A Publication of the American Association for Hand Surgery

Spring 2000

HAND SURGERY QUARTERLY

# Annual Meeting in Review

*Submitted by Saleh M. Shenaq, MD, Program Chair*

**William M. Swartz, MD (right), 1999 AAHS President, passes on the Presidential Medallion and Gavel to William F. Blair, MD for his reign as President for 2000.**

The 30th Annual Meeting of the American Association for Hand Surgery was held at the Loews Miami Beach Hotel in beautiful South Beach, Florida, from January 5-8, 2000. The three-day scientific program and the social activities were outstanding and memorable. The scientific program included four panels, eight instructional courses, and over 100 posters. From 160 submitted papers, 66 were chosen on various topics of interest to our members, including bone, trauma, nerve, tendon, joint, microvascular surgery, and research. In the residents' portion of the program, there were eleven outstanding papers presented on subjects covering thumb reconstruction, carpal tunnel syndrome, MRI assessment of intercarpal kinematics, and outcomes research in arthrodesis.

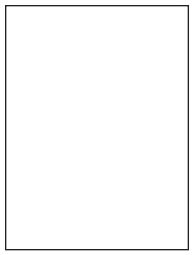
The members enjoyed two very fine panels, moderated by Drs. David Netscher and Richard Berger, on vascular disorders of the hand and skeletal fixation of carpal & metacarpal fractures. Dr. Nancy Dickey, the Immediate Past President of the American Medical Association, gave an insightful presentation as the Presidental Invited Lecturer. Keynote Speaker, Dr. Frank Jones, gave an excellent overview of the evolution of the AMA Guides from the first to the fifth editions.

The efforts of the two sister organizations were highlighted by the joint scientific day which was received by the membership of both organizations. Dr. Alfred Berger from Hannover, Germany, gave an excellent review of his 25 years' personal experience in replantation surgery in Europe. Current information was presented on the management of brachial plexus lesions and hand transplantation in the two joint panels moderated by Dr. Saleh Shenaq and Dr. Chris Pederson.

Through the efforts of the AAHS and ASRM staff, The Conference Exchange was engaged to facilitate the first year of electronic on-line registration, abstract submission, and abstract

*continued on page 8*

# A Look Back and a Look Forward



JAMES G. HOEHN, MD

With a tinge of sadness, I write this last note "From the Editor's Desk". It has been an eventful 6 years and, hopefully, the *Hand Surgery Quarterly* is on an even keel which will allow it to continue to serve the membership and to continue to grow in new and different directions under the editorial pen of your new Editor, Peter Amadio, MD. Please join me in welcoming him and wishing him the best of luck.

A note of recognition and my personal appreciation is due Anne Behrens, the Executive Editor. She enhanced the readability and thus the enjoyment of *HSQ* by her creative spatial use of material. Her doggedness in pursuing the contributors has allowed the *HSQ* to meet most of the publication deadlines. Thank you, Anne!

Special thanks should also go to those many members who served as Deputy and Assistant Editors over the years. Several members should be singled out for special recognition. Forst Brown has coordinated the very popular feature "Around the Hand Table". Ray Janevicius and Stiles Jewett, Jr. contributed the complimentary CPT Coding article. Christine Novak, Laura Kearney, Shirley Cohen, Colette Jewell and Sue Michlovitz provided timely information regarding the background and activities of our Affiliate Members in the "Hand Therapist's Corner". Each of these innovative efforts was eminent success due to the individual efforts of these people.

Perhaps our only regret was our inability to attract sufficient, continuing advertising revenue to make *HSQ* a self-sufficient entity and to allow the elevation of the newsletter to a four-color printing process. This job I'll pass on to your new Editor.

Please join me in welcoming Peter to the Editorship. The *Hand Surgery Quarterly* is in excellent "HANDS".

I look forward to seeing all of you in the future.

Regards,
*JGH*

HAND SURGERY QUARTERLY

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*Hand Surgery Quarterly* is a publication of The American Association for Hand Surgery and is published strictly for the members of AAHS. This publication is designed as a forum for open discussion and debate among the AAHS membership. Opinions discussed are those of the authors or speakers and are not necessarily the position, posture or stance of the Association.



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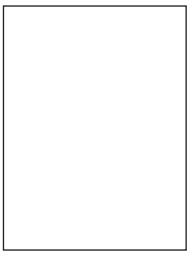
# The Board's New Strategic Plan Takes AAHS in New Directions



WILLIAM F. BLAIR, MD

I begin my year as your President with the privilege of recalling a highly successful Annual meeting for the year 2000. The setting in South Miami was indeed beautiful with an intriguing street scene, exciting nightlife, and sun-warmed beaches where attendees had an opportunity to enjoy both the unusually warm sunshine and to contemplate Miami's hospitality. The Annual Meeting was again very well attended with 326 registrants, family members, friends and corporate vendors. Dr. Sal Shenaq and his Program Committee brought us a diversified content-rich scientific program.

Meetings of this quality are only possible if we have a highly effective administrative office and a thoughtful Board with visionary leadership. Our Central Office, under the direction of Laura Downes Leeper, CAE continues to do an excellent job of planning and conducting our annual meetings and our operations.

Your AAHS Board members have also been working hard this year and the results are apparent. We have made substantial changes for the year 2000 in how we conduct our Board and Central Office business. At the mid-year Board meeting in Chicago, we developed our organization's first Strategic Plan with a Plan of Work for 2000. The Strategic Plan was formally approved by the Board at our Annual Meeting in Miami. The plan clearly states the general principles that guide our organization, prioritizes our goals and delineates specific work items for Board members, committees, ad hoc committees and our Central Office. This is a significant but important departure from our previous method of operation.

Our Strategic Plan takes us in a number of general directions that I would like to share with you. First, it was apparent that our existing committee structure did not serve our Work Plan needs. This was a prompt challenge. In response, I have appointed an Ad Hoc Committee on Committees with Dr. Peter Amadio, Past President, as chair to help us restructure our committees to better effect our Work Plan. Among the Board's strongest direction was an analysis of an increased use of Internet applications to better serve membership needs from meeting registrations to delivering clinical educational content. Much of the Work Plan for 2000 is devoted to enhanced Internet applications. Again, our organization did not have a suitable committee structure to pursue these types of goals. Fortunately, our organization has expertise in a number of areas which I brought together again in an Ad Hoc Committee on Internet Applications under the chair of Dr. Keith Brandt. As our web site develops, increasing services will be available to membership including our roster, registrations, applications and access to clinical content, both for members and our patients. Please visit our web site at www.handsurgery.org for an introduction to our initial efforts.

AMONG THE BOARD'S STRONGEST DIRECTION WAS AN ANALYSIS OF AN INCREASED USE OF INTERNET APPLICATIONS TO BETTER SERVE MEMBERSHIP NEEDS.

Membership development continues to be another high priority for our Board. A corollary interest of mine has been the participation of international members in our organization's educational programming. Again, our committee structure did not really include attention to attracting or serving international hand surgeons in the context of the AAHS. Again, I appointed an Ad Hoc International Members Development Committee chaired by Dr. Alan Freeland. He and his committee members are considering and preparing, for inclusion in our Work Plan for 2001, specific recommendations to better serve present and future international membership.

My first two months as your President have given me the opportunity to identify, support, and direct a number of initiatives that I am confident will continue to improve our organization and to increase the number and quality of opportunities available for our membership. These are exciting times of change, but as your President, I am enjoying the challenge. In the next *Hand Surgery Quarterly*, I will update you on our administrative activities and the plans for our Annual Meeting 2001 in San Diego. H

*The AAHS Board of Directors and the 2000 Annual Meeting Program Committee would like to thank the following companies for their support and participation.*

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# A Tribute to Endre Cziffer

On December 12, 1999, the American Association for Hand Surgery lost a dear friend and devoted proponent, Endre Cziffer, MD. Endre was the Professor and Chairman of the Department of Orthopaedic Surgery at the Central Army Hospital in Budapest, Hungary. He died suddenly, unexpectedly, and at much too young an age while making routine rounds in his own hospital, casting a pall upon the holiday season for his family, colleagues, patients, and many friends throughout the world.

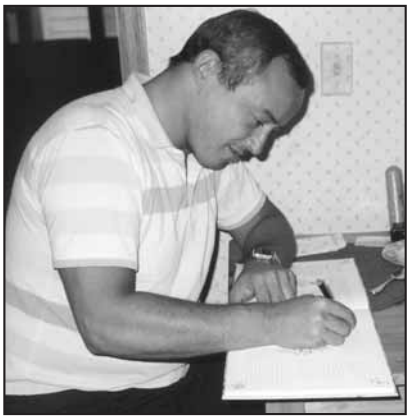
Endre was the genuine article, a prince among men, a friend to all who met him. He always had a ready and infectious smile, a warm heart, and a kind or encouraging word. He was a great leader and charming visionary who worked tirelessly to improve the standard of care and the level of education in orthopaedic and hand surgery, not only for his countrymen, but throughout the globe.

Endre had the gift of creative genious, designing and developing a cost-effective external fixator system through successive generations starting with a rough model in his hospital engineering shop and culminating in a refined and very effective manufactured product. He similarly invented and ultimately produced a nerve approximator,

**Endre Cziffer, MD with his wife, Maria.**

the first of its kind, to coapt lacerated nerve ends for suturing. He edited two books and wrote several scholarly articles in the fields of orthopaedic and hand trauma.

Endre was the driving force in arranging the first AAHS international meeting, co-sponsored with the Hungarian Hand Society, and held in Budapest in 1992. The meeting was a great success and solidified a lasting friendship among the members of the two societies. It remains fondly remembered by all that attended. This event importantly initiated a new international direction for the AAHS, culminating in our International Vargas Teaching Award and the development of friendships and scientific exchange with many hand surgeons from a variety of nations around the world. Endre Cziffer was made an honorary member of AAHS for his efforts in Budapest and frequently attended our meetings and visited and lectured at our medical centers.



**Dr. Endre Cziffer on the job.**

Most recently, as Hungary's representative to the International Federation of Societies for Surgery of the Hand, Endre worked and lobbied hard to obtain for Hungary and the Hungarian Hand Society the privilege of hosting the 2004 IFSSH meeting. He was looking forward to organizing this meeting to serve as a showpiece for his beloved country. Now, this task will fall to others.

Most importantly, Endre was a devoted and loving husband and father. He often traveled with his wife, Maria and proudly doted on his daughter, Veronica and his son Laszio. Our sympathies extend to Endre's family, who can perhaps take some small comfort in the fact that their stalwart will live on in the hearts and memories of his friends and colleagues around the planet as well as in their own. We salute our fallen comrade. He will be sorely missed. Godspeed, good friend. H

*Peter Amadio, MD*
*Alan Freeland, MD*

**OBITUARY**

# Endre Cziffer MD, PhD, DSc 1948-1999

Colonel Endre Cziffer was director of the Trauma Department of the Central Military Hospital Budapest, Hungary. He was born on November 1, 1948, in Budapesten. He qualified ("Summa cum laude") at the Semmelweis University of Medicine, Budapest in 1973. He started his medical career in the Central Military Hospital, first in the General Surgical Department for two years and subsequently at the Trauma Unit. Over the years he acquired postgraduate qualifications in general, trauma, plastic and reconstructive, and hand surgery. He became Director of the Trauma Department in 1996.

He wrote his PhD and DSc thesis in the topic of external fixation. His remarkable inventions include the Manuflex™ external fixation system and the Neuromeet™ tissue approximator which were both patented internationally.

He authored nearly 80 publications, and edited the textbook *External Fixation of Small Bones* (1994, Literatura Medica, supported by the IFSSH), and wrote a chapter in *Current Practice in Hand Surgery* (1997).

The work he was probably most proud of was published in 1997 by Springer: *Operative Management of Fractures* will be *the* textbook to study from in this field in Hungary in the next few years. *Conservative Management of Fractures*, edited by the Foundation for Modern Trauma Care in Budapest, came out in 1999.

He was on the editorial board of the *Journal of Hand Surgery* from 1995.

Colonel Cziffer was honorary member of the American Association of Hand Surgery and the official delegate of Hungary in the International Federation for Societies of Surgery of the Hand. He also contributed to the work of IFSSH in various committees and subcommittees.

At the everyday work in the operating room his meticulous technique, swift and often brilliant decisions gained many admirers among his collegues and juniors.

His friendly and encouraging manner was very much liked by his patients. In the last morning of his life, at the end of a busy on-call session he performed a lifesaving operation on an RTA victim; the acute coronary attacked him without warning a few hours later at his own department. By the late afternoon Endre Cziffer, aged 51 years, died in the Intensive Care Unit. He is sadly missed by his family, collegues, students and innumerable patients.

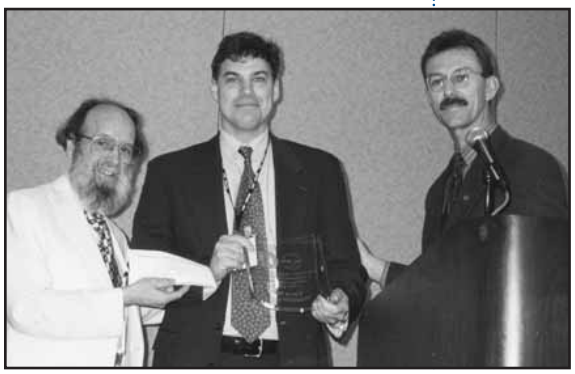
The Trauma Department of the Central Military Hospital founded the Prize "In Memoriam Cziffer Endre" which will support the scientific activities of young doctors specializing in trauma surgery.

*Béla Turchányi MD*
*Consultant trauma and hand surgeon*
*Trauma Department, Central Military Hospital, Hungary*

# The Hand Surgery Endowment Increases Its Support of AAHS

Through the generous donations of the members of AAHS, the Hand Surgery Endowment has been able to increase its support of several educational activities of the American Association for Hand Surgery. This was most evident in the events at the annual meeting in South Beach, Florida.

The Hand Therapy Pre-Conference Seminar, "Fracture Management: Evidence-Based Surgical and Therapy Practice," was underwritten in part by a significant contribution from the Hand Surgery Endowment. In making these contributions to the seminar, the objective is to encourage greater participation in the seminar by holding down the cost to the members.

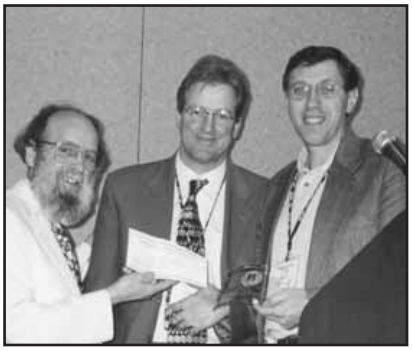


Robert R. Schenck, MD, President of the Hand Surgery Endowment, (left), and Brian Adams, MD, Chair of the Resident Essay Award Committee (right), present the award for the Resident Essay - First Place.

The Hand Surgery Endowment funds the Presidential Invited Lecturer. The AAHS members were stimulated by the remarks of Nancy Dickey, MD, immediate Past President of the American Medical Association when she addressed the group on the opening day of the 2000 Annual Meeting.

The Spanish translation of the educational events, funded by the Hand Surgery Endowment, made it possible for the international members to participate more fully in the educational activities during the annual meeting. The objective is also to encourage more international involvement in AAHS and the educational programs that it sponsors.

Poster Award - First Place was presented to Sean Lille, MD (right) by Robert R. Schenck, MD (left) and Steven McCabe, MD, Chair of the Poster Award Committee.



Poster Award - Second Place was presented to Peter Janevski, MD (right) by Robert R. Schenck, MD (left) and Steven McCabe, MD.

## THE AWARDS

The influence of the Hand Surgery Endowment was most visible during the Awards Luncheon. Two Resident Essay Awards, two Poster Awards and, in part, the Vargas Award are funded by the Endowment. The recipients of the awards are as follows:

**Resident Essay - First Prize**
David Mathes, MD
with J.P. Rubin, MD; G.S. Gazelle, MD; M.A. Randolph, MD; A. Wu, MD; D.H. Sachs, MD and W.P.A. Lee, MD
*"In Utero Induction of Transplantation Tolerance without Immunosuppression in a Large Animal Model"*

**Resident Essay - Second Prize**
Claire Temple, MD
with D.C. Ross, MD; J.A. Johnson, MD and C. Dunning, MD
*"Acquired Mechanical Strength of Healing Peripheral Nerves"*

**Poster Award - First Prize**
Sean Lille, MD
with Thomas Hayakawa, MD; Lonny Ross, MD; Michael W. Neumeister, MD, FRCS(Ed); R.E. Brown, MD; R.C. Russell, MD; E.G. Zook, MD; A. Mowlavi; K. Murray, MD
*"Continuous Post-operative Catheter Irrigation Is Not Necessary for Treatment of Suppurative Tenosynovitis: A Bi-Institutional Review"*

**Poster Award - Second Prize**
Peter Janevski, MD
*"Recurrence Risk Factors for Giant Cell Tumor of the Tendon Sheath"*

**Vargas International Hand Therapist Teaching Award**
Karen Henehan-Flink, OTR/L, CHT
*Will be working in Lithuania beginning in February 2000*

## ACKNOWLEDGMENTS

The Board of Governors of the Hand Surgery Endowment:

| | |
|---|---|
| President | Robert R. Schenck, MD |
| Vice President | Joseph Danyo, MD |
| Secretary / Treasurer | Ronald Palmer, MD |
| Member | Miguel Saldana, MD |
| Member | James Hoehn, MD |

wishes to acknowledge the work of the Resident Essay Award Committee:

Brian Adams, MD, Chair
Linda Philips, MD
Michael White, MD

as well as the Poster Award Committee:

Steven McCabe, MD, Chair
Michael Angel, MD
Daniel Labs, MD
Benisse Lester, MD
Robin Miller, OTR/CHT

in selecting the educational activities that most benefitted the members of AAHS, and to the AAHS Board of Directors in selecting the Vargas Award winner.

Further, the Board of Governors thanks all the members of AAHS who have so generously contributed to the Hand Surgery Endowment. As you can see, these donations directly benefit you and the hand surgery profession.

PROFILE

## President William F. Blair, MD

William F. Blair, MD graduated from the University of Iowa College of Medicine in 1974. He completed an orthopedic residency and a fellowship in hand surgery at the University of New Mexico. He began his academic career in the Department of Orthopedics, University of Iowa in 1980. He served there as a full professor and director of the Hand Service until May 1997, when he entered private practice in Iowa City, Iowa. Dr. Blair has authored over 110 scientific publications and 17 book chapters; he has also edited a leading textbook in hand surgery entitled *Techniques in Hand Surgery*.

In addition to being a member of AAHS since 1984, Dr. Blair is a member of numerous other professional organizations, including the American Academy of Orthopedic Surgeons, the American Orthopedic Association, and the American Society for Surgery of the Hand. He has served on many AAHS standing, special and ad hoc committees, and on the AAHS Board as Chairman of the Membership Committee, Historian, Director At Large, Parliamentarian and most recently, Vice President and President-Elect. Dr. Blair is now the 2000 AAHS President.

## 2001 Application for Research Grants

**The AAHS Research Grant Awards were established to further the purpose of the Association as stated in its Bylaws and to foster creativity and innovation in basic and/or clinical research in all areas pertinent to hand surgery.**

### Awards and Eligibility

Grants will be made for a one year period to up to three investigators. Grants are available to all AAHS members. One of the investigators must be an **active** or **affiliate** member of the association.

### Grant Application

Applications may be obtained from:

American Association for Hand Surgery
20 N. Michigan Avenue, Suite 700
Chicago, Illinois 60602

Applications (**an original plus seven copies**) must be received by the committee chair no later than **Friday, December 1, 2000,** in order for the judging to be completed in time and the recipients to be announced at the Annual Meeting.

The AAHS and the Research Committee are required by the IRS to document disbursement of grant funds. Award recipients will be required to sign a letter of acceptance and submit a progress report once each year. The AAHS must be acknowledged as the source of funding in any presentation or publication. A final report must be submitted at the completion of the study. It is expected that the results of the funded research be submitted for presentation at an Annual Meeting within two years of the receipt of the award.

Funds must be returned to the AAHS if the study is not undertaken within twelve months of the receipt of the award.

Failure to follow these guidelines will disqualify the recipient from any further grant opportunities and from presenting any papers at the AAHS Annual Meeting for a period of three years following such default.

### Mail Grant Proposals to

William Lineaweaver, MD
812 Arlington Street
Jackson, MS 39202

*continued from page 1*

ratings by the Program Committee. The use of this service proved to be successful and it is anticipated that it will be more cost effective than the traditional method of printing and mailing.

As Program Chair, my special thanks to the speakers, panelists and instructors for an outstanding job, and congratulations to the winners of the Resident Assay Awards and Poster Awards. I would like to also extend my appreciation to the Program Committee for their guidance, and to Krista Greco and Laura Downes Leeper of the AAHS Central Office, and Julie Wiener on my staff for their enthusiastic and tireless help in bringing this year's program to a timely and successful

*The American Association for Hand Surgery would like to thank our 4th Annual "Day at the Links" Golf Tournament Sponsors*

*Cook Vascular, Inc.*

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## 2000 Annual Meeting Photo Highlights

ASSH President William P. Cooney speaks to the members.

2000 AAHS Program Chair Saleh M. Shenaq, MD

William Swart, MD (right) presents an award to the Presidential Invited Speaker Nancy Dickey, MD (left).

Daniel Nagle, MD (right) congratulates Alfred Berger, MD (left), the President's Invited Lecturer.

Keynote Speaker Frank Jones, MD (right) and William Swartz, MD.

Peter C. Amadio, MD (left) is recognized as the AAHS 2000 Clinician/Teacher of the Year.

Dr. Robert Schenck (left), President of the Hand Surgery Endowment, presents Dr. Nash Naam with the Vargas Physician Award.

(Left to right) Drs. Bruce Shack, Gunter Germann, William Swartz and Ronald Barton make up a foursome in the AAHS/ASRM 4th Annual Day at the Links.

## AAHS 2000 NEW MEMBERS

### Active Membership

Rocco Barbieri, MD
*Newark, New Jersey*

Timothy M. Bradley, MD
*Swansea, Illinois*

Mark A. Brzezienski, MD
*Chattanooga, Tennessee*

E. Collins, MD
*Lebanon, New Hampshire*

Kimball Crofts, MD
*Provo, Utah*

Michael J. Fealy, MD
*Peoria, Illinois*

Lawrence Foster, MD
*Brookfield, Wisconsin*

Eric Roy George, MD
*Metairie, Louisiana*

Richard M. Harkness, MD
*Norman, Oklahoma*

Tad R. Heinz, MD
*Birmingham, Alabama*

Gregory Hill, MD
*Akron, Ohio*

Lon W. Howard, MD
*Littleton, New Hampshire*

Gilbert W. Lee, MD
*San Diego, California*

Peter Lund, MD
*Martin, Tennessee*

Doug Mackenzie, MD
*Portland, Oregon*

David S. Martin, MD
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Keith Melancon, MD
*Hattiesburg, Mississippi*

Joe Minarchek, MD
*Columbus, Ohio*

Bruce A. Monoghan, MD
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*Miami, Florida*

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*Winston-Salem, North Carolina*

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*Philadelphia, Pennsylvania*

Craig Torosian, MD
*Geneva, Illinois*

Tsu-Min Tsai, MD
*Louisville, Kentucky*

Benjamin Van Raalte, MD
*Davenport, Iowa*

### Corresponding Membership

Anthony DeSantolo, MD
*Caracas, Venezuela*

Georg Rappold, MD
*Vienna, Austria*

### Affiliate Membership

Jane Aitken, OTR, CHT
*Mesa, Arizona*

Elizabeth Everett Blake, OTR/CHT
*Naples, Florida*

Sylvia Boddener, OTR/L
*Miami Lakes, Florida*

Paul Brach, MS, PT, CHT
*Pittsburgh, Pennsylvania*

Andria M. Eisman, MS, OTR
*Ann Arbor, Michigan*

Leigh French, MSPT, CHT
*Ocean Springs, Mississippi*

Sharon R. Gaebler, OTR, CHT
*Citrus Heights, Pennsylvania*

Gail Groth, MHS, OTR/L, CHT
*St. Louis, Missouri*

Cathy Korger, OTR/L
*Chicago, Illinois*

Jane Mackinnon, BScPT, CHT
*Richmond, British Columbia, Canada*

Carmen Roberts, OTR/CHT
*Peoria, Illinois*

Sandra Robinson, CHT
*Elmira, New York*

Shannon Singletary, PT, ATC
*Jackson, Mississippi*

Charleen Stennett, OTR/L
*Miami, Florida*

Margaret Tull, PT, CHT
*Philadelphia, Pennsylvania*

Lani Urquiola, OTR/L
Oklahoma City, Oklahoma

Susan Weiss-Lessard, OTR/L, CHT
*St. Petersburg, Florida*

### Candidate Membership

Adam Summers, MD
*Milwaukee, Wisconsin*

# South Beach and Affiliate Update

*By Susan Michlovitz, PhD, PT*

In spite of a sunny, warm day, the Pre-Conference Hand Therapy Day on "Fracture Management: Evidence-Based Surgical and Therapy Practice" was well attended with 60-100 people throughout the day. We appreciate the time each speaker took from her/his busy schedule to prepare and present. Morning sessions included topics on assessment and management of fractures and complications, providing a foundation for surgeon/therapist presented case studies in the afternoon. The day ended with a panel discussion that could have easily continued past the time planned. Both Katherine Scofield, OTR/L, CHT and Nash Naam, MD also provided a summary of their Vargas trip to Cairo.

Other meeting highlights pertaining to therapists included the by-laws changes approved at the Annual Business meeting (refer back to the Winter 1999, HSQ for a copy of the changes). Katherine Scofield is the first therapist in an elected position, as a member of the Affiliate Subcommittee of the Nominating Committee. That subcommittee is responsible for nominating (a) candidate(s) for the Vice-Chair of the Hand Therapy Committee. This will be done for the year 2001. In addition, there are now be two therapists as Affiliate Directors (Chair and Vice-Chair of the Committee for Hand Therapy) who are voting members of the Board of Directors.

The new Vice-Chair of the Committee for Hand Therapy is Paul LaStayo, MPT, CHT from Northern Arizona University and DeRosa Therapy (Flagstaff, AZ). He is the Assistant Editor, Journal of Hand Therapy. His research has included studies on dynamic grip; sensitivity/specificity of wrist provocative maneuvers; CPM post-RTC repair; splinting for basal joint arthritis and total end range time for PIP flexion contractures. H

## HAND THERAPY PROFILE

### Paul Brach, PT, MS, CHT

PAUL BRACH, PT, MS, CHT

**Personal:** I have been living in Pittsburgh, PA, for nine years. When I am not working in the clinic, I love to work around the home, travel and cook wonderful gourmet meals for my wife and friends.

**Education:** B.S. in Exercise Physiology from West Virginia University in 1988. I went on to earn my Masters Degree in Physical Therapy from D'Youville College in Buffalo, New York in 1991. I received my Certification in Hand Therapy in 1997.

**Employer:** I am currently working for the Centers for Rehab Services in Pittsburgh, PA, where I have worked for 3 years as a clinical specialist in their Hand and Upper Extremity Rehabilitation program.

**Best Parts of My Job:** The best part of my job is working as a team with the physicians to provide the best care possible to our patients.

**Greatest Challenge:** To continuously provide the quality of care to each and every patient when the demands for increased productivity are asked of you in today's managed care environment.

**Major Accomplishment:** Receiving my Certification in Hand Therapy.

**Clinical Specialties:** I enjoy working with all the variety of patients that come through the door, but I especially like to treat injuries related to the wrist

**AAHS Involvement:** I recently joined the AAHS this year. I have attended previous conferences before becoming a member. I had the pleasure of speaking at this year's conference on "Two Bone Forearm Fractures "with Dr. Dean Sotereanos and "Radial Head Fractures" with Dr. Mark Cohen. I look forward to becoming more involved in the association.

**Three Words to Describe Me:** Determined, Charming, and Personable H

# Nerve Trauma

*This edition of the Around the Hand Table deals with the evaluation and management of injuries with respect to nerve trauma. Leading our discussion is moderator* ***Susan E. Mackinnon, MD****, Shoenberg Professor of Surgery, Chief of the Div. of Plastic and Reconstructive Surgery, Washington University School of Medicine, St. Louis, MO. Joining her in this discussion are hand surgeons* ***Milan Stevanovic, MD****, Associate Professor of Clinical Orthopaedics, Hand and Microsurgery, Dept. of Orthopaedics, The Keck School of Medicine of the Univ. of Southern California, Los Angeles, CA,* ***Julie A. Katarincic, MD****, Consultant in Orthopaedic Surgery, Mayo Clinic, Rochester, MN,* ***Sheila Lindley, MD, FACS,*** *Assistant Professor of Orthopaedic Surgery, Univ. of Mississippi Medical Center, Jackson, MS, and hand therapist* ***Julianne W. Howell, PT, MS, CHT****, Hand Therapy Services, Albany General Hospital, Albany, OR.*

**I DON'T THINK THAT THERE IS ANYTHING IN OUR LITERATURE TO SUGGEST THAT A FEW DAYS, EVEN TO A COUPLE OF WEEKS IS GOING TO IN ANY WAY MAKE A DIFFERENCE TO THE LONG-TERM FUNCTIONAL RESULTS.**

**SUSAN E. MACKINNON, MD**

**Dr. Mackinnon:** Let's start out our discussion on nerve trauma by outlining the important aspects of the evaluation of the patient with an acute nerve injury.

**Dr. Stevanovic:** When seeing a patient in the emergency room with an acute injury, I look for the level of injury, the mechanism of injury, and the age of the patient. I also find out whether the patient has any underlying diseases such as diabetes, kidney disease, thyroid abnormalities and so on before deciding on what treatment is necessary. Open injuries are treated differently than closed injuries.

**Dr. Lindley:** I would emphasize the importance of the mechanism of injury, whether it's an open or closed wound, and whether or not I can do an accurate extremity examination depending on the patient's underlying condition.

**Dr. Katarincic:** If there are any additional injuries the patient suffered, we have to prioritize them. Again, a good exam is important and this can be difficult to do in the trauma setting.

**Dr. Stevanovic:** The key is that the patient should be thoroughly evaluated. If the level of injury is uncertain or if there are associated head or spine injuries, the neurological examinations should be performed several times throughout the day until the neurologic examination is stable and the level of injury is determined.

**Dr. Mackinnon:** Staying with the same patient in the emergency room with neurological deficit and an open wound, when following the injury, would you consider surgical intervention?

**Dr. Stevanovic:** If the patient presents with a neurological deficit and a clean laceration, I will schedule that patient for exploration as soon as possible. I will not necessarily do this as an emergency, but I would like to do this within the first 72 hours. However, if the patient has a closed injury, I would certainly wait and follow the patient with serial examinations over a longer period of time.

**Dr. Lindley:** If there is an open wound and if it's a sharp injury, if I am happy with my extremity examination and I can define the nerve injury, I would do a primary repair. If it's more of a blast injury or I can't determine the level of nerve injury, I would debride and close the wound, then follow the patient.

**Dr. Katarincic:** I would agree. If it is a dirty injury or a crush type injury, I'd consider about three weeks the best time if the wound looks good.

**Dr. Mackinnon:** I think it's important to discuss the timing of the surgical intervention. I know patients or even lawyers have asked us if "such and such" a delay in the primary repair impacted negatively on the ultimate result. Do any of you have any comments about how emergent or how urgent a nerve repair is, for example, a glass injury or a knife injury to the forearm with a median nerve deficit? My feeling is that you should close the wound and get the patient to the operating room—when you have a decent operating room available with a good nurse and good equipment. Better off to wait a few days to have a good surgeon with good equipment than to do something emergently or urgently without that backup.

Dr. Stevanovic, given that patient with a stab or glass wound to the forearm, who was seen in the emergency room, had the incision closed and told to report to the hand surgeon's office to be evaluated and managed, must they be operated on within 72 hours? Or do

you think if they were in that hand surgeon's office in a few days and scheduled for surgery in a few days after that, that would be too long to wait to do a definitive nerve repair?

**Dr. Stevanovic:** No, I don't think it would be too long. If the patient is covered with antibiotics and received prophylactic tetanus protection, he will be fine. Even a week would be acceptable for repair.

**Dr. Mackinnon:** I would certainly agree with that. If it is determined that the best way to manage the injury is a primary repair without a nerve graft, I think that that—almost by definition—means you got to it fast enough.

I don't think that there is anything in our literature to suggest that a few days, to even a couple of weeks is going to in any way make a difference to the long-term functional results, especially if you are able to do a primary repair. Now along that line, sometimes we won't want to do a primary repair. I'd like to discuss now whether or not the mechanism of injury will influence your decision in the timing of the surgery, open versus closed. So why don't we stay with open injuries and discuss how you'd manage sharp injuries versus a messy table saw injury, or a gunshot wound. Dr. Stevanovic?

**Dr. Stevanovic:** As we discussed, if there is a sharp laceration, I do a primary repair. With a table saw injury you should be prepared to use a nerve graft. I decide on using a nerve graft intra-operatively. After resecting the nerve back to normal appearing fascicles, I try to approximate the proximal and distal ends with a single 10-0 nylon suture. If the suture breaks or pulls out of the nerve, I will do a nerve graft. Some authors have recommended using an 8-0 nylon suture for measuring tension. I think that this size suture can stretch the nerve too much. So I prefer to use a 10-0 for assessing tension and 9-0 for the nerve repair. I also try to avoid excessive mobilization of the proximal and distal stumps to minimize problems with perineural scarring and disruption of the vascularity of the nerve.

**Dr. Mackinnon:** When would you do a nerve graft at the first exploration?

**Dr. Stevanovic:** I would do a nerve graft if I had to do something for soft tissue coverage. If there is an extensive wound that needs flap coverage, I would do nerve grafting at the same time, even if it is 72 hours or less from the injury.

**Dr. Lindley:** If there is a significant wound, either a table saw or significant soft tissue-bony loss, and if it is necessary to reconstruct and even restore vascularity to the upper extremity, and there is a significant nerve gap, or if I'm not confident that I can determine the proximal extent of nerve injury or the amount of nerve that needs to be resected, I would delay nerve grafting. At the same time I would mark the nerve ends.

**Dr. Mackinnon:** When would you come back in to do your nerve graft?

**Dr. Lindley:** Whenever the inflammatory response has subsided or healing has taken place. It depends on the injury itself. If there are fractures present and significant soft tissue loss, when I have to do a free tissue transfer to gain soft tissue coverage, I would want to wait until significant inflammatory response has settled down.

**Dr. Katarincic:** I agree with that timing. If I'm in there and it was a sharp injury with a clean wound that needs grafting, I will consider doing it right away. In the farm injuries, chain saws or table saws we usually see, often I cannot determine the proximal extent. I prefer to come back at two or three weeks when the zone of injury is apparent. In the interim, I will tag the nerve ends and try to keep them out to length. At three weeks, if the soft tissues are ready, I will do the grafting.

**Dr. Mackinnon:** I would think that doing an acute nerve graft would definitely not be the norm. However, if you had a messy injury with a gap or if you could not determine the proximal and distal length of the extent of the injury, you would bring the nerve together to hold it out to length. When you came back at two to four weeks, or when the wound allowed, your nerve graft would be shorter. But I would also agree with one thing Dr. Stevanovic said earlier, and I think Dr. Lindley echoed, that if you had a situation involving a very significant injury and you felt that coming back later to do the nerve graft was going to be a nightmare, then you might consider a primary elective nerve graft. I would not do that in a farm injury where there is wound contamination. In some injuries where you think you have a clean injury but there is a long injury to the nerve and you have a lot of other things to do, like a lot of tendon repairs or revascularizing or free flaps, then in that situation I would consider doing an acute nerve graft. If I did an acute graft, I

*continued on page 14*

**IN THE FARM INJURIES, CHAIN SAWS OR TABLE SAWS WE USUALLY SEE, OFTEN I CANNOT DETERMINE THE PROXIMAL EXTENT. I PREFER TO COME BACK AT TWO OR THREE WEEKS WHEN THE ZONE OF INJURY IS APPARENT.**

**JULIE A. KATARINCIC, MD**

*continued from page 13*

would do my very, very best to make sure I was widely outside the zone of injury, probably accepting a longer graft than I might need if I waited three weeks to let the scar define the zone of injury. But that way I'd be saving the patient the potential downside of going back at a time that might potentially compromise my initial surgery.

Could you all comment for me on the particular donor nerve grafts that you like or dislike?

**FOR DIGITAL NERVES WITH GAPS LESS THAN 2 CM, I PREFER USING VEIN GRAFTS.... MORE RECENTLY, I HAVE BEEN USING THE NEURAL TUBE.**

**MILAN STEVANOVIC, MD**

**Dr. Stevanovic:** As far as nerve grafting for the brachial plexus, I try to use sural and saphenous nerves. If I have a complete avulsion of C8 and T1, I prefer to sacrifice the ulnar nerve and use it as a non-vascularized nerve graft. I think that this is the best size match for the width of the trunks and cords. If I am dealing with a more distal nerve peripheral nerve injury, I generally use sural nerve grafts. For digital nerves with gaps less than 2 cm, I prefer using vein grafts. My preference is for the dorsal veins, especially the cephalic, which have thicker walls. More recently, I have been using the neural tube, which you and Lee Dellon have developed. Probably the results are not quite as good as primary repair, but almost the same. Also, I still occasionally use the posterior interosseous nerve graft for single digital nerve injuries with more than 2 cm defect. The saphenous nerve is long, and you can take up to around 30 cm length.

**Dr. Mackinnon:** So Dr. Stevanovic's favorite grafts then are saphenous, sural and the non-vascularized ulnar.

**Dr. Stevanovic:** Yes.

**Dr. Mackinnon:** Dr. Lindley?

**Dr. Lindley:** My favorite nerve is the sural nerve, and I use it the majority of the time. I like to use posterior interosseous nerve at the wrist for digital nerve grafting. Occasionally I will use the lateral antebrachial cutaneous nerve to the forearm. But the sural nerve is by far my favorite.

**Dr. Mackinnon:** Do you use a step incision or a longitudinal incision?

**Dr. Lindley:** I use multiple longitudinal step incisions.

**Dr. Katarincic:** I agree with Dr. Stevanovic about the brachial plexus. For peripheral injuries I tend to like to use the sural nerve. The downside is that I use a single longitudinal incision, so there is that cosmetic morbidity. Functionally I think it's a nerve that's not missed. Also, for the digital nerves, I would use the posterior interosseous. I have not been happy with the lateral antebrachial cutaneous because I've had some troubling neuromas and post-operative phantom-type pain.

**Dr. Mackinnon:** It's interesting to see the variations in people's preferences for nerve grafts. I use the sural graft if I need long length of nerve, and I will use a longitudinal incision in obese patients or when I need a very large amount of graft material so that I don't miss any branches of the sural nerve. Otherwise I'd use a step incision. After Dr. Stevanovic's comments, I would now consider looking at the saphenous nerve. In theory to use a non-vascularized ulnar nerve should give problems with necrosis and scarring in the middle of the nerve. Certainly with animal experience, when you use large caliber nerves, non-vascularized, they scar. My favorite nerve graft that no one has mentioned yet is the anterior branch of the medial antebrachial cutaneous nerve. I make an incision in the medial aspect of the arm beside the basilic vein and take out the anterior branch. There is also in the upper arm, crisscrossing obliquely across the arm, a branch coming off the anterior branch of the medial antebrachial cutaneous nerve which gives hardly any donor sensory deficit. If I need a very short piece of graft, I'll use the lateral antebrachial cutaneous nerve and do a transverse incision, finding it in the upper forearm, and taking the proximal end, and burying it in muscle so I don't get a tender neuroma. The posterior cutaneous nerve at the wrist I feel has a lot of fibrous tissue in it. I have used the terminal branch of the anterior interosseous nerve which would innervate the pronator quadratus. This donor has no sensory or motor deficit. With median nerve injuries where there is no function in the median nerve following, for example, a failed median nerve, I have used the fascicles of the median nerve that would innervate the third web space both proximal and distal to the nerve injury. I use it to graft and reconstruct the radial side of the median nerve to the thumb index and long fingers so the patient has no new sensory deficit.

**Dr. Stevanovic:** I would like to add something. Many times when we are dealing with a mangled hand, the sensory branch of the radial nerve distally is completely crushed. In these cases, we use the entire sensory branch proximally to the distal level of injury as a donor nerve for grafting deficits in the median or ulnar nerves if a nerve graft is required.

As far as complications are concerned, we have to be very careful in dissecting the sural nerve. If you are close to the edge of the Achilles tendon, scar tissue sometimes can be a problem, especially in people who are genetically prone to make more scar. The incision should be as

far lateral and anterior as possible to avoid scarring of the Achilles tendon. Closure of the skin donor site should be done with subcuticular technique to minimize skin scarring.

**Dr. Mackinnon:** That's a very good point. Ms. Howell, do you have any comments about how you manage problematic donor sites?

**Ms. Howell:** Generally what I see is either hypersensitivity or guarded movement. Then I'll have to deal with these problems either through a desensitization program or exercise.

Components of the desensitization program may include mild heat; hand held mini-vibrator, various textured fabrics and massage. In my view, desensitization is a patient-administered-therapist-directed program. The patient is given an assortment of different textured fabric swatches. I ask the patient to lightly stroke over the sensitive area with each. Next the patient is asked to rank the fabrics from least to most irritating. A short period of mild heat application follows. Then the patient places multiple layers of towel over the sensitive area and applies a mini-vibrator. It is important that ample toweling is used to dampen the vibration to a mild nonpainful level. This is done for 3 to 5 minutes, and if tolerated, the patient can reduce the layers of towel as long as it does not become an irritating stimulus. After the vibrator is used, the 3 "least irritating" fabric swatches are each lightly and slowly moved over the sensitive area for 30-60 seconds. The patient is asked to try to do a slow effluerage type massage with lotion over the area for another 1-2 minutes. I request that patients do this in a quiet environment at home 2-3 times a day if possible. Too much heat, too few towel layers, too firm or fast fabric massage or effluerage and too infrequent sessions often produce failure. Initially, between desensitization sessions, patients will often need some sort of silicon or otoform pad or protective splint over the sensitive area for comfort. Progression of the desensitization program is to less or no towels, the more irritating fabrics and to quicker stimulation such as a foam-padded tongue depressor for tapping. Generally by 3 weeks you'll get an idea whether the program will succeed.

**Dr. Mackinnon:** Can we say a few words about gunshot wounds? What pointers do you have for the management of the patient with a neurological deficit from a gunshot wound. Dr. Stevanovic?

**Dr. Stevanovic:** We see a lot of these injuries here in Los Angeles. If they do not require surgical intervention for vascular repair, bony stabilization, or soft tissue coverage, we try to wait to see whether there is nerve recovery. If there are no signs of recovery by four to six weeks, we obtain an EMG study. If there is no EMG activity at two months, we schedule the patient for exploration, neurolysis and nerve grafting as needed. If there is some EMG activity, but no functional recovery, we wait up to three months. If there are open wounds that need debridement and reconstruction, we resect as much nerve as necessary until healthy appearing fascicles are seen and do grafting of this nerve primarily. In my opinion that is the key to success.

**Dr. Mackinnon:** Dr. Stevanovic, if you had to go in because a vascular surgeon was exploring a gunshot wound and you found a major nerve in continuity but slightly bruised, how would you manage that?

**Dr. Stevanovic:** I wouldn't do anything at that time, but would follow the patient over the next several months and observe for recovery. If there is no recovery at four months, I would explore. My surgical plan would include neurolysis and possible nerve grafting. If there is a complete neurologic deficit, I may be more inclined to perform a nerve graft, depending on the quality of the nerve under the microscope.

**Dr. Mackinnon:** So if the nerve is intact, you watch it expectantly and if it's disrupted then you would consider treating with an acute long nerve graft?

**Dr. Stevanovic:** Yes. I would use an acute long nerve graft, if the patient needs a major reconstruction with bone and soft tissue coverage. If the patient does not require major reconstruction and we know that the nerve is disrupted, then I would do an early nerve graft at two to three weeks, after the zone of injury has been demarcated, even in gunshot wounds.

**Dr. Katarincic:** I agree. We see mostly open injuries and those we end up exploring acutely. I will not graft them until the nerves declare themselves after being tagged, typically three weeks. In these cases, the zone of injury is very hard to define acutely.

**Dr. Mackinnon:** If they were in continuity?

**Dr. Katarincic:** I would watch them.

**Dr. Mackinnon:** What are your thoughts regarding epineurial versus fascicular repair?

**I'D ALSO LIKE TO EMPHASIZE MOBILIZING THE NERVE SYSTEM EITHER FROM THE PROXIMAL OR DISTAL END.**

**JULIANNE W. HOWELL, PT, MS, CHT**

**Dr. Katarincic:** I prefer an epineurial repair, to minimize the amount of scarring within the nerve. The only other thing is I like to minimize the tension on the repair. If the repair fails the 8-0 nylon test, I will go to a graft. I also like to have a nice soft tissue bed so if any type of soft tissue reconstruction is required I will do that first.

**Dr. Lindley:** I agree that there must be no tension on the nerve repair and that you must be confident that you have resected the extent of

*continued on page 16*

*continued from page 15*

injury. The nerves must also be coapted appropriately. Epineurial is probably my favorite repair although if I can do a primary grouped fascicular repair I would prefer to do that.

**Dr. Stevanovic:** I do probably 90% of my cases with an epineurial repair. I try to cut a little bit of the fascicles inside the epineurium, so that when I repair the epineurium, the fascicles are approximated rather than overlapped, making an epineurial tube. And if I have any tension, I would use a nerve graft. I also would explore the nerve proximally and distally for at least 1/2 inch to 2 inches to try to get better topographic orientation. I try to use the nutrient artery that runs over the nerve or fascicular groups to help orient the repair, avoid any twisting of the nerve.

**I AGREE THAT THERE MUST BE NO TENSION ON THE NERVE REPAIR AND THAT YOU MUST BE CONFIDENT THAT YOU HAVE RESECTED THE EXTENT OF INJURY.**

**SHEILA LINDLEY, MD, FACS**

**Dr. Mackinnon:** I would agree with all of our panelists that microneurosurgical technique is key. Many surgeons would use an 8-0 micro-suture to bring the nerve together and then do a definitive repair with a 9-0 or 10-0 micro-suture without tension, making sure, of course, that the nerve ends were healthy. It always is a bit of a guess to make sure you have estimated correctly the longitudinal extent of the injury. If you are still in the zone of injury, the results will be poor. My feeling about epineurial versus fascicular is unless I know absolutely that there is some specific sensory or motor topography to a particular fascicular group, I would do an epineurial repair. In an open injury that required a delayed nerve graft, I would attempt, if possible, at the time of the initial exploration to do some type of repair to try to get the sensory/motor topography aligned. Any more thoughts from the panel about the actual technique of the nerve repair?

**Dr. Stevanovic:** If I need to use a nerve graft, I try to put as many grafts as possible. I use at least five to six cables for the median nerve or ulnar nerve.

**Dr. Lindley:** No one has mentioned whether to use the operating microscope or just loupe magnification: I prefer the operating microscope. I also use 9 and 10-0 suture.

**Dr. Katarincic:** I agree with Dr. Lindley. Also, we reverse the grafts when we put them in.

**Dr. Mackinnon:** I would like to echo and emphasize Dr. Stevanovic's point about not having the repair too tight. I imagine a slight whisper of a gap between the proximal and distal ends of the repair. If I feel that fascicles are pouting out at the repair site, I use micro-scissors and trim the fascicle back slightly on whatever fascicle is starting to pout out.

**Dr. Stevanovic:** I have a question for you, Dr. Mackinnon. Do you, or do any of the panelists, ever use thrombin to spray the nerve graft to decrease formation of the hematoma where you're grafting the nerve? I spray the repair site and tissue bed with thrombin.

**Dr. Mackinnon:** I've used fibrin glue in babies with obstetrical palsies for the repair. And we are thinking about using fibrin glue in the prostate nerve reconstructions. But I haven't used thrombin.

Postoperatively how long do you, Dr. Katarincic, immobilize the patient with a nerve repair or a nerve graft?

**Dr. Katarincic:** I tend to hold them for about three weeks. The exception would be a digital nerve repair with a Zone II flexor injury. I'll immobilize them per my standard protocol with more PIP flexion in the splint.

**Dr. Mackinnon:** Dr. Lindley?

**Dr. Lindley:** I immobilize them for three weeks, and would do the exact same thing if the flexor tendon were injured.

**Dr. Mackinnon:** How about you, Dr. Stevanovic?

**Dr. Stevanovic:** I immobilize them for only two weeks. If it's a repair of the digital nerve and there is not any tension on the repair when I extend the finger intraoperatively, I allow the hand therapist to start passive motion immediately in nerve injuries associated with a tendon laceration. I immobilize my grafts the same length of time.

**Dr. Mackinnon:** When I'm operating, after I've done my repair or my graft, I will check in the OR to see how much movement I feel the repairs are comfortable with. I start all my patients immediately postoperatively on some type of protected movement. Even if I have the wrist blocked I will have some finger flexion to have the tendons sliding past the nerve repair. In general, I immobilize the repairs for about three weeks and nerve grafts for about two weeks. Having said that, they are all on some type of active range of movement depending on what looks satisfactory in the operating room.

**Ms. Howell:** I would agree with the time frames from a therapist standpoint—three weeks for the repair—but I'd also like to emphasize mobilizing the nerve system either from the proximal or distal end. Let's say it's a Zone II flexor tendon repair: we might be able to get some movement by IP joint motion or moving them more proximally through the wrist, still protecting the flexor tendon repair without putting too much tension on the

nerve repair.

**Dr. Mackinnon:** In the late postoperative period, how important are sensory re-education and/or motor re-education in maximizing function?

**Ms. Howell:** I think for many patients, both sensory and motor reeducation is necessary during the postoperative management following nerve repair. In both types of reeducation our goal is to alter cortical input. Because sensory precedes motor reinervation, I will start with sensory reeducation practice and these exercises can also be designed to include purposeful movement. Often specific tasks designed to encourage motor biofeedback are additionally integrated into the program. I think the key is to start the reeducation process early, which means when the patient is able to identify "sharp". Next in the process is to get the patient to localize the sharp or dull. As reinervation progresses, textures and movement are introduced into the drill. As with any exercise, this takes practice, so teaching the patient the rationale behind the reeducation drills is critical to the final outcome.

**Dr. Mackinnon:** Do any of you use techniques to differentiate between sensory and motor fascicles?

**Dr. Stevanovic:** No, I don't, unfortunately. I would like to, but it is impossible at the institution where I am.

**Dr. Lindley:** I have not used any of the histochemical staining techniques. If I did have an acute case, I would do awake stimulation if I thought that was appropriate. But I don't use anything routinely.

**Dr. Katarincic:** I agree with Dr. Lindley.

**Dr. Mackinnon:** I use awake stimulation for the proximal nerve, especially to try to determine motor and sensory on the ulnar nerve. But I think as we become more familiar with the internal topography of the various nerves, then we can use anatomical dissection to help us sort out sensory and motor. Some are easy like the ulnar nerve in the distal forearm where the motor component is sandwiched between the dorsocutaneous sensory and the main sensory to the hand. In other areas, for example, the radial nerve in the proximal arm, it's more difficult to pull out the sensory fascicles from the motor fascicles. But I do believe that that's the area that's going to give us one of the biggest breakthroughs—knowing proximally and distally what the sensory/motor topography is. Distally we can usually figure it out anatomically. Proximally it is more difficult. I think in general that staining is something that is fairly tedious, takes quite awhile and is not generally used much.

Let's talk a little bit about neuromas. Does anybody want to comment on the Type VI or the mixed nerve injury where some of the

*continued on page 18*

*continued from page 17*

nerve function is working and some of the nerves not working?

**Dr. Stevanovic:** With a Type VI or mixed nerve injury, it is a nightmare to distinguish which fascicles are working and which not. When we have a patient like that, we try to dissect the nerve both proximal and distal to the neuroma. We use intra-operative stimulation to distinguish the fascicles that are functioning and separate these from fascicles that are disrupted or scarred beyond functioning and require grafting. If we have any reasonable function, we don't do anything.

**Dr. Mackinnon:** Dr. Lindley?

**Dr. Lindley:** You really must do a very thorough clinical evaluation and document what's functioning, and what's not. You want to know what's essential to restore function in the upper extremity, if it's sensory versus motor components that are absent. Intraoperatively I dissect out the fascicles and do intraoperative stimulation to find out what is working and decide whether or not I need to reconstruct.

**Dr. Mackinnon:** A good preoperative examination will allow the surgeon to do a mental dissection as to what's working or not working in a mixed nerve injury. If you have a median injury and you know you've got good sensation in the thumb and good motor function but horrible pain in the second or third web space, then you know what you're expecting to do at surgery. You'll want to protect the radial side of the median nerve and reconstruct the ulnar side. When there is motor function that you want to protect, you simply quickly explore the area of injury, find the neuroma in continuity and then stimulate proximal and distal with a throwaway nerve stimulator. You can identify the fascicles proximal and distal to the injury that demonstrate good motor function and not disturb that. By contrast if the rest of the nerve has non-functioning sensory, then you can just divide that nerve and graft. If some of that nerve has got sensory fascicles intact, then the only way to determine which fascicles are which is with detailed intraoperative electrical studies. Silent fascicles with no conductivity would be excised and grafted.

Ms. Howell, how do you manage the patient with the painful neuroma?

**Ms. Howell:** If a program of desensitization has not been tried, I think it is important to do so. The timing of desensitization is also important. The earlier the better has been my experience. There are many ways to manage a painful neuroma. My bias is to establish a program that can be easily done by the patient at home, returning to therapy weekly for assessment and upgrading of the program. The program must be tailored to the individual's response.

**Dr. Mackinnon:** Let's talk further about the management of neuromas. What do the rest of you do?

**Dr. Stevanovic:** I don't think there is any good treatment for the painful neuroma. I have tried desensitization. I'll also probably give Toradol for a couple of weeks, and see if this helps. I would wait for about six weeks, but almost 90% of the patients require surgical treatment.

**Dr. Lindley:** I'd certainly try desensitization, vibratory techniques and a peripheral nerve stimulator. As a diagnostic technique, I will block the area of the neuroma or the distribution of the neuroma and see if that provides any relief for the patient prior to doing any operative procedure. And I also try oral medications such as Neurontin.

**Dr. Katarincic:** I tend to use the same step-wise protocol and therapy with desensitization. I do make liberal use of medications and also diagnostic injections, and I try to do this over approximately a six to eight week period. I like to get to know these patients, often before I operate on them.

**Dr. Mackinnon:** How about medications? Have you found any that you are particularly fond of?

**Dr. Katarincic:** The best that I've used is Neurontin. Typically I like to stop at 1800, but I have occasionally actually gone to 2400, even 3600 in three divided doses a day.

**Dr. Mackinnon:** When conservative management has failed, could you give us your thoughts on operative management of painful traumatic neuroma?

**Dr. Katarincic:** Once they respond to block, I like to go in and find them. I will re-resect them, and I try to bury them as deep in muscle, as close to but not in the bone as I can put them to try to minimize their motion.

**Dr. Lindley:** It depends obviously on the neuroma and whether or not the nerve is actually essential to function. If there is distal nerve available, I'll resect the neuroma proximally until I see viable nerve on histologic examination, then do an interposing nerve graft. If it's distal, like an amputation stump, I'll resect the neuroma back to within a centimeter of the contact surface. It is key to avoid any mechanical stimulation of the nerve. Proximally, I bury the nerve following neuroma excision in muscle or bone.

**Dr. Stevanovic:** The neuroma is very painful, and I think the key to any success is to resect the nerve and bury this as much as possible in healthy tissue. I try to bury it in the muscle; if not, I bury it in bone. I think that it is very important to keep enough length, so that when you mobilize the extremity the nerve is not stretched as it is taken through the entire range of flexion and extension. I try to do earlier surgical treatment.

**Dr. Mackinnon:** Are there any specific evaluations that you do before you

*continued on page 22*

# The Microscope and Nerve Repair in CPT Coding

As use of the operating microscope came into greater application in peripheral nerve and vascular repair in the 70s, code **64830** (use of operating microscope) or, alternatively, a **–20 modifier** was added to the CPT Coding System to reflect the increased complexity of repair (often fasicular) utilizing the operating microscope compared with traditional epineural suture technique done with the unaided eye. Both of these codes have now been deleted and replaced by **69990**. The convention at that time was that use of the operating microscope in nerve repair justified an additional fee equal to 50% of the fee charged for the repair. When microsurgery was still a relative novelty, most carriers paid the additional charge. However, as use of the microscope became the standard of care rather than the exception, many carriers took the stance that they didn't care if the surgeon "used something to help him see better", they were not going to pay extra for it. As a result, many surgeons have seen carriers reject the operating microscope add on code (**69990**) even when it has been correctly added to their claims submission. Therefore I thought that it might be worthwhile to revisit the issue of coding for use of the operating microscope in peripheral nerve surgery.

First, **loupes** or other types of magnifying glasses **do not qualify** as an operating microscope. In order to use the 69990 as an add on code, a real surgical microscope must be utilized in the repair. The CPT codes do not distinguish between epineural and fasicular repairs and the microscope may be legitimately employed for either type of repair. Secondly, even if correctly coded, as mentioned above, some carriers may still chose to ignore the code. The fact that microscopic repair of a nerve is a more complex surgical procedure that throwing in a few epineural 5-0 sutures is conveniently ignored even though Medicare assigns a 6.02 Relative Value to the code. You may wish to bring this fact to the attention of the medical director of any carrier that does not recognize this code.

**Nerve repairs** are found in the **648XX series**. The ascending numeric code sequence corresponds with the anatomic location of the nerve being repaired. **64831** for a digital nerve, **64834** for a common sensory nerve in the hand, **64835** for median motor, **64836** for ulnar motor, **64856** for the arm and **64861** for the brachial plexus. Each anatomic area has its own specific add on code for repair of additional nerves: **64832** for each additional digital nerve, **64837** for each additional nerve of the hand, and **64859** for suture of each additional nerve of the arm.

Also, add on codes exist to identify procedures that are *more difficult* due to delay or secondary repair - **64872;** requiring extensive *mobilization or transposition* - **64874;** or requiring *shortening of bone* of extremity - **64876.** Remember, add-on codes must be used with a primary stand alone

*continued on page 20*

**STILES T. JEWETT, JR., MD, FACS**

**TABLE 1**

**Neurorrhaphy**

| | |
|---|---|
| 64831 | Suture of digital nerve, hand or foot; one nerve |
| +64832 | each additional digital nerve (List separately in addition to code for primary procedure. |
| 64834 | Suture of one nerve, hand or foot; common sensory nerve |
| 64835 | median motor thenar |
| 64836 | ulnar motor |
| + 64837 | Suture of each additional nerve, hand or foot (List separately in addition to code for primary procedure) (Use 64837 in conjunction with codes 64834-64836) |
| 64856 | Suture of major peripheral nerve, arm or leg, except sciatic: including transposition |
| 64857 | without transposition |
| +64859 | Suture of each additional major peripheral nerve. (List separately in addition to code for primary procedure) |
| 64861 | suture of brachial plexus |
| +64872 | Suture of nerve; requiring secondary or delayed suture (List separately in addition to code for primary neurorrhaphy) |
| + 64874 | requiring extensive mobilization of transposition of nerve (List separately in addition to code for nerve suture) |
| +64876 | requiring shortening of bone of extremity (List separately in addition to code for nerve suture) |

## CODING CORNER

*continued from page 19*

code used for neurorrhaphy.

Neurorrhaphy with nerve graft codes reflect: 1. *location* - hand or arm. 2. *length* of the graft - less than or greater than 4cm, and 3. *number of strands* required for the graft. The *CPT codes include obtaining the graft and therefore a separate charge may not be submitted.* Add-on codes are used for *each additional graft* performed -**64901** for each additional nerve; *single strand* and **64902** for each additional nerve; *multiple strands (cables).*

### You Code It!

A 22 year old computer programmer lacerates his left forearm and hand in a fall through a plate glass window. He suffers a laceration of the median nerve at the wrist with a gap of 5 cm. In addition, the common sensory nerve to the ring and little fingers is also lacerated. To simplify this example only the palmaris longus tendon was lacerated. The patient undergoes repair of the common sensory nerve in the palm, repair of the palmaris longus tendon and, because of the large gap in continuity, requires 4 strands of sural nerve as a graft to the median nerve. The operating microscope is used for the nerve repairs.

**TABLE 3**

**ICD-9-CM Codes**

| | | |
|---|---|---|
| **955** | **injury to peripheral nerve(s) of shoulder girdle and upper limb** | |
| | 955.0 | Axillary nerve |
| | 955.1 | Median nerve |
| | 955.2 | Ulnar nerve |
| | 955.3 | Radial nerve |
| | 955.4 | Musculocutaneous nerve |
| | 955.5 | Cutaneous sensory nerve, upper limb |
| | 955.6 | Digital nerve |
| | 955.7 | Other specified nerve(s) of shoulder girdle and upper limb |
| | 955.8 | Multiple nerves of shoulder girdle and upper limb |
| | 955.9 | Unspecified nerve of shoulder girdle and upper limb |

* Note: 955.7, 955.8 and 955.9 are nonspecific codes and should therefore be avoided if possible.

**TABLE 2**

**Neurorrhaphy With Nerve Graft**

| | |
|---|---|
| **64890** | **Nerve graft (includes obtaining graft), single strand, hand or foot, up to 4 cm length** |
| **64891** | **more than 4 cm length** |
| **64892** | **Nerve graft (includes obtaining graft) single strand, arm or leg, up to 4 cm length** |
| **64893** | **more than 4 cm length** |
| **64895** | **Nerve graft(includes obtaining graft), multiple strands (cable), hand or foot; up to 4 cm length** |
| **64896** | **more than 4 cm length** |
| **64897** | **Nerve graft (includes obtaining graft), multiple strands(cable), arm or leg; up to 4 cm length** |
| **64898** | **more than 4 cm length** |
| **+64901** | **Nerve graft, each additional nerve; single strand (List separately in addition to code for primary procedure)** **(Use 64901 in conjunction with codes 64885-64893)** |
| **+64902** | **multiple strands (cable) (List separately in addition to code for primary procedure)** **(Use 64902 in conjunction with codes 64885, 64886, 64895 - 64898)** |

**Solution**

| | |
|---|---|
| 64896 | Nerve graft, multiple strands, arm, greater than 4 cm |
| | **ICD-9 955.1** |
| 69990 | Use of surgical microscope |
| **64834-51** | Suture of one nerve, hand, common sensory |
| | **ICD-9 955.5** |
| 69990-51 | Use of surgical microscope |
| 25260-51 | Repair, tendon, flexor, forearm and/or wrist, primary, single, each tendon or muscle |
| | **ICD-9 881.22** |

Good Luck and Good Coding!

# Intranets, Extranets, and the Internet

J. DANIEL LABS, MD

In January 2000, Bill Gates stepped down as CEO of Microsoft after 25 years at the helm. Windows is now on 400 million PC's worldwide, and yet Mr. Gates states, "you haven't seen anything yet." Now then, when the founder of Microsoft predicted that every household would have a computer running his software back in the 70's, the mainframe 'affectionatos' at IBM couldn't have been laughing any harder. After all, it was absurd to believe that the common man could ever afford, understand, or make use of a computer. So, when Mr. Gates states "software will be delivered...as a service across the Internet instead of a packaged product," it seems appropriate that we all stand up and take note. He is now the chief architect of software development platforms at Microsoft focused on the Internet.

At the bottom of it all is communications technology. It was not long after the computer could do meaningful work that designers anticipated that if one computer was good, then two might be better—-the concept of networking began. Proprietary cables, connectors, and programs, however, limited computer-to-computer communications, and the complexity was, for a long time, immense. To boil a painful story down to its successful conclusion, a single communications protocol called TCP/IP has emerged as the de facto language for computer to computer "talking." TCP/IP, or Transport Control Protocol/Internet Protocol, is the default wide area network protocol that provides communication across diverse interconnected networks. NetBEUI, and Netware's IPX/SPX are competing protocols, and there are others. The fact is that TCP/IP works as well through a network wire and hub as is does across the phone lines and the Internet. Presto! LAN's (Local Area Networks) and WAN's (Wide Area Networks) therefore become Intranets and Extranets using the Internet's protocol. Since we are all "speaking the same language," protective devices called "fire walls" have become the standard to protect certain computers while still permitting communications. If you have upgraded your billing system to an NT LAN as most of us have to get over the Y2K hurdle, make sure that your private network is protected.

So what is in store for Medicine? Steve Ballmer, successor to Bill Gates had this to say: "I want to outline... how the Internet User Experience will change... in the healthcare area. There will be a day when you're able to keep all of your information, your medical information, in a secure, private place out on the Web. You'll be able to give permission to appropriate doctors to put new information in and to view your medical history. You'll be able to pay your bills, interact with your healthcare insurer, receive notification when an appointment is necessary and incorporate those appointments automatically into your calendar. Wherever you are...in the world and whenever you want to you'll...access that information."

*(Remarks by Bill Gates and Steve Ballmer Jan. 13, 2000 Redmond, Washington. www.microsoft.com)* H

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*continued from page 18*

operate on a patient with a painful neuroma?

**Dr. Katarincic:** I do like to use the diagnostic injections. If they don't respond to that, I have a serious talk with the patients before I'll operate on them.

**Dr. Mackinnon:** Dr. Lindley?

**Dr. Lindley:** I would definitely do diagnostic injections. I actually very often refer these patients to pain management for an evaluation. They may have a block of the extremity such as a bretylium block, to look for an underlying diagnosis of chronic regional pain syndrome. A psychological profile could also be helpful.

**Dr. Mackinnon:** Ms. Howell, what role do you play in evaluations?

**Ms. Howell:** Generally my role as a therapist has been to provide a sensory evaluation before and after a differential injection and/or surgery. More recently, I've included the status of neural mobility, so that if this is compromised the surgeon is alerted to this fact and can address it prior to surgery or very soon postoperatively. The value of preoperative sensory, neural mobility and functional impairment as a baseline for later comparison should not be overlooked. I also agree that some of these patients have excessive pain that won't be cured by surgery. If you are not sure about prior therapy interventions, a three-week trial of hand therapy for desensitization, strategies for pain control and nerve gliding exercises is essential.

**Dr. Mackinnon:** Do you have any specific management techniques for these patients postoperatively?

**Dr. Katarincic:** I immobilize them for two to three weeks until the soft tissues heal, then gradually increase their activities.

**Dr. Mackinnon:** Ms. Howell?

**Ms. Howell:** After surgery, my role as a therapist seems to be to attend to any neural or joint mobility problem that may persist. Often for months preoperatively these patients compensate for the painful neuroma by moving or avoiding movement. Preferably the patient and the therapist have worked on these issues as best they can preoperatively, so that only the fine-tuning remains following surgery.

**Dr. Mackinnon:** I like to use our pain evaluation scale. It in part asks the patient to draw out the distribution of the pain on an anatomical drawing and grade their pain from zero to ten. These two parameters are useful to refer to in the postoperative follow-up to evaluate pain relief. It also asks probing questions to get at a super imposed psychological influence that may require preoperative investigation.

Dr. Katarincic, if you've done surgery on one of these patients for a painful neuroma and it does not relieve the pain, would you re-explore the area?

**Dr. Katarincic:** Probably not. If I think the neuroma is well positioned and the patient has been compliant, I'm afraid I can make them worse.

**Dr. Mackinnon:** How about you, Dr. Lindley?

**Dr. Lindley:** It would have to be a very individualized decision. I would be very reluctant to operate a second time, but if I had done a nerve graft and they showed recovery with an advancing Tinel's then which stops at what I think is the distal extent of the nerve graft, perhaps I would re-explore to look for any scarring at that level. This would be a compliant patient who was also participating in therapy.

**Dr. Mackinnon:** And Dr. Stevanovic?

**Dr. Stevanovic:** I would explore again. I would wait at least six months before I tried to explore a second time. I also would tell the patient there is the possibility that this will not work, and I would try to do all kinds of other treatment.

**Dr. Mackinnon:** A lot of people would say if you have a neuroma patient and you work them up well and you do the best operation you can to get rid of their pain and you don't get rid of the pain, don't operate on them again.

Could each of you give us one statement that you think might help others in managing these painful problems after nerve injuries?

**Ms. Howell:** My advice is to get started right away on methods to control the pain, don't use the same cookbook approach for all, individualize treatment, and help the patient regain control by getting them involved in the process.

**Dr. Katarincic:** I remember I can always make the person worse. I make liberal use of injections, exhausting conservative treatment before I attempt to operate. I think the only clinical pearl I found is that it's very important to do a thorough motor and sensory exam and document it. So serial exams by the same examiner, especially in the closed nerve injury, can help you decide if operative intervention is appropriate.

**Dr. Lindley:** I agree about certainly spending a lot of time with the patient, making sure that they understand what are realistic expectations regarding their results. I would exhaust conservative management, but I would also enlist other groups of knowledgeable physicians, such as pain management groups, and the therapist for pre-operative assessment and treatment. I would select patients for surgery very cautiously, using diagnostic blocks of the neuroma distribution.

**Dr. Stevanovic:** I agree completely, especially with Dr. Katarincic that patients should be examined not by a resident or a Fellow, but by an attending physician. The patient should be followed by the attending. I try to do only one surgery. Sometimes, if the nerve injury is too great, for example with a large defect in the radial nerve, I will do a primary tendon transfer in addition to a nerve graft.

**Ms. Howell:** I'd also like to add that for insightful reading, share a copy of the textbook, "Mobilization of the Nervous System" by David Butler with therapist and surgeon colleagues!

**Dr. Mackinnon:** That's all the time we

## The Plastic Surgery Research Council 45th Annual Meeting

**Dates:**
May 17-20, 2000

**Location:**
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**CME Credit:**
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Westin Hotel / University of Washington
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For more information, contact the PSRC Executive Office at 603-643-2325 (see announcement on page 23)

**July 15-16, 2000**
Mid-Year Board of Directors Meeting
Chicago, Illinois

### 2001

**January 10-13, 2001**
31st Annual Meeting
Loews Coronado Bay Resort
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### 2002

**January 9-12, 2002**
32nd Annual Meeting
Westin Caesar Park
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### 2003

**January, 2003**
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