. O'Grady moved to approve the Board, Committee Chair, and SIG policy document. ADOPTED (unanimous)

=MOTION 18= Mr. Cibulka moved to approve the Membership Committee policy document and cover page. ADOPTED (unanimous)

=MOTION 19= Mr. McPoil moved to approve the Education Committee policy document and cover page. ADOPTED (unanimous)

=MOTION 20= Mr. McPoil moved to approve the Publications policy document and cover page. ADOPTED (unanimous)

=MOTION 21= Mr. Irrgang moved to approve the Research Committee policy document and cover page. ADOPTED (unanimous)

The Board of Directors reviewed the Practice Committee policy document and cover page and decided to bring it back up for approval at the November Board of Directors conference call meeting.

=MOTION 22= Mr. McPoil moved to approve the Independent Study Course policy document and cover page. ADOPTED (unanimous)

=MOTION 23= Mr. Irrgang moved to approve the Public Relations/Marketing policy cover page. ADOPTED (unanimous)

The Board of Directors reviewed the Public Relations/Marketing policy document and charged

BOARD OF DIRECTOR'S MEETING MINUTES

OCTOBER 6-8, 2005

Rick Watson, Chair, to update and bring back to the Board of Directors meeting at CSM 2006.

The Board of Directors reviewed the Awards Committee policy document and cover page and at the request of the Awards Committee Chair will table until the November Board of Directors conference call.

The Board of Directors reviewed the Occupational Health SIG policy cover page and charged Bill O'Grady to ask the SIG for clarification on what they mean by practice and research initiatives. This will be brought back to the Board at their November conference call meeting.

=MOTION 24= Mr. McPoil moved to approve the Foot and Ankle SIG policy cover page. ADOPTED (unanimous)

=MOTION 25= Mr. O'Grady moved to approve the Pain SIG policy cover page. ADOPTED (unanimous)

The Board of Directors reviewed the Performing Arts SIG policy cover page and charged Jay Irrgang to contact the SIG and work with them on developing a purpose statement that is not a vision or a mission statement and bring back to the Board of Directors for approval on their November conference call meeting.

=MOTION 26= Mr. Godges moved to approve the Animal Physical Therapist SIG policy cover page. ADOPTED (unanimous)

=MOTION 27= Mr McPoil moved that the Orthopaedic Section Board of Directors write a letter to the ABPTS stating that because of indifference on the part of the ABPTS to concerns the Board has regarding the degradation of the Orthopaedic Certified Specialist, we are left with no choice but to discourage our membership from taking the OCS exam as we proceed with the development of an OCS exam administered by the Section. DEFEATED (Mike Cibulka, Against; Tom McPoil, For; Joe Godges, Against; Jay Irrgang, Against; Bill O'Grady, Against)

Mr. Godges moved that the Orthopaedic Section Board of Directors draft a letter to the ABPTS addressing concerns related to the Orthopaedic Specialty Certification process. A copy of the letter will be sent to the APTA Board of Directors and the Orthopaedic Specialty Council. ADOPTED (unanimous)

The meeting adjourned at 2:10 PM CST on Saturday, October 8, 2005.

Submitted by Terri A. DeFlorian, Executive Director

2006 CSM SCHEDULE

CSM 2006 San Diego, CA

WEDNESDAY, February 1, 2006

PRECONFERENCE:

8:00 AM – 5:00 PM

Occupational Health PT Special Interest Group
Ergonomics Tools - Helping Clients and Your Business Everyday (OHSIG)
Miriam Joffee, PT; Drew Bossen, PT

THURSDAY, February 2, 2006

12:00 Noon – 4:30 PM

Research Platforms Session A
Research Platforms Session B

12:00 Noon – 3:00 PM

Lumbar Segmental Instability- Evidence and Integration into Manual Physical Therapy Practice
Timothy W. Flynn, PT, PhD, OCS, FAAOMPT; J. Haxby Abbott, PT, MSC, FNZSP; Deydre Teyhen, PT, PhD, OCS

1:00 PM – 5:00 PM

Pain Management Special Interest Group
Chronic Pain Assessment and Management with an Emphasis on Fibromyalgia
Maureen Simmonds, PT, PhD; Carolyn McManus, PT, MS, MA; Nancy Rich, PT, PhD, FACSM

1:00 PM – 5:00 PM

Occupational Health PT Special Interest Group
On-site PT- Building an Effective Practice in Industry
Wayne Rath, PT, Dip. MDT

1:30 PM – 3:00 PM

Calling All Authors: Evidence for Effectiveness
Mary Ann Wilmarth, DPT, MS, OCS, MTC, CertMDT; Christopher Hughes, PT, PhD, OCS, CSCS; Guy Simoneau, PT, PhD, ATC

2:30 PM – 3:30 PM

OCS Exam & DSP – What's the Deal?
Rick Ritter, PT, DPT, OCS; Joe Godges, DPT, MA, OCS

3:00 PM - 4:30 PM

Evidence-based Practice: Solving Clinical Dilemmas in Orthopaedics
Carol A. Oatis, PT, PhD; Marian T. Hannan, DSc, MPH

3:30 PM - 4:30 PM

ABPTS OCS Update
Aimee Klein, PT, DPT, MS, OCS; Robert Landel, PT, DPT, OCS, CSCS; Robert Johnson, PT, MS, OCS

6:30 PM – 7:30 PM

Business Meeting
Pain Management Special Interest Group

6:30 PM – 8:00 PM

Business Meeting
Occupational Health PT Special Interest Group

7:30 PM – 8:30 PM

Pain Management Special Interest Group Reception

FRIDAY, February 3, 2006

8:00 AM – 11:00 AM

Integrated Control of Stability and Movement: Perspectives from Orthopaedics & Geriatrics
John A. Buford, PT, PhD; Deborah Givens Heiss, PT, PhD, DPT, OCS; John D. Borstad, PT, PhD; Deborah Kegelmeyer, EDPT, MS, GCS; Anne D. Kloos, PT, PhD, NCS

8:00 AM – 11:00 AM

Recent Advances in the Management and Rehabilitation of Massive Rotator Cuff Tears
Martin Kelley, DPT, OCS; Brian Leggin, MS, PT, OCS; Charles Getz, MD

8:30 AM - 10:30AM

Research Platforms Session

8:30 AM - 10:30 AM

Case Study Presentations

1:00 PM – 4:00 PM

Evidence-based Clinical Practice Guidelines: Low Back & Ankle Sprain Guidelines
Eric J. Hendriks, PhD, MSc, RPT; Rob A. de Bie; Roger Nelson, PT, PhD, FAPTA; Lori A. Michener, PT, PhD, ATC, SCS

1:00 PM – 5:00 PM

Performing Arts Special Interest Group
Evaluation and Management of Lumbar and Pelvic Dysfunction in the Performing Artist
Michael Cibulka, PT, DPT, MHS, OCS; John D. Childs ,PT, PhD, MBA, OCS, FAAOMPT; Rob Watkins, MD; Shaw Bronner, PT, MHS, EdM, PhD, OCS; Airelle O. Hunter, MPT, SCS, CSCS; Leigh Anne Roberts, PT, DPT, OCS

1:00 PM – 5:00 PM

Foot & Ankle Special Interest Group
Conservative and Surgical Management of the Arthritic Ankle
RobRoy L. Martin, PhD, PT, CSCS; Stephen F. Conti, MD; Stephen Reischl, DPT, OCS

2:00 PM – 5:00 PM

PTA Education Group Programming
A. Michael Spitz, PTA

2:00 PM – 4:00 PM

Research Exchange Center
Anthony Delitto, PT, PhD, FAPTA; G. Kelley Fitzgeral, PT, PhD, OCS; Robert S. Wainner, PT, PhD, OCS, ECS, FAAOMPT; Julie M. Fritz, PhD, PT, ATC; Michael Mueller, PT, PhD, FAPTA; Christopher Powers, PT, PhD; John Childs, PT, PhD, MBA, OCS, FAAOMPT; Sara R. Piva, PT, MS, OCS, FAAOMPT; James J. Irrgang, PT, PhD, ATC; Daniel L. Riddle, PT, PhD; Steve Allison, PT, PhD, ECS; Deydre Teyhen, PT, PhD, OCS; Paul LaStayo, PT, PhD, CHT; J. Parry Gerber, PT, DSc, ATC; Patrick Sparto, PT, PhD; Carolynn Patten, PT, PhD; Michael P. Johnson, PT, MS, OCS; David Sinacore, PT, PhD

5:00 PM – 6:00 PM

Business Meetings
Performing Arts Special Interest Group
Foot & Ankle Special Interest Group
PTA Education Group
Manual Therapy Education Group

6:00 PM – 8:30 PM

Performing Arts Special Interest Group Reception

SATURDAY, February 4, 2006

8:30 AM – 11:00 AM

Orthopaedic Section Business Meeting

1:00 PM – 2:30 PM

Research Platform Session A
Research Platform Session B

1:00 PM – 5:00 PM

Animal Special Interest Group Programming
Hands, Hooves, & Paws: Collaborative Efforts in Animal Physical Therapy & Rehabilitation
Brett Wood, DVM; Charles Evans, MPT, CCRP; Diana Carman, PT; Ilaria F. Borghese, MS, MA OTR/L

1:00 PM - 4:30 PM

Knee/Patellofemoral Education Group
A Critical Review of Common Interventions for Patellofemoral Joint Dysfunction
Michael Gross, PT, PhD; Kay Crossley, PT, PhD; Christopher Powers, PT, PhD; Irene Davis, PT, PhD

2:00 PM – 5:00 PM

Manual Therapy Education Group Programming
Manual Therapy and Exercise for Subacromial Impingement of the Shoulder
Mark Bookhout, PT, MS

2:00 PM – 5:00 PM

Primary Care Education Group
Musculoskeletal Imaging for Physical Therapists
John Meyer, PT, DPT, OCS

2:30 PM – 3:00 PM

Rose Research Platform

5:00 PM – 6:00 PM

Business Meetings
Animal Special Interest Group
Primary Care Education Group

7:00 PM - 7:30 PM

Awards Ceremony

7:30 PM – 11:00 PM

Rose Award Celebration (formerly Black Tie and Roses Reception)

PLATFORM PRESENTATIONS

CSM 2006 San Diego, CA

THURSDAY – Session A

12:00 – 12:15

Chang, Alison
Flexion Contracture and Progression of Knee Osteoarthritis (OA)

12:15 – 12:30

Sutlive, Thomas
Development of a Clinical Prediction Rule for Classifying Patients with Patellofemoral Pain Who Respond Successfully to Lumbo-Pelvic Manipulation

12:30 – 12:45

Schmitt, Laura
Relationships among Factors Associated with Medial Knee Osteoarthritis

12:45 – 1:00

Blanpied, Peter
The Effects of Intra-articular Anesthesia on Muscle Reactions During Perturbation Testing

1:00 – 1:15

Souza, Richard
The Relationship between Femoral Anteversion and Femoral Segment Kinematics During a Step Down Maneuver

1:15 – 1:30

Piva, Sara
Reliability of Measures of Impairments Associated with Patellofemoral Pain Syndrome

1:30 – 1:45

Piva, Sara
Association between Impairments and Function in Individuals with Patellofemoral Pain Syndrome

1:45 – 2:00

Host, Helen
Optimizing Strength and Functional Gains Post-hip Fracture

2:00 – 2:15

David Lake
Passive 10 Minute Self-Stretching Protocol Increases Flexibility in Subjects with Limited Hamstring Flexibility

2:15 – 2:30

Langhenry, Mary
Analysis of Knee Joint Biomechanics During Cycling in Patients with Total Knee Arthroplasty

2:30 – 2:45

Monosa-Hefele, Giselle
Functional Outcomes of Hip and Knee Arthroplasty in Subacute Rehabilitation: Before and After the 75 Percent Rule

2:45 – 3:00

Enseki, Keelan
Can Pain Distribution Distinguish Individuals with Labral Tears from Individuals with Iliotibial Band Syndrome?

3:00 – 3:15

Warden, Stuart
Low-intensity Pulsed Ultrasound Accelerates and a Nonsteroidal Anti-inflammatory Drug Delays Knee Ligament Healing

3:15 – 3:30

Martin, RobRoy
A 3-year Outcome Study of Hip Arthroscopy

3:30 – 3:45

Martin, RobRoy
Evidence of Validity for the Hip Outcome Score (HOS) Based on Differential Item Functioning

3:45 – 4:00

Fergus, Andrea
The Effects of a Knee Injury Prevention Jump Training Program on the Landing Techniques and Neuromuscular Control of Female Athletes

4:00 – 4:15

Loghmani, Mary
Instrument-assisted Cross Fiber Massage Accelerates Knee Ligament Healing

4:15 – 4:30

Crossley, Kay
Clinical Features Differ in Individuals with Patellar Tendinopathy: Implications for Rehabilitation

THURSDAY – Session B

12:00 – 12:15

Strunce, Joseph
The Immediate Effects of Thoracic Spine Manipulation on Patients with a Primary Complaint of Shoulder Pain

12:15 – 12:30

Middag, Tansy
Digital Fluroscopic Video Assessment of Glenohumeral Migration: Static Versus Dynamic Arthrokinematics

12:30 – 12:45

Ebaugh, David
Changes in Scapulothoracic and Glenohumeral Motion Following the Performance of a Shoulder External Rotator Muscle Fatigue Protocol

12:45 – 1:00

Sum, Jonathan
Glenohumeral Joint Range of Motion, Rotational Muscle Strength, and Functional Self-report Following Shoulder Arthroplasty

1:00 – 1:15

Wilcox, Reg
Functional Outcomes Following Rotator Cuff Repair Based on Tissue Quality: A Pilot Study

1:15 – 1:30

Gard, Kevin
Interrater Reliability of a Proposed Scapular Classification System

1:30 – 1:45

Ward, Samuel
The Operating Ranges of the Rotator Cuff Muscles: Implications for Injury and Rehabilitation

THURSDAY – Session B

1:45 – 2:00

Wang, Sharon
Effectiveness of Two Physical Therapy Interventions for Increasing Length in the Pectoralis Minor Muscle

2:00 – 2:15

Hastings, Mary
Effect of Metatarsal Pad Placement on Plantar Pressure at the Second Metatarsal Head

2:15 – 2:30

Lott, Donovan
Effect of Footwear and Orthotic Devices on Soft Tissue Thickness and Pressure Variables of the Neuropathic Foot

2:30 – 2:45

Mueller, Michael
A Computational Model of the Diabetic Foot: Implications for Physical Therapy

2:45 – 3:00

Neville, Christopher
Affect of Stage II Posterior Tibialis Tendon Dysfunction on Muscle Length During Walking

3:00 – 3:15

Sinacore, David
Structural Polymorphism in Diabetic Foot Disease

3:15 – 3:30

Cornwall, Mark
Classification of Frontal Plane Rearfoot Motion Patterns

3:30 – 3:45

Zubcevik, Nevena
The Effect of Spring-Assist and Wedge-Rocker Shoes on Gait and Energy Expenditure in Subjects With Triceps Surae Weakness During Self-Selected Walking Speed: A Case Study Across Multiple Subjects

3:45 – 4:00

Moffit, Steven
A Comparison of Physical Therapy Outcomes in Individuals with Cervical Spine Pain With and Without Thoracic Manipulation

4:00 – 4:15

McGaw, Scott
Factors Related to Success with the Use of Mechanical Cervical Traction

4:15 – 4:30

Lindsay, Weston
The Use of Evidence-based Treatment on Patients with Headaches: A Pragmatic Case-Control Study

FRIDAY – Session A

8:30 – 8:45

Fritz, Julie
Does the Evidence for Spinal Manipulation Translate into Better Outcomes in Routine Clinical Care for Patients with Occupational Low Back Pain?

8:45 – 9:00

Silfies, Sheri
Analysis of Movement Coordination of the Lumbar Spine and Pelvis between Patients with Mechanical Low Back Pain Attributed to Osteoligamentous Damage and Controls

9:00 – 9:15

Rieger, Jennifer
Ultrasound Imaging of the Deep Abdominal Muscles During Core Stabilization Exercises

9:15 – 9:30

Miller-Spoto, Marcia
Physical Therapy Diagnosis in Clinical Practice: A Survey of Orthopedic Certified Specialists in the United States

9:30 – 9:45

Brennan, Gerard
Identifying Subgroups of Patients with Low Back Pain: A Randomized Clinical Trial

9:45 – 10:00

George, Steven
Immediate Effect of Spinal Manipulation on Temporal Summation of Pain

10:00 – 10:15

Butler, Matthew
A Randomized, Controlled Study Examining the Effect of Pilates on Physical Factors Related to Dynamic Trunk Stabilization in Subjects with Chronic and Recurrent Low Back Pain

10:15 – 10:30

Butler, Matthew
A Randomized, Controlled Study Examining the Effect of Pilates on Pain and Disability in Subjects with Chronic and Recurrent Low Back Pain

FRIDAY – Session B (Case Reports)

8:30 – 8:45

Ross, Michael
Cancer as a Cause of Low Back and Hip Pain in a Patient Seen in a Direct Access Physical Therapy Setting

8:45 – 9:00

Troyer, Mark
Differential Diagnosis of Endometriosis in a Patient with Non-specific Low Back Pain

9:00 – 9:15

Gard, Kevin
Eccentric Training for the Treatment of Patellar Tendinosis: A Case Study

9:15 – 9:30

Hunter, Airelle
A Different Path of Treatment for a Patient with Persistent Quadriceps Weakness

9:30 – 9:45

Rudolph, Katherine
Development of a Smart Exercise Device

9:45 – 10:00

Duszak, Kelly
Management of Patient with Sjogren's Syndrome: A Case Report

10:00 – 10:15

Lin, Suh-Jen
The Reliability of the Six-Minute Walk Test in Persons with Transtibial Amputation – A Preliminary Report

10:15 – 10:30

Ward, Samuel
Stress-Dependent and Stress-Independent Gene Expression in Rat Skeletal Muscle After a Single Bout of Exercise

SATURDAY – Session A

1:00 – 1:15

Rodriguez, Brian
Factors Associated with Outcome in Patients with Symptoms Distal to the Elbow With or Without Neck Pain

1:15 – 1:30

Thackeray, Anne
An Examination of the Reliability of a Classification Algorithm for Subgrouping Patients with Low Back Pain

1:30 – 1:45

Barakatt, Edward
Validity and Reliability of Maitland's Construct of LBP Irritability

1:45 – 2:00

Danzl, Megan
Examining Oral Contraception as a Contraindication for Spinal Manipulation (High Velocity Thrusts): A Literature Review

2:00 – 2:15

Nourbakhsh, Mohammad
An Alternative Approach to Treating Lateral Epicondylitis: A Randomized, Placebo-control, Double-blinded Study

2:15 – 2:30

Rancour, Jessica
The Influence of Superficial Precooling on a Static Stretching Regimen: A Randomized Trial

SATURDAY – Session B

1:00 – 1:15

Bronner, Shaw
Reliability and Validity of Electrogoniometry for Measurement of Lower Extremity Dance Movement

1:15 – 1:30

Bronner, Shaw
Lower Extremity Functional Motion Requirements in Common Dance Movements

1:30 – 1:45

Garlington, Mylah
Prevalence of Joint Hypermobility and Correlation with Injury in Professional and Student Modern Dancers: A Preliminary Investigation

1:45 – 2:00

Bronner, Shaw
Reliability and Validity of a New Electrogoniometer Ankle Sensor for Lower Extremity Dance Movement

2:00 – 2:15

Smith, Heather
Physical Therapy Management of Patients with Osteochondral Lesions of the Talus Following Arthroscopic Drilling: A Case Series

2:15 – 2:30

Noteboom, J
Behaviors and Knowledge of Orthopedic Physical Therapists Regarding Cardiovascular Screening and Risk Determination

PRE-CONFERENCE COURSE

Ergonomics Tools - Helping Clients and Your Business Everyday

CSM
2006 • San Diego, CA

Wednesday, February 1, 2006

Course Description: This program introduces the participant to 4 commonly used ergonomics evaluation tools. These tools allow the user to objectively measure some of the more common ergonomics risk factors, then use an established problem solving process to develop cost-effective solutions. The program also addresses how to transition from providing rehab services to how to grow your ergonomics-related practice.

This course is expressly designed to enhance the evaluation skills of clinicians who integrate ergonomics into their practice. These tools provide reliable and objective data used to identify root cause, set reasonable limits, and develop recommendations for the reduction or elimination of ergonomics risk factors in the work setting. Attendees will be shown how to use each tool to evaluate a videotaped job, develop a list of primary problems, and then generate a list of potential solutions. To day will wrap up with a discussion about "the business of ergonomics", pointing out pathways for clinicians to incorporate ergonomics into their business plans. Discussion will highlight how much the customer wants and needs to know about your analysis process, how to develop cost-effective solutions, how to know what is considered "value-added" by your customer for return business.

Upon completion of this course, you'll be able to:

1. Identify ergonomics risk factors and root causes
2. Utilize specific ergonomics analysis tools
3. Prioritize ergonomics-related problems in the workplace
4. Develop & implement solutions to resolve ergonomics-related problems using the six-step problem solving process

Course Speakers: Miriam Joffee, PT, CPE; Drew Bossen, PT, MBA

Contact Tara Fredrickson at the Orthopaedic Section for registration details and pricing information: **tfred@orthopt.org or 800/444-3982 x203**

Post-Offer Screening: Is There An Opportunity In Your Neighborhood?

As you wrap up the year and make plans for the next, are opportunities in the Occupational Health Physical Therapy on your radar screen? Whether we are in private practice or part of a hospital-based system we all make plans for growth, be it professional or business. If you are running your own practice, the advantage of post-offer screening is working directly with the employer. Your compensation is agreed upon prior to service and there are no prior approvals or ugly surprises at billing time. The clinical advantages to this area of practice are that these evaluations are usually shorter than a full FCE, job applicants are typically motivated to perform well on the test, and paperwork is minimal. Post-offer screening provides an opportunity to serve both the employer and employee through injury prevention. However, there are some important clinical and medico-legal issues to consider when doing post-offer screens.

THE OPTIMAL SEQUENCE FOR TESTING

The Equal Employment Opportunity Commission (EEOC) has published Enforcement Guidance: Pre-employment Disability-Related Questions and Medical Examination[1] as well as other guidelines related to pre-employment screening that can be accessed online at http://www.eeoc.gov/policy/docs/preemp.html. Based on my review of this document, pre-employment functional screening is best performed after a conditional offer has been made. According to the EEOCs guidelines, medical examinations (such as monitoring blood pressure and heart rate) can be performed only after a conditional offer has been made. Performing strenuous physical testing, such as is often the case in pre-employment screening, without monitoring these physiological parameters puts everyone at risk. In addition, post-offer screening is more cost-effective for the employer as they do not have to screen every applicant, only the ones to whom they make a conditional offer. Employers will appreciate your making the recommendation for post-offer screening and pointing out that this approach works to their advantage. This recommendation will go a long way toward building trust between you and the employer.

EVIDENCE IN SUPPORT OF EFFECTIVENESS

There have been at least 5 research studies published since 1994 that speak to the effectiveness of post-offer screening. "Reimer[2] et al studied the effectiveness of pre-employment screening combined with a worker fitness program for grocery warehouse workers. They found significant decreases in injuries and injury-related expenses over a 3.5 year period. Nassau[3] combined prework placement screening and case management for the injuries that occurred. This study, performed at a 250-bed hospital, found that the number of injuries did not decrease but the severity of the injuries were significantly less. Gassoway and Flory[4] performed screening on nursing assistants at a regional health center. They found a slight decrease in injuries requiring medical intervention and a more significant decrease in job turnover rate. This study showed that the company saved $6 for every $1 spent on screening. In a study that presents the strongest evidence to date in support of post-offer, Littleton[5] tested physical plant applicants at a major university hospital and found that the number of lost day cases decreased 18%, the total injury costs decreased 78%, and that for every $1 spent on post-offer screening the employer saved $18. The added benefit of these last two studies is that the only intervention used was the post-offer screen.

PITFALLS TO AVOID

In addition to pre-offer screens, there are some pitfalls to avoid in pre-employment testing.

General Strength Testing. The concept of a one-size fits all generic strength test (such as a set of push-ups, sit-ups, aerobic step tests, or isokinetic strength tests) is appealing because of its simplicity and ease of administration. However, such tests are not ADA compliant because they cannot be directly correlated to the demands of the job. All of the law suits lost by employers (and there have not been many) related to pre-employment screening have involved generic strength testing.

Comparison to Normative Data. In pre-employment screening, the ADA is violated when hiring decisions are made based on a comparison of the applicant to normative data. It does not matter whether the applicant is in the 5th percentile or the 95th percentile as compared to a group of 'norms.' What matters is whether their abilities match the job demands.

Predicting Future Injury. Some providers market their services by claiming to be able to predict future injury. Unless you have data to back you up it is best to avoid this potentially litigious claim. What we have to sell to employers is testing the abilities of workers that can be matched to job demands. By matching the worker's abilities to the demands of work, we help the employers minimize the chances of injury and the associated costs. No more, no less.

Steps of the Process. To develop a valid, legally defensible,

and cost-effective post-offer screens there are several steps that should be followed with each employer:

- **Targeting the jobs.** The employer may not need to screen for all jobs within the organization. A few jobs may be creating most of the injuries. By sitting down with the employer and looking at the injury data you can help identify the jobs that should be screened. You may perform fewer screens in the short run but in the long run, if the employer's return on investment is high, you have long-term job security.
- **Performing job demands analysis.** Identifying the physical demands of work is the foundation of defensible post-offer screening. If not done well or not done at all, the screens may not accurately reflect the job demands. If not accurate, the employer is at risk. While the employer may be reluctant to spend the money on the job demands analysis, it is money well spent in the long run.
- **Developing the test items and pass/fail criteria.** If an accurate job analysis is performed, selecting the test items and the minimal requirements is a relatively easy task. In cases where the materials or equipment create some unusual demands, it may be best for the company to loan these items to you for a simulation of the work demands. It is extremely important to use functional testing that has established reliability and validity,[5,6] for test items when possible.
- **Establishing procedures.** There are a variety of procedural issues that will have to be resolved with each company:
  - How will applicants be referred to you?
  - Where will testing occur?
  - How will test results be handled?
  - How will test failures be handled?
  - How will you deal with any injuries that will occur during testing?
  - How will the applicant who attends the screen with alcohol on his/her breath be handled?
  - What will you do if an applicant is pregnant?

  There are no hard and fast rules for any of these decisions. Each employer may want to handle these things just a little differently. The important issue is consistency. Once policies are in place for handling these issues, they must be followed for each and every applicant.
- **Testing Incumbents.** Many employers are reluctant to test incumbents. They fear it will be perceived negatively by incumbents. The incumbents must be reassured that their test results will not be shared with the employer except as aggregate data (ie, an individual's test results are not shared but the employer is told that 9 out of 10 employees passed the screen). While this step is not the easiest to accomplish with all employers, it is extremely beneficial if the validity of the screen is called into question. Incumbent testing provides additional proof of the validity of the screen. It can also be used as a mini-feasibility study. If there are any communication, procedural, or equipment problems with the system, then it is best to discover and correct during incumbent testing than to have them occur when the applicants are being tested.
- **Monitoring Outcomes.** Both you and the employer should have an idea of what constitutes 'success' from the outset of the project. You need to evaluate the company's prescreen injury incidence rates, severity, and related costs. After 6 months to a year of screening, you can make a preliminary comparison to the prescreen numbers. All parties need to agree on the desired or expected outcome. If you achieve your numbers, great. If you fall short, you can analyze the data to determine the reason and correct the problem. If you have no prior experience, look to the literature for some guidelines as to what you should expect.

In summary, post-offer screening is an opportunity to serve employers, employees, and society through the prevention of work-related injuries. As with any opportunity to serve, physical therapists need to have knowledge of the research demonstrating effectiveness of this intervention and the medico-legal issues surrounding it. We need to have reliable and valid assessment tools,[5,6] and we must know how to apply them in a systematic and consistent manner.

REFERENCES

1. U.S Equal Employment Opportunity Commission. EEOC Notice #915.002: ADA enforcement guidance pre-employment disability-related questions and medical examinations. 1995:1-26.
2. Reimer DS, Halbrook BD, Dreyfuss PH, Tibiletti C. A novel approach to preemployment worker fitness evaluations in a material-handling industry. *Spine.* 1994;19:2026-2032.
3. Nassau DW. The effects of prework functional screening on lowering an employer's injury rate, medical costs, and lost work days. *Spine.* 1999;24:1-10.
4. Gassoway J, Flory V. Prework screen: Is it helpful in reducing injuries and cost? *Work.* 2000;15:101-106.
5. Littleton M. Cost-effectiveness of a prework screening program for the University of Illinois at Chicago Physical Plant. *Work.* 2003;21:243-250.
6. Lechner DE, Jackson JR, Roth DL, Staaton KV. Reliability and validity of a newly developed test of physical work performance. *J Occup Med.* 1994;36:997-1003.

President's Report

I was reading a guest editorial in the Private Practice Section magazine [*Advance,* 2005;14(4)] recently. The author discussed why we as professional physical therapists use far too many letters after our name to denote our academic and other achievements. His point is well taken, although it raises the issue about certifications, the necessity, meaning, and then the utilization of said certification. Does the general population/consumer know what it means or what it permits us to do? I would tend to doubt it!

In order to educate the consumer and referring physicians, we as Physical Therapists who treat foot and ankle disorders should establish some form of certification, or better yet, a fellowship. This topic has been debated for several years in SIG Business Meetings and between colleagues. Other SIGs and Sections are moving in this direction. In the medical community, a fellowship indicates a level of excellence and notoriety. Although some of you may oppose such a process and some are in favor, I would like to hear from you on our SIG bulletin board or directly to me. It will take a tremendous effort to establish the criteria that would be included in a fellowship. I for one am in favor of a foot fellowship, not that any of us need to add letters to our professional demarcation.

Our SIG is still looking for assistance from the membership to establish a survey that will be sent to all entry-level physical therapy programs in order to ascertain the content being taught pertinent to the foot and ankle. Like the other Orthopaedic Section SIGs, we should be able to advise PT schools as well as continuing education instructors on the content and relevance of their foot and ankle information. In addition, certain courses that are available to PTs should be evaluated by our SIG to enable them to make recommendations to our members. This effort may help to synthesize the overwhelming variety of treatment techniques, evaluative strategies, and evidence that is valid. Of course, I must toot our SIGs own horn as it relates to the next FASIG program at the CSM in San Diego. The program will include an excellent faculty who will thoroughly discuss ankle injury and arthrosis. I hope that you all plan to attend this great program. As per the purpose of this periodical for our membership, we welcome treatment pearls, case studies, new techniques, etc that you are using in the clinic and that can be shared in *OPTP*.

Stephen Paulseth
President, FASIG

The Accessory Soleus: An Uncommon Source of Distal Lower Extremity Pain

Stephen Paulseth, PT, SCS, ATC and Daniel Kim, ATC

The accessory soleus muscle is a fairly uncommon form of muscular anomaly, found in roughly 1% to 6% of the general population according to a recent study.[1] Presence of the muscle is rarely symptomatic, but has been known to lead to swelling, pain, or a combination.[3] Its existence has also been linked to tarsal tunnel syndrome due to compression or entrapment of the tibial nerve.[4] Detection of this muscular anomaly typically occurs around the age of 20, and is more common among males than females by a two to one ratio.[3]

There are a few different hypotheses regarding how this muscle anomaly arises. In 1913, Frohse and Frankel described the accessory soleus as an abnormal plantaris muscle whose origin migrated from the epicondyle of the femur to the tibia or the anterior surface of the soleus.[7] Other studies have identified a separate plantaris muscle in addition to the accessory soleus,[10,13] leading to another hypothesis that the muscle is actually a portion of the normal soleus muscle which at some point separated, probably early in development.[2,5,6,8,10] It is possible that the typical presentation of symptoms during adolescence is due to an increase in muscle mass during this time of development, and could explain why men, who have more muscle mass are more predisposed to having a symptomatic accessory soleus.[3,4,11,14]

The size, structure, and location of the accessory soleus have been seen to vary among different individuals. Depending on the individual, the anomalous muscle can be seen on one extremity or bilaterally, and it typically has its own fascia.[2,4,8] The muscle can originate from the distal posterior portion of the tibia, which is the most common origin, or from the fascia surrounding the soleus muscle.[2,4,8,9] The distal insertion of the accessory soleus tendon is most commonly located on the calcaneus, just anterior and medial to the Achilles insertion on the calcaneal tuberosity. The tendon also may insert on the lateral calcaneus, superior calcaneus, or blend in with the Achilles tendon.[2,4,8,9] The muscle is innervated by a branch of the tibial nerve and blood is supplied by a branch of the posterior tibial artery.[9] As mentioned earlier, most cases of accessory soleus muscle are asymptomatic but have been known to cause problems in the lower leg. Swelling along the medial aspect of the Achilles tendon is the most common symptom that arises. In most cases, pain will increase during or after exercise.[9,11] Typically, the symptoms are caused either as a result of tarsal tunnel syndrome, with the tibial nerve being entrapped or compressed by the muscle, or

by a compartment-type syndrome with excessive pressure within the muscle fascia.[11,12] Occasionally, the presence of the accessory muscle also makes it difficult to wear certain types of shoes, boots, or other footwear.

According to Leswick, the problem is often unrecognized or mistaken for other types of soft tissue masses or disorders. The presence of an accessory soleus muscle can be detected by MRI, which is the preferred means of study.[11] Painful soft tissues masses can present with varying differential diagnoses, including ganglion, hematoma, lipoma, hemangioma, synovioma, and sarcomas.[11] Without knowledge of a soft tissue mass, differential diagnoses could include tarsal tunnel syndrome, medial tibial stress syndrome, posterior compartment syndrome, flexor hallucis longus syndrome, peripheral neuropathy, posterior tibialis tendonitis, calf strain, deep vein thrombosis, Achilles tendonitis, lumbar radiculitis, and contusion.

Most individuals who have an accessory soleus muscle are asymptomatic, and treatment is typically conservative or not done at all. Individuals who present with symptoms have a few different treatment options, depending on the nature and cause of the symptoms. Review of the literature suggests that surgical intervention is the most common form of treatment, particularly fasciotomy[3] which has been effective for symptoms related to compartment-type syndromes. If the accessory muscle presence is coupled with tarsal tunnel syndrome, excision seems to be effective in relieving pain. Other types of surgery include debulking, biopsy, and observation.[3] Nonsurgical treatments are scarcely documented in the literature, but the use of foot orthoses and physical therapy have been reported to relieve pain in certain circumstances.[12]

The lack of evidence for nonsurgical treatment of this condition is apparent. Albeit limited in its scope and validity, a report on a patient seen in physical therapy for this problem recently prompted this article.

PATIENT EXAMPLE

The patient is a 27 y/o female who presented with chronic and severe bilateral (R > L) lower leg 'tightness' and pain which began in 2001 after increasing her mileage of running on concrete. The patient has no co-morbidities, medical conditions, or familial diseases. Her symptoms progressed over the next year during activity despite commencing resistive training, stretching, and curtailing running. In 2003 she sought medical advice from a podiatrist who made her foot orthoses and referred her to a PT clinic. At that time her symptoms were constant and more exquisite, especially with exercise. Physical therapy, consisting primarily of modalities and exercises for 16 weeks, was ineffective according to the patient. She was not able to participate in sports or run and the pain commenced after walking for a few minutes.

In 2004 she began PT treatment for a lumbar HNP with radiculitis which was diagnosed with MRI and EMG/NCV. The latter test was done to evaluate the effect that the lumbar condition had on her lower leg pain. The NCV test was 'inconclusive' but showed mild conductive slowing in the distal tibial nerve, right > left. Her orthopedist also prescribed 2 epidural injections in 2004 which reduced her back pain but did not alter her lower leg symptoms.

Up until June 2005 the patient was not able to be fully functional in her typical exercise routine or run, due to persistent calf pain. Physical therapy treatment for her leg symptoms commenced at that time once/wk. Her pain was constant and severe but did not radiate from the medial mid-shaft tibia and deep calf. Symptoms increased after standing for 5 minutes or walking with or without her foot orthotics for 2 minutes. Objectively, the patient presented with bilateral ankle dorsiflexion restriction with knees bent and straight, pes planus, os naviculare with associated tibialis posterior deficits R > L, ineffective stance and heel rise in gait, and negative lumbar or neural involvement. Vibration testing and pulses of both LE were normal and palpation yielded increased tension and tissue thickening along the right medial border of the mid-tibia. The patient was referred back to her physician for diagnostic imaging of the posterior compartment of her tibia. Diagnosis of an accessory soleus muscle bilaterally was confirmed by MRI (Figures 1 & 2).

MRI FINDINGS DISPLAY AN ACCESSORY SOLEUS.

Physical therapy is to continue until possible surgical intervention at a later time. Physical therapy has been effective to date as she is now able to walk for 25 minutes without symptoms other than feeling fatigued in her calf (R > L). It appears that over time with walking, the posterior muscles of the tibia become less active or effective due to fatigue and possibly deep posterior compartment dysfunction due to the fatigue. Foot position alteration via foot orthoses and/or foot taping has helped to increase the time of walking from 2 to 20 minutes in the first month of physical therapy. Soft tissue mobilization, manual therapy, ultrasound, deep suction tissue mobilization, ice, and tibialis posterior open and closed chain exercises were also used during this time. The addition of rocker shoes, medial calf unloading tape, and neural gliding has reduced her pain to the present level of moderate localized symptoms which only occurs with walking for 25 minutes.

Presently, the patient has increased her ankle dorsiflexion ROM to 10° and her LE strength to 5/5 grossly, except soleus (4/5) and tibialis posterior (4+/5). She experiences pain with soleus specific exercises which of course limits her gait and tibial/foot control coupled with the tibialis posterior. A visit to an additional orthopedist suggested that she try UCBL orthoses to assist in gait and standing as well as to continue PT with greater frequency.

ASSESSMENT

The literature is devoid of any RCT or case series of this condition. Only select case studies have been published and show minimal improvement without surgery. It appears that the patient's symptoms are consistent with a posterior compartment-like syndrome that causes calf weakness and pain but nonsig-

Figure 1. Sagittal view of the distal right lower extremity MRI. The accessory soleus muscle is positioned in the posterior portion of the lower limb, with the muscle body extending below the talocrural joint, just anterior to the Achilles tendon.

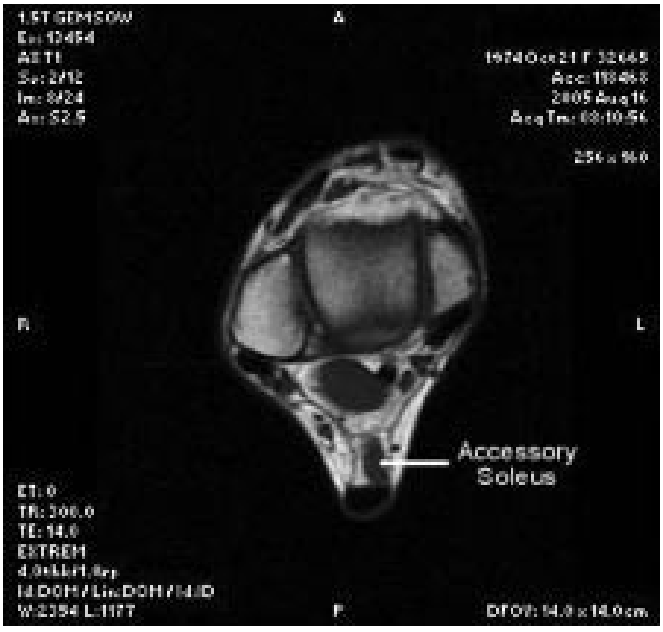


Figure 2. Transverse view of the distal lower extremity MRI, cut at the left talocrural joint line. The accessory soleus is positioned in the posterior medial portion of the lower limb.

nificant neural signs. A deep fascial band that eminates from the deep soleus medially and superiorly to the medial tibia is the likely culprit. The actual mechanism of dysfunction is not truly known. Due to her incomplete progress it is likely that surgical fascial debridement will provide relief of symptoms. Physical therapy has provided benefit for this patient's function but will not likely provide full return to running.

There is a need for further research into this rare and frustrating condition. Clinicians should include this diagnosis in their differential list for lower leg problems.

REFERENCES

1. Agur AM, McKee N, Leekam R. Accessory soleus muscle. American Association of Clinical Anotomists Meeting; Jul 9-11, 1997; Honolulu, Hawaii.
2. Assoun J, Railhac JJ, Richardi G, Fajadet P, Fourcade D, Sans N. Ct and Mr of accessory soleus muscle. *J Comput Assist Tomogr.* 1995;19:333-335.
3. Brodie JT, Dormans JP, Gregg JR, Davidson RS. Accessory soleus muscle. A report of 4 cases and review of literature. *Clin Orthop.* 1997;337:180-186.
4. DosRemedios ET, Jolly GP. The accessory soleus and recurrent tarsal tunnel syndrome: case report of a new surgical approach. *J Foot Ankle Surg.* 2000;39:194-197.
5. Faller A. Zur deutung der akzessorischen Kopfe des Schollenmuskels. *Anat Anz.* 1942;93:161-179.
6. Flower JM. Note on an accessory soleus muscle. *J Anat.* 1931;65:548-549.
7. Frohse FM. Frankel Die Muskein des menschlichen Beines: in von Bardeleben k: Handbuch der Anatomie des Menschen. Jena Gustav Fischer, Il band, Il Apt, Teil. 1913: 415-693.
8. Gordon SL, Matheson DW. The accessory soleus muscle. *Clin Orthop.* 1973;97:129-132.
9. Kurtoglu Z, Haluk U. Bilateral accessory soleus muscle. *Turk J Med Sci.* 2000;30:393-395.
10. Le Double AF. Traite des variation du systeme musculaire de l'homme. Paris, Schleicher Freres, tome 2. 1897:310-314.
11. Leswick DA, Chow V, Stoneham G. Accessory soleus muscle. *Can Assoc Radiol J.* 2003;54:313-315.
12. Pla ME, Dillingham TR, Spellman NT, Colon E, Jabbari B. Painful legs and moving toes associates with tarsal tunnel syndrome and accessory soleus muscle. *Mov Disord.* 1996;11:82-86.
13. Sekiya S, Kumaki K, Yamada TK, Horiguchi M. Nerve supply to the accessory soleus muscle. *Acta Anat Nippon.* 1994;149:121-127.
14. Yu JS, Resnick D. MR imaging of the accessory soleus muscle appearance in six patients and a review of the literature. *Skeletal Radiol.* 1994;23:525-528.

painmanagement

SPECIAL INTEREST GROUP

President's Message

Joe Kleinkort, PT, MA, PhD, CIE, CEAS, DAAPM

Loss is such an empty bittersweet word. It is shallow and so insensitive. We have all heard of stories of loved ones who have gone through much of this and close personal friends these past few months with so many natural disasters. Through all of this we have lost to our profession two towering pillars of strength, courage, and fortitude that emulate the very profession they come from. They both in many different ways contributed to the field of Pain Management. The both will be genuinely lost in our profession.

Joe Kahn, PT, PhD, 79 of Syosset, NY, died June 25 after a long illness. To those of us who knew him he was one of if not the "GODFATHER" of pain management through his various uses of electrotherapy. He was such a tremendous mentor who always had time to spend with a learning therapist until they got it. His love for his profession and the students he touched was evident in the time he spent and action to gently and lovingly teach and care for their growth as they learned all they could about the endless techniques he would have to apply to various anomalies. I will never forget the many times we spent discussing various applications of therapy and the one day that I actually taught laser to Joe in 1980! He addressed this in one of his early electro books. But he taught me so much in so many ways as he did so many other therapists in their professional walks. He loved to write and was finally able to finish *The Principles and Practice of Electrotherapy* which was published in 2000 and has been translated into many languages. Any of us who ever came into contact with him will never ever forget the legacy that he left with us from the love of a profession and the love of the patient care. His heart was huge and his legacy even larger. We all will miss you dear friend.

Jules Rothstein, PT, PhD, FAPTA, at the age of 57, died August 27 after a long illness. I knew him as Editor-in-Chief of *Physical Therapy*. All you would have to do is read his various commentaries over the years as Editor of our journal to feel and sense his tremendous love for our profession. One only has to read *Journeys Beyond the Horizons*, Mary McMillan Lecture 2001 to tap into the respect and honor that he had, as well as the vision for our future. He contributed many books and articles throughout the years but one of his greatest accomplishments was that of giving us sage and often needed advice on how to mold the future of our profession. Jules always was there to tell you how many ways his life was blessed. The largest blessing was to those of us whose lives he touched in a very personal way. The character and dignity in which he went through the tremendous adversity of his twilight years spoke volumes of the strong oak of a person that he truly was. Both of these men have left an indelible mark on our profession and to the cause of pain management. They will be truly and deeply missed.

On a separate note, I would like to strongly encourage each of you to attend this year's CSM. Join us for our first cocktail party before our Business Meeting which is scheduled for 6:30 PM on Friday. This will be a time to network and meet in person those who are interested in pain management. We also have a wonderful academic program scheduled this year and hope that all can attend. Finally may I wish each of you blessings on this holiday season and thank you for all of your support.

Facing The Fear

Anita L Davis, PT, MSM, CEASII
Brooks Health System
Jacksonville, FL

Once a patient crosses into the realm of chronic pain, multiple factors begin to creep into the picture. The aspects of pain as identified by Stanley V. Paris PT, PhD include physical, rational, and emotional components (Manual Therapy: Treat Function not Pain). The balance of these 3 aspects can easily become distorted with one issue becoming so large that it not only overshadows the physical component but may even drive it.

There are other issues that can have an equally dysfunctional effect on a person with primary pain issues. Finances and legalities are known to have a powerful effect on one's recovery and rehabilitation. As a therapist there is little that we can do to directly influence these circumstances for our patients. However there is one aspect that we can help our patients address to experience rehabilitation at its best.

Fear can be a powerful motivator—or de-motivator. For fear to have power over one's actions it need not present a threat of pain or injury. The impact of fear cannot be ignored. Think of how we react to our own fears of heights, snakes, etc. Our natural instinct is to avoid that which we fear or perceive as unpleasant. For us this seldom deprives us of anything of significance. I'm doing just fine keeping my feet on solid ground and have no desire to climb higher than my step stool to clean the ceiling fan. However the fear-avoidance model indicates that some may interpret pain as a serious threat and thereby avoid tasks that they perceive as painful. This then leads to an expectation of fear

and further reduction in activity tolerance.

But consider the patient who is 'unsure' about returning to work lifting 50 lb containers, or the housewife who is 'antsy' about cleaning the bathtub and lower surfaces. Is this not their way of expressing their fear? Left without treatment, this fear could lead to performance anxiety, hesitancy, and a lack of confidence. These repercussions can directly lead to faulty implementation of body mechanics and motor recruitment, which can lead to reinjury or increased pain when the activity in question is performed. If still unresolved, over time this would then lead to disuse, disability, and depression.

We have the ability to drastically change this and enhance our patients' lives. The first step would be identifying the act or position that patients fear. It could be as easy as asking "What do you feel the least confident doing?" or "What task are you unsure of?" After all we don't want to acknowledge it as a fear—that sounds too drastic and our patients may not respond as honestly as we anticipate with that wording.

I address this within my population of patients with acute injuries and pain who are approaching discharge and anticipating returning to their normal tasks, be it work or home. For these I tend to ask one of the questions listed above. Their response guides me to address those specific tasks with cues and instructions to maximize their performance and safety. For a fear of lifting, I begin with an empty container and perform basic lifting techniques with the patient. Then the weight is increased as they demonstrate better skill and strength. The final phase then progresses to simulating the actual task as they would encounter at home or work. Beginning with the empty container reduces the fear of the task. As they succeed in light weight more is added as their confidence, skill, and strength increases. As these increase, their fear and apprehension of the task fades away. There is nothing better than having a goal of restoring 100% confidence in returning to work tasks.

The other portion of patients that I see have chronic pain. These individuals are provided with a questionnaire that identifies over 20 various tasks. On the form they rank each activity from 0-100 with 100 representing maximum fear. The large range allows greater sensitivity to change during treatment. At the completion of their therapy, they receive another form to rescore the same items. Examples of activities listed on the questionnaire include: lifting less than 20 lbs, lifting greater the 20 lbs, doing laundry, vacuuming, reaching to the floor, weeding, etc. Their treatment includes not only manual therapy and exercise activity but also a specific portion of time dedicated to actually performing and practicing simulations of the tasks listed on the questionnaire. In this way, the patients are exposed to the task in a controlled and therapeutic environment. Modifications and instructions are given as necessary including increasing the task difficulty (weight) if appropriate.

As this has been implemented, I've been able to measure both the initial fear score and the final fear score. Results clearly show decreased fear of basic activities. Using the raw numbers, patients have shown up to 70% improvement in fear reduction of daily tasks. Raw scores being the total of individual scores for each task. In looking at the average of the scores, individuals have shown improvement up to 77%.

Addressing the fear component that pain patients experience can lead to a dramatic increase in their functional abilities. Increasing their confidence and skill in performing tasks is also a step toward prevention of potential chronic pain and reinjury. Being aware of the influence of fear is critical to our success in effectively treating the whole person and not just the pathology. Addressing the fear can be as easy as adding a few questions to the interview and staying in touch with the patient's concerns. For a percentage of our patients, they will always have pain. However, pain need not limit their quality of life by fearing basic tasks.

REFERENCE

1. Verbunt J, Seelen H, Vlaeyen JW, van der Heijden GJ, Knottnerus JA. Fear of injury and physical deconditioning in patients with chronic low back pain. *Arch Phys Med Rehabil.* 2003;84:1227-1232.

performingarts

SPECIAL INTEREST GROUP

President's Letter

Hello all!

This past year has seen many large scale world events and the recent Hurricane devastation in the Gulf coast region did not leave the PASIG Board unscathed. Susan Clinton, the current PASIG President, lives in New Orleans and was affected by Hurricane Katrina. She is thankfully doing well, but is still in recovery mode, traveling farther to work and dealing with the necessary upheaval in that area—so I am stepping in on her behalf to write this installment of the "President's Letter." Hopefully anyone else in our membership affected by these storms is in good health and surrounded by their family and loved ones. Having been through Hurricane Andrew in Miami back in 1992, I am certainly reminded of the very difficult months that followed that storm for everyone and the great outpouring of support from the rest of the country as a result.

Despite these more sobering events, your Board continues to prepare for next CSM that occurs in early February 2006 in San Diego, California. Our Vice President, Tara Jo Manal, is busy developing our general programming lineup that I believe will be exciting and not-to-be-missed. We will be focusing on the lumbopelvic region and all presentations are evidence-based with incorporation of competencies identified in our Description of Advanced Clinical Practice (DACP). This important document has guided our decisions for programming content and you should look for an upcoming issue of the *Journal of Dance Medicine and Science* (JDMS), Volume 9, Issue 2 for a published summary. Also at CSM 2006, we will be presenting our second annual student scholarship award. In this issue, the criteria for participation is included.

Everyone should have been receiving the e-mailed citation blasts on performing arts research/literature through the efforts of our Research Chair, Shaw Bronner. This is a great way to try and keep up with the various sources of current research available to all of us today. We have received wonderful feedback from many of you, and we hope that this members-only benefit will continue to receive your support.

You will notice that in addition to the monthly citation blasts, you will each be receiving a "membership blast" to help us update the ever-changing contact information on so many of our members. This effort is important so that mailings can reach each of you in a timely fashion and possible opportunities for performing arts-related involvement can be directed your way. You should also be receiving a questionnaire regarding research within the performing arts that is designed to help us understand how we can facilitate the sharing of information/resources and enable those who wish to do research in this area to do so. Please try to return these completed questionnaires quickly to expedite these efforts.

Lastly, I hope to see all of you at our next large gathering—Combined Sections Meeting in San Diego. The PASIG is only as good as its members. We need you and we need your input. Hopefully, Susan Clinton will be back at her post as your new PASIG President in the near future. We wish all of those affected by recent natural disasters a speedy recovery. Our thoughts are with you.

Sincerely,
Jeff Stenback, PT, OCS
Immediate Past President
(Standing in for Susan Clinton)

General PASIG Programming for CMS 2006 San Diego

Evaluation and Management of Lumbar and Pelvic Dysfunction in the Performing Artist

The purpose of this course is to explore the evidence surrounding the evaluation and treatment of the pelvis and lumbar area in performing artists. The course will include a review of SI joint dysfunction including the use of manipulation and case example of muscular imbalance/control strategies useful in cases of hypermobility. Lumbar spine evaluation and manipulation will be reviewed from an evidence-based approach and an expansive review of nonoperative medical management will be presented. Issues regarding diagnostic imaging, spinal injections, muscular injections, rigid bracing, and other medical interventions will be presented. Cases presentations will be provided to reinforce and expand on topics covered in the main program to include: nonoperative management of a spinal stress fracture, lumbar spinal stabilization training and evaluation, and return to performance considerations and progressions for the performing artists.

Level: Multi Level

Objectives: Following this presentation the participant will be able to:

1. Identify theoretical dysfunction that can exist in the SIJ and apply techniques likely to demonstrate an improvement in patient complaints.
2. Recognize patients with lumbar pain and dysfunction who are likely to respond positively to a lumbar manipulation procedure.
3. Recognize the need and understand the role of diagnostic tests and invasive and noninvasive medical procedures in the management of lumbar and sacroiliac pain.
4. Prepare a rehabilitation program for performing artists with lumbar and sacroiliac dysfunction that includes return to artistic activity progressions.

Friday Feb 3, 2006 1:00-5:00 PM

1:00-2:00 PM

Lumbar Spine Mobilization and Manipulation: What Does the Evidence Tell Us and How Can It Be Applied to the Performing Arts Population

John David Childs, PT, PhD, OCS, FAAOMPT

2:00- 2:45 PM

SI Joint Dysfunction, Evaluation and Physical Therapy Management

Mike Cibulka, PT, DPT, MHS, OCS

2:45- 4:00 PM

Nonoperative Medical Management of Lumbar Pain and Injury in Performing Artists

Robert Watkins, Jr., MD

4:00-5:00 PM

Case Studies in Performing Artists

CASE 1: Muscular Imbalance Issues and SIJ Treatment in a Performing Artist

Shaw Bronner, PT, MHS, EdM, OCS

CASE 2: Nonoperative Managment of Lumbar Stress Fractures in Dancers and Figure Skaters

Airelle O. Hunter, PT, MPT, SCS, CSCS

CASE 3: Lumbar Spine Stabilization Training in Dancers

Leigh Anne Roberts, PT, MPT, OCS

Performing Arts Special Interest Group PASIG Student Scholarship

Purpose: To recognize students for their contribution to performing arts medicine and to assist in defraying the cost of attending the Combined Sections Meeting (CSM).

Eligibility:

1. You must be a member of the Performing Arts Special Interest Group (PASIG).
2. You must be a student in an accredited physical therapy program when the research was conducted.
3. Your abstract for a poster or platform presentation abstract has been submitted and accepted to CSM.
4. You must attend CSM.
5. You must be listed as an author on the presentation.
6. You must participate in presenting the poster/platform.
7. Deadline for submission of your abstract for consideration for the PASIG scholarship is November 1st of the year preceding the CSM for which the scholarship is being offered.

Criteria for Selection:

1. The importance of the contribution of the abstract to the physical therapy management of performing arts physical therapy.
2. The clinical implications derived or suggested from the abstract.
3. The quality of the writing.
4. The clarity of the clinical information/data presented.

Award Committee: The committee consists of:

1. The PASIG Student Scholarship Committee Chairperson.
2. The PASIG Research Committee Chairperson.
3. The PASIG Education Committee Chairperson.

Notification of the Award:

The recipient of the award will be notified in December (of the year preceding the CSM for which the scholarship is being offered) by the PASIG Scholarship Chairperson.

Nature of the Award:

1. The PASIG BOD will determine the monetary amount of the reward annually based on the budget.
2. A certificate will be presented to the student at the PASIG's Business Meeting during CSM of the year of presentation.
3. This award is intended to defray the costs of attending CSM. Therefore, the monies awarded will be made available after submission of receipts verifying expenses incurred to attend CSM.
4. Announcement of the scholarship recipient will be made in the PASIG newsletter section of Orthopaedic Physical Therapy Practice.

PASIG Research Committee

Chair: Shaw Bronner

Members: Jeff Stenback, Jennifer Gamboa, Marshall Hagins, Sheyi Ojofeitimi, Brent Anderson

To date, the Research Committee has sent out 4 Citation BLASTS. Three were sent to the entire Orthopaedic Section membership. After that, if non-PASIG Orthopaedic Section members wanted to continue to receive the Citation BLASTS, they needed to join the PASIG. Our SIG gained over 40 new members as a result of this initiative. If you have not received any of these BLASTS, please check your junk filter—it may be filtering it out, or check with the Orthopaedic Section to ensure your e-mail address is current. If anyone would like to contribute new citations to this effort, please e-mail me.

By now, members will have also received our PASIG research questionnaire. We ask that you support our committee efforts by sending in your answers. Your replies will help us to develop our programs and committee efforts to increase and focus performing arts research.

We're happy to report an increase in performing arts-related abstract submissions for Combined Sections Meeting 2006 (from none in 2005). We will work to let PASIG members know when these platforms and posters are being presented. Each presenter always appreciates the support of their work by our attendance and discussion following their presentations may spur new avenues of research—you never know.

DANCE/USA Medical Task Force on Dancer Health

DANCE/USA is a national service organization for professional dance. The Dance/USA Task Force on Dancer Health was charged with a mandate by the Council of Company Managers (Dance/USA) to make recommendations on annual, post-hire, healthy dance screening.

Chair (Dance Company/Organization):

Richard Gibbs, MD (San Francisco Ballet)

Attendees (Dance Company/Organization):

Julia Alleyne, MD (National Ballet of Canada),
Steven Anderson, MD (Pacific Northwest Ballet),
Boyd Bender, PT (Pacific Northwest Ballet),
Shaw Bronner, PT (Alvin Ailey, ADAM Center at Long Island University),
Micky Cassella, PT (Boston Ballet, Boston Children's Hospital),
Erica Coffey, PT (Pittsburgh Ballet, UPMC Center for Rehab Services),
Allison Deleget (Harkness Center),
Julie Daugherty, PT (American Ballet Theater),
Anne Dunning (Dance/USA),
Jennifer Gamboa, PT (Washington Ballet, Universal Ballet Academy),
Greg Gilman, ATC (Texas Ballet Theater),
Linda Hamilton, PhD (New York City Ballet),
William Hamilton, MD (American Ballet Theater, New York City Ballet, School of American Ballet),
David Johnson, MD (Washington Ballet),
Marika Molnar, PT (New York City Ballet, School of American Ballet),
Kathleen Nachazel, ATC (Pittsburgh Ballet, UPMC Sports Medicine),
Julie O'Connell, PT, ATC (Hubbard Street, Joffrey Ballet),
Sheyi Ojofeitimi, PT (Alvin Ailey, ADAM Center at Long Island University),
Elaine Redman, ATC (Radio City Music Hall),
Leigh Roberts, PT (Washington Ballet, Universal Ballet Academy),
Meg Schneider, ATC (Radio City Music Hall).

Medical personnel from professional dance companies throughout the US and Canada met for 2 days in July in New York City. Our goal was to come to consensus on the need and objectives of an annual, post-hire, dance screening for professional company members. Ultimately, it was the feeling of the group that participation in annual screening would benefit the dancers through early understanding of their individual medical history, recognizing unaddressed problems, and developing better preventative programs to maintain their optimal well being. All agreed that use of a standardized form would facilitate pooling of data in the aggregate to permit a better description of the physical characteristics of professional dancers. Also agreed was that such a universal screen must have relevancy and applicability to many styles of dance (eg, ballet, modern dance, theater, etc.).

Presentations on current programs at New York City Ballet, Pittsburgh Ballet, and Boston Ballet were made by L. Hamilton, E. Coffey and K. Nachazel, and M. Cassella respectively. Each emphasized that the implementation of formal annual screening and its sequelae have had an extremely positive effect on injury and time loss reduction.

Core principals delineated at this and previous Task Force meetings include:

1. The absolute confidentiality of all individual medical information. The guidelines of HIPPA would be followed.
2. That both dancers and their union, AGMA, as well as the dance organization's artistic directors and administrators participate in the development process so that all understand and support the common goals of this project.
3. A dance specific assessment is necessary for our unique population's requirement.
4. The Task Force recommends that the annual screenings be mandatory and that the costs (including dancer's time) be covered by the organization in order to optimize our health goals.
5. The screening and intake forms must address comprehensive issues from the physical, emotional, nutritional, and general health area.
6. The final dance screen must be a streamlined user-friendly document that can be easily used by health care professionals.

A preliminary outline of the screening was developed, based on the most common injuries and problems seen by the medical group. The intrinsic factors contributing to these problems were selected as most relevant to the individual dancer. Tests were selected from both impairment and functional levels. The acronym SCAMPS—Stability, Control (neuromuscular), Alignment, Motion, Pain, Strength—was developed to ensure that all tests, measures, and medical history applicable to the common injuries and problems were reviewed. M. Cassella was appointed Chair of the Screening Committee, charged with drafting a preliminary dance-screening document.

The Task Force agreed that the dance-screening instrument that is produced will have the following purpose:

- To help dancers dance safely and artistically.
- To create intervention recommendations based on the screening information.
- To develop a normative database of professional dancers to extend our understanding of risk factors for future injury.
- To prevent injuries and decrease their cost (time loss, new workers compensation costs, financial costs).

The Task Force will reconvene in the fall to review the document and finalize their recommendations on a universal form. In addition, our next meeting will bring the dancers and their union into our discussion on implementing this worthy endeavor.

The second meeting of the DANCE/USA Medical Task Force on Dancer Health met on October 1 and 2. Attendees included Medical Task Force Chair Richard Gibbs, MD (San Francisco Ballet), Shaw Bronner, PT (Alvin Ailey, ADAM Center at LIU), Micky Cassella, PT and Heather Southwick, PT (Boston Ballet, Boston Children's Hospital), Andrea Dickerson (Dance/USA), Julie Daugherty, PT (American Ballet Theater), Mj. Liederbach, PT, ATC (Harkness Center), Marika Molnar, PT (New York City Ballet). Over August and September, Micky Cassella, Chair of the Screening Committee, with the assistance of Heather Southwick produced a preliminary draft of the 'Annual Health Assessment for Professional Dancers' document. Work at this meeting focused on review of this draft to refine it further. Our goal is to have a standardized assessment that can be administered in 30 minutes or less. The group also commented on a document written by Richard Gibbs on the 'Core Principles' of the Medical Task Force. This document reviews the purpose, guidelines, and rationale in the establishment of annual health assessments in

professional dance companies. On Day 2, attendees met with a former dancer and union representative to get further feedback from the dancer's perspective.

A follow-up meeting is scheduled in NYC on January 7 and 8 to review the next assessment draft. In addition, the group will meet with members of the dancer union, AGMA, to assess their response and any recommendations they may have. Following acceptance of the draft by the Task Force, a backup document with test instructions and references will be written. In addition, the Committee anticipates that findings during the assessment that recommend further musculoskeletal evaluation may require a secondary standardized evaluation form. It is anticipated that the final draft will be available for presentation to the Board and Company Managers at the DANCE/USA winter meeting in Washington DC on February 17th.

IADMS Consensus Project

During the October Dance/USA meeting, MJ Liederbach made a brief presentation on her work on behalf of IADMS. This is a 3-year consensus program that aims to establish uniform language and standards among its membership on issues surrounding injury and illness risk screenings, clinical testing methods, and injury reporting.

MJ is endeavoring to collect, from as many teachers and health care practitioners from various disciplines as possible who work with dancers, the screening forms used by them to assess dance injury and illness risk, in advance of the November IADMS annual meeting in Stockholm. The purpose of this collection process is to understand the breadth of information being collected, and to distill what items are found most commonly.

Unfortunately, information about this project was not provided to the PASIG or Dance/USA Medical Teak Force until just prior to the DANCE/USA meeting. Therefore, her September 30th collection deadline has expired. MJ reported that other opportunities will arise and apologized for any communication failures. For further information on the scope, purpose, mission, and vision of this project, please see the Fall 2005 IADMS newsletter and informational updates posted periodically on the IADMS website: www.iadms.org. Additional questions can be addressed to Marijeanne Liederbach, MSPT, MSATC, CSCS, at marijeanne.liederbach@nyumc.org.

PASIG Members Present

The PASIG membership will be well represented at the upcoming annual IADMS conference in November in Stockholm. The PASIG presenters and coauthors include Mylah Garlington, Gayanne Grossman, Marika Molnar, Marijeanne Liederbach, Sheyi Ojofeitimi, and Shaw Bronner. In addition, PASIG members Sheyi Ojofeitimi and Shaw Bronner were coauthors on posters presented at the recent International Society for Biomechanics in August in Cleveland.

Please contact me with any suggestions for the Research Committee or to volunteer.

Shaw Bronner, PT, MHS, EdM, OCS
Research Committee Chair
Email: sbronner@liu.edu

animalpt

SPECIAL INTEREST GROUP

President's Message

I hope everyone is enjoying the beauty of fall. The Animal PT SIG will be conducting a very important strategic planning session in Alexandria, VA on November 17th and 18th. All of the SIG members should have received an email with a survey. The survey is an attempt to ascertain YOUR needs as members so the officers and others present at the meeting can prepare for the future of the SIG and the future of animal physical therapy. The goals of the meeting are to plan for the next upcoming years and set goals as to what we need to accomplish together as a group. Many of the members have been involved in the treatment of animals and are aware of many of the obstacles of physical therapists treating animals. If you have any thoughts or suggestions, please email me directly prior to our meeting at wizofpaws@aol.com or if you would like to attend the meeting, please also let me know.

Deborah Gross Saunders, MSPT, OCS, CCRP
Certified Canine Rehabilitation Practitioner
Wizard of Paws Physical Rehabilitation for Animals, LLC
www.wizardofpaws.net

How I Treat Peripheral Nerve Injuries in the Horse

Peripheral nerve damage can be caused by degenerative changes, metabolic processes, neoplasm, nutritional deficits, infection, inflammation, toxic influences, and most commonly, by trauma. In horses, trauma can occur in many situations such as halter-breaking accidents, athletic injuries, trailer or road traffic accidents, pasture injuries, falls, kicks, and gunshot wounds. The nerves most often involved in the forelimb are the brachial plexus (C6-T2), suprascapular (C6-C7), and radial (C8-T1). In the hind limb, the nerves most frequently injured include the sciatic (L6-S2), femoral (L4-L6), and peroneal (L6-S1). Nerve injuries can be classified as neurapraxia, axonotmesis, or neurotmesis. Edema, pain, wounds, gait changes, impaired balance, and atrophy within 7 to 10 days are signs of nerve injury.

Rehabilitation of peripheral nerve injuries requires a Team Approach where several professionals contribute to the outcome. Team members might include veterinarians specializing in orthopaedics and neurology, a physical therapist, a veterinary technician, the primary caregiver, the trainer, an orthotist, and farrier.

A Physical Therapist evaluation begins with taking a history and consulting with veterinarians for medical and diagnostic testing results. The physical examination addresses wounds, atrophy, reflexes, tone, skin sensation, gait, completing a clinical EMG using FES, joint range of motion, muscle girth, balance, proprioception, edema, pain, weight bearing abilities, and observing function and behavior. Locating the injury site and identifying the muscles are the focus of the examination. Prognosis can be difficult to estimate initially, and is affected by the severity of injury, distance from the injury to the muscle (s) involved, acute vs. chronic problem, and complications from wounds or fractures.

Goals for physical therapist intervention include return to full function, increased strength of affected musculature, promotion of normal sensory input, improved weight bearing, improved gait, increased balance, increased endurance, and improved joint stability. The initial rehabilitation protocol is aimed at preventing fractures from falls, preventing pressure sores, and preventing abnormal loading of joints. Utilizing thick bedding, confinement to a small safe area, using orthotics or a sling support, and enhancing the environment are strategies to prevent problems. Treatment may include ESTIM, massage, ice, heat, ultrasound, laser, acupressure, joint approximation, and balance activities. Neurotrophic stimulation (ESTIM) is a key component of the rehabilitation protocol and may be recommended 3 to 5 times each week for approximately one hour. An initial active exercise plan involves hand walking on straight level surfaces, weight shifting, and walking over ground poles or caveletti. Treament can be progressed by adding walking backwards, circles, and figure eights. Balance and proprioception are challenged by using uneven surfaces, sand, water, and moving around obstacles (TTEAM serpentine and star). Strength and gait can be progressed by adding hills, inclines, swimming, stepping in/out of a trailer, and gradually raising the cavaletti. Trotting, cantering, and pasture turnout can be attempted as joint stability improves. Recovery time varies from a few weeks up to 9 to 12 months or more. Additional factors that affect outcome include the physical status of the animal, owner compliance, and financial commitment.

Lin McGonagle, MSPT, LVT
Morningstar Animal Physical Therapy, Genoa, NY

Rehab Redux
(Announcing the reopening of Sports Medicine and Rehabilitation)

Alameda East Veterinary Hospital

We've added 10,000 additional square feet of state-of-the-art everything. Alameda East Veterinary Hospital is proud to

announce the grand opening of our newly renovated Sports Medicine & Rehabilitation facility! Our 10,000 square-foot transformation, including boarding and daycare, features:

The Clare and Eugene Thaw Biomechanics Laboratory

The first of its kind in private practice, the Biomechanics Laboratory uses force plates (kinetics) and sophisticated digital motion analysis (kinematics) for superlative analysis of the gait and weight-bearing properties of your canine companion. The Lab helps to diagnose sources of lameness, select an appropriate plan of care, and to test efficacy of treatments provided.

Nutrition Center

With obesity becoming an increasing problem among our pets, Alameda East Veterinary Hospital has invested in another 'first:' a DEXA (Dual Energy X-Ray Absorptiometry) scanner that measures body mass composition including bone mineral density and body fat analysis. With an initial reading, a customized nutritional course and exercise program are determined for optimal well-being of the pet. The seriously obese dog may board in our upscale Animal LodgeTM for initial in-patient treatment and clinical supervision. The nutrition center combines the talents of veterinarians, canine nutritional advisors, and canine physical rehabilitation therapists with technology for optimal, lifelong pet health.

Hydrotherapy Center

We present an in-ground lap pool with high pressure jets used to increase strength and endurance or just for general recreation. A slightly warmer in-ground therapy pool is used for more specific rehabilitation of orthopaedic and neurologic conditions. We now house 2 underwater treadmills with jet and incline/decline capabilities and speeds of up to 7.5 mph. Public webcams are installed to view your pet in action online!

Treatment/ Modality Room

This cozy room allows us to consult with new patients and offers a quiet area to apply modalities such as ultrasound, electrical stimulation, extracorporeal shockwave therapy, Equi-Light, and a variety of manual techniques.

Exercise Room

Our 'work out' room is lined with 8 millimeters of rubber flooring and outfitted with a land treadmill, therapy balls, cavaletti rails, etc. to focus our rehabilitation on higher level activities such as balance, coordination, agility, and core strengthening. Even a simulated dog door is installed to allow our patients to regain their normal activities of daily living.

Custom Orthotic & Prosthetic Prescription

Aligned with our 'on call' CPO, we design custom fit orthotics and prosthetics for even the most unusual of cases. From a stretched tibial nerve in a lure coursing accident, Achilles mechanism avulsion (ie, 'dropped hock'), scapulectomy secondary to osteosarcoma, torn cranial cruciate ligament, to bony agenesis, we can custom mold and design an assistive device to fit your critter with a supportive brace or to even replace a missing limb.

Please join us in our celebration and take a tour of our transformed facility online at www.aevh.com.

Caroline Adamson, MSPT, CCRP
Director, Rehabilitation Services
Tammy Wolfe, BSPT, CCRP, GCFP

Animal SIG CSM Programming
A Multidisciplinary Event

by Ginamarie Epifano

The Animal SIG welcomes CSM attendees to our educational programming. We have assembled a panel of speakers who span several professions, giving many different perspectives to the growing field of animal rehabilitation. **Brett Wood, DVM and Charles Evans, PT** of Dover Veterinary Hospital will collaboratively speak on current surgical techniques and corresponding rehabilitation protocols. **Ilaria Borghese, OTR/L** and owner of Therapaws, Inc. will then speak on custom splinting for animals. On a different note, **Diana Carman, PT** of Athens Technical College will give an overview of hippotherapy, the utilization of horses in human therapy. We invite you to join us for our business meeting, which will take place directly after programming

advertisersindex

Orthopaedic Physical Therapy Practice
Orthopaedic Section, APTA, Inc.
2920 East Avenue South, Suite 200
La Crosse, WI 54601

Non-Profit Org.
U.S. Postage
PAID
Permit No. 25
La Crosse, WI