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American Association for Hand Surgery

HAND SURGERY QUARTERLY

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MESSAGE FROM THE PRESIDENT

Steering Towards Openess and Unity

Nicholas Vedder, MD

As my term as AAHS President comes to its conclusion, I have the opportunity to reflect on what we, as an organization, have achieved over the past year, and, more importantly, where we are headed. Perhaps you have noted that I have changed my photo attached to this column – to my "Facebook" photo, that better portrays my "joie de vivre" that I think is the essence of the AAHS. It may also be a metaphor for the "AAHS ship" that I have tried to steer, sometimes successfully; sometimes unsuccessfully, over the past year. As I look at our future Presidential line, our Board of Directors, our new and vibrant professional management, our financial situation, and, most importantly our membership, and future membership, I am indeed heartened and thankful for all that you have done to enhance this organization and its future.


NICHOLAS VEDDER, MD

The central theme of my presidency has been unity: promoting unity within the broad field of hand surgery, involving hand surgeons and hand therapists from the AAHS, ASSH, AAOS, ASPS, ASHT, and all organizations to capitalize on our individual strengths and shared commitments and to work together for future of hand surgery. Clearly, the most rewarding aspect of my professional career has been my 20 year collaboration with my Orthopedic hand partners and our hand therapists to help build a model, truly combined Orthopedic-Plastic Surgery hand service at the University of Washington that centers around one of the top hand surgery training programs nationwide.

Like the majority of AAHS members, I am also an active, and actively contributing member of one of our "big brother" hand organizations, the American Society for Surgery of the Hand, as many of our Affiliate Members are also members of the American Society for Hand Therapists. Throughout my presidency, I have focused on the question posed to me by a close friend, colleague, and mentor long ago, "what does the AAHS have to offer?" Over the years, the answer to that question has become cogent and powerful to me, as I believe it has for many of our members.

There are clearly benefits to the specialty of hand surgery in having two hand organizations – both for hand surgeons and for hand therapists. These include our dual representation within the larger bodies of the AMA, AAOS, ASPS and the ASSH and ASHT.

But, to me, the key raison d'être of the AAHS goes to the core concept of this organization: a truly open organization, open to any hand professional, regardless of specialty or background who is interested in hand care, whether or not they have completed a hand fellowship or hold a hand certificate, a CHT, or whatever. The involvement of hand therapists, not only as participating members, but also within the voting leadership of the organization, is unique and one that I have promoted for over a decade, when, as Parliamentarian, I included in

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PRESIDENT

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our revised bylaws the provision giving Affiliate Members true voting membership on our Board of Directors. We are both thankful and proud of our relationships with the hand therapists who are our day-to-day colleagues in patient care, and whom we were thrilled to include as our colleagues and peers in this organization. Many of us belong to two hand organizations, and are proud of our dual membership. The openness, inclusivity, and "joie de vivre" of the AAHS is really what defines us as an organization. We do not compete with the ASSH or the ASHT meetings but instead are a welcome addition, enjoyed by all for its camaraderie and its relevent and timely content.

WE NEED TO TRUMPET OUR VISION OF THE AAHS AS BEING THE REAL "MELTING POT" OF HAND SURGERY, BRINGING TOGETHER THE BRIGHTEST MINDS AND THE HARDEST WORKERS IN THE FIELD OF HAND SURGERY AND HAND THERAPY.

The other reality is that our membership has been stagnant. Like anything in life, if you are not growing, you are dead. The leading strategic goal of our Board's strategic planning session this past summer was "collaboration" as a means of growth and expanding our identity. Right now, we do not have any members of our Board who are not also members of ASSH or ASHT. All of us strongly identify with the mission and the identity of the ASSH and ASHT, but also with the "collaboration," and "joie de vivre" of the AAHS. I think that is incredibly powerful. For the AAHS to thrive, we need to trumpet that dual identity that we cherish, and our vision of the AAHS as being the real "melting pot" of hand surgery, bringing together the brightest minds and the hardest workers in the field of hand surgery and hand therapy so that we can truly enjoy the process of enhancing our understanding of hand care and improving our patient care.

Once again, the most important function of the organization is to hold our annual meeting, in January, at a warm resort location, with an informal and inclusive approach, where open exchange is not only permitted, but encouraged, and where the most important interchanges are often held at the pool or on the beach. The 2010 meeting in Boca Raton promises to be just such a meeting.

I hope that you are all planning to attend the annual meeting, January 6-9 at the beautiful Boca Raton Resort in Florida. I wish to recognize the tremendous efforts of our program co-chairs, Kevin Chung and Gretchen Kaiser-Bodell, in collaboration with the program committee, who have developed an outstanding program.

Specialty Day will include a number of exciting panels chaired by distinguished faculty, including panels chaired by Thomas Trumble, MD, on flexor tendon surgery, James Chang, MD, on medical-legal issues, Michael Neumeister, MD, on CMC arthritis, and a lively debate between Robert Szabo, MD, President of ASSH and A. Lee Osterman, MD, incoming President of AAHS, on evidence-based medicine, moderated by Jesse Jupiter, MD. In addition, David Ring, MD will moderate a panel on controversies in the treatment of compressive neuropathies. The main meeting will include more instructional courses and panels on a variety of topics of interest to hand surgeons of all backgrounds. This year's Danyo Lecture will be given by AAHS Past-President Richard Berger on the critical link between the transformation of medical education and transformation of health care.

On Saturday, we are honored to have Paul Farmer, MD, PhD as the Joint Presidential Keynote Lecturer. Dr. Farmer is a medical anthropologist and physician at Harvard, where he is the Chair of the Department of Global Health and Social Medicine at the Medical School, and a founding director of Partners In Health. He is truly a leader in global health and an inspiration to all. He will speak, among other things, on the role of the surgeon in global health and will be followed by a panel discussion. It should be a memorable event.

Again, I thank you all for your commitment and contributions to the essence of the AAHS. I truly believe that we have a great future ahead of us, and I am proud beyond words to welcome the next President of the AAHS, A. Lee Osterman, MD, truly one of my personal "icons" of hand surgery. We do need all of your help in encouraging your friends and colleagues who are not already members of the AAHS to come to one of our meetings. If they do, they will be hooked for life. Thank you.

It has been an honor for me to serve as your President. I hope to see all of you in Boca Raton! H

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 Next Best Thing

This edition of the newsletter has a wonderful round table discussion on nerve transfers that is moderated by Dr. Susan Mackinnon. It is both interesting and humbling. Interesting because of the detailed understanding and application of the intraneural anatomy that is exploited to reinnervate muscle and skin. Humbling because I have not kept up with these procedures and at this time I do not feel I have the ability or confidence to do them.

I have often wondered about taking on new surgical procedures. Conventional wisdom is that we should not practice surgery throughout our life in the same manner we did on our last day of residency. We are all faced with the prospect of learning new procedures. Some of these are natural extensions of our day-to-day practice, coming naturally, and some of these require a significant effort. Most hand surgeons learned how to put a plate on the palmar surface of the radius to deal with a palmar displaced fracture. It was not difficult then to expand the indications for the palmar approach when new hardware came along. And yet most of us don't want to embark on a meandering trail of new techniques for common problems. The first CMC joint comes to mind. Some how, some way, we need to judge when to adopt a new technique and find a way to learn how to do it.

The first problem is to keep up with what is new and important in hand surgery. We have our colleagues, journals, newsletters, annual meetings, and many other mechanisms to help us with that. I suggest that the adoption of new procedures is not usually based on scientific evidence. There are many unsolved problems in hand surgery and no surgeon likes to think he or she is incapable of the latest and greatest. I would venture that most of us think if we are not the best hand surgeon in North America we are clearly in the top ten. I suspect we first learn about new procedures at meetings and from conversations with our partners who have been at these meetings. For the "clear" advances, the praise of a new procedure by an esteemed colleague at a meeting is often enough to prompt us to change to that new procedure. The clinical research then follows and the procedure is either supported or receives a caution flag. An example of such a "clear" advance is the palmar locking plate for fixation of the distal radius fracture. This technique is universally taught to our residents and has almost monopolized care for this problem. We are now starting to accumulate a body of evidence of its value. With many techniques, the new procedure does not pan out but luckily the next best thing comes along and takes over and the cycle repeats itself. For the less evident advances, the surgeon may plough through a few years of experience and clear evidence in favor of the procedure may never emerge. Luckily the next best thing comes along and takes over and the cycle repeats itself. The first CMC joint comes to mind.

STEVE MCCABE, MD

Is there an early warning system that can be brought to bear on the decision to adopt a new technique? When faced with the task of deciding to learn a new procedure, I don't have a litmus test but there are a few things I think about.

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AAHS Calendar

2010

January 6-9, 2010
AAHS 40th Annual Meeting
Boca Raton Resort and Club
Boca Raton, FL

March 6-8, 2010
Hand Rehabilitation Foundation
12th Annual Hand Surgery Symposia
Philadelphia, PA

March 10-13, 2010
AAOS Annual Meeting
New Orleans, LA

June 24-26, 2010
8th Triennial Congress of IFSHT
Orlando, FL

October 1-6, 2010
ASPS Annual Meeting
Toronto, ON, Canada

October 7-9, 2010
ASSH Annual Meeting
Boston, MA

October 31-November 4, 2010
XIth Triennial Congress of IFSSH
Seoul, Korea

2011

January 12-15, 2011
AAHS 41st Annual Meeting
Ritz Carlton Cancun
Cancun, MX

February 16-20, 2011
AAOS Annual Meeting
San Diego, CA

September 8-10, 2011
ASSH Annual Meeting
Las Vegas, NV

September 23-28, 2011
ASPS Annual Meeting
Denver, CO

For information contact: AAHS Central Office at 847-228-9276 or www.handsurgery.org

EDITOR'S DESK

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A) Is It Real? (No one wants to do a fellowship in cold fusion!)

1) Is it a problem looking for a solution or a solution looking for a problem?

Although you may not like this example, in my mind a good example of this is endoscopic release of the carpal tunnel.

2) Is the only surgeon promoting the new idea the same person as the inventor and the entrepreneur? For example, is there money being made?

You might be able to think of an example. We need industry to help us advance but be a skeptic.

3) Is the idea transferable across time and geography?

Something that is good in North America will usually be good around the world and should stand the test of time. Common wisdom says, "Don't be the first to adopt a new procedure but don't be the last."

4) Is it done for fame if not fortune?

The "Look what I can do y'all" justification is one of the 4 L's of trauma and should not be a reason to adopt a new procedure. (You may know the other L's are liquor, lust, and loot.)

5) Is there good scientific evidence to support the use of this new procedure?

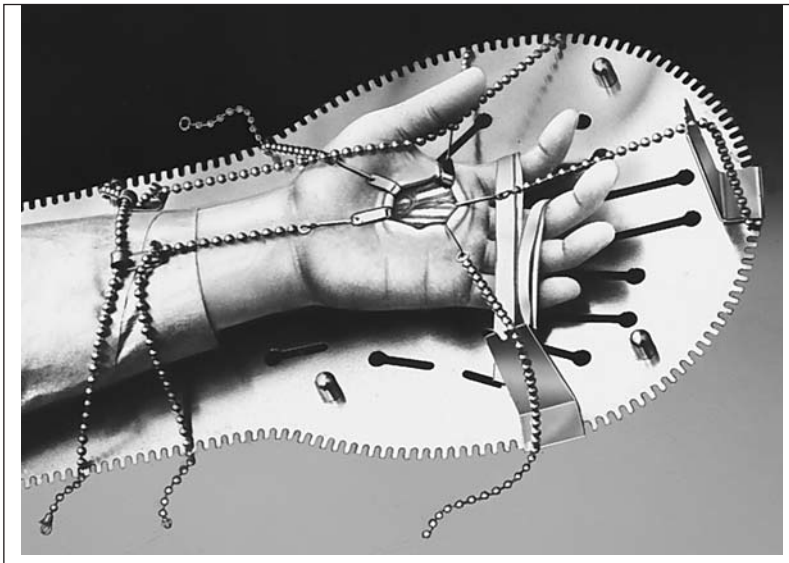
The most important but usually late indicator in hand surgery.

If the procedure is not real don't waste your time on it.

B) Is It Worthwhile For Me?

Does the time and expense of learning this new procedure make sense in the context of my practice? I would love to do a fellowship in pediatric brachial plexus but if I don't work in a children's hospital and I am so old that I won't be around to see the results I don't think this makes a lot of sense.

We can save ourselves a lot of grief and still do the best for our patients by being thoughtful and cautious adopters of new procedures. The round table in this newsletter discusses a new technique, nerve transfers, while at the same time mentioning some refinement and limitations of the application of a previously interesting and novel technique, end-to-side nerve repair. What will the newsletter say about nerve transfers in five years? You will have to decide if these procedures are something you will take on for your patients. From my take on nerve transfers, prompted by the discussion in this newsletter, I plan on spending some time in the anatomy lab and then looking for a hand's on course to learn how to do these procedures. Thank you to the discussants for their ongoing curiosity. H



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The Hand Surgery Endowment Call to Action

Last year at the time of annual meeting, the HSE had lost significant value and those of you with retirement plans probably had 401s become 201s while office visits were also less than usual. The economy still suffers but the HSE and your portfolios have improved some over the recent months. Since its origin, the HSE goals have changed. It has funded numerous research fellows, research grants and has supported the educational efforts of AAHS members. The HSE was one of the first subspecialty endowments. With limited goals, loyal members support, and thanks to contributions from organizations such as the American Academy of Orthopedic Surgeons, it has been able to support numerous member research projects.

This letter is to thank AAHS members for their continued support of the HSE. It is also a call to action for those hoping to help beyond their financial support. Some of the goals of the HSE have been expanded to include sponsoring efforts to educate surgeons in underserved areas of the world about the surgical and therapy principles of hand surgery. These efforts would involve didactic as well as demonstrative surgical and therapy efforts. Ms. Lynn Bassinni's 501C3 organization, Healing Hands, is one model of how to attain this goal and HSE supports her efforts financially.

Another model is to coordinate with existing on-site teaching programs and organize annual trips to foster education and service in geographical areas where it is requested and AAHS and HSE can help. Centers of excellence in hand surgery are needed and remarkably absent in many emerging economies. The HSE and members of the AAHS could provide organizational leadership and perhaps, more importantly, individuals with the skill sets, desire and willingness to volunteer their time and resources to make this happen. This could also serve as a format for cooperation with other interested organizations.

THOUGH YOU WILL BE TEACHING, EXPECT TO ALSO LEARN AN ENORMOUS AMOUNT AND CREATE NEW FRIENDS IN ANOTHER PART OF THE WORLD.

This is a call to action for our members to become directly involved in supporting the HSE. It isn't merely about giving financial resources, it is also about donating your time (one week), your skills (complex hand reconstruction), and spending about $2000 for an airline tickets, reasonable hotel and local cuisine of your choice. In October 2010, it is my goal to have the HSE and AAHS officially sponsor a team of hand surgeons. We'll need two plastic surgery-oriented hand surgeons, two orthopedic hand surgeons, and at least four hand therapists. Anticipated cases: pollicization, complex syndactyly, toe to hand transfer, radial club hand, cleft hand, severe burn scar contracture, arthrogryposis, nerve transfers and others that our hosts would present and request assistance in management. Though you will be teaching, expect to also learn an enormous amount and create new friends in another part of the world. A special request was made for hand therapy teaching sessions. One half day or evening will be devoted to lectures to interested students and others at a medical school. Surgeries will be done at 2-3 established hospitals; teaching and sharing with local surgeons, surgical residents, therapists, medical students, and other interested individuals the principles of upper extremity and hand care. I anticipate leaving on a Friday and returning the following weekend on Saturday.

ALLEN VAN BEEK, MD

If you are willing to participate contact me during the Boca meeting or by email at plsurgry@aol.com.

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Boca Raton: A Great Venue for a Meeting

On behalf of the Program Committee of the American Association of Hand Surgery (AAHS), it is my pleasure to welcome you to the 2010 Annual Meeting at the wonderful Boca Raton Resort and Club in Florida. This beautiful facility with its meandering beach front provides a relaxing and friendly venue for a meeting. The President of this meeting, Nicholas B. Vedder, MD, FACS, and the Program Committee have worked diligently to ensure that the educational content is first rate to comprehensively cover all the components of hand surgery. In addition, we have added new programs on practice management topics that are even more relevant in today's economic climate.

The Specialty Day will be co-chaired by Gretchen Kaiser, OTD, OTR/L, MBA, CHT who worked diligently on structuring an exciting series of symposia. The distinguished panels will be chaired by (1) Thomas Trumble, MD, on flexor tendon surgery, (2) James Chang, MD, on medical-legal issues, and by (3) Michael Neumeister, MD, on CMC arthritis. In addition, this day is made more lively by Jesse Jupiter, MD, moderating the debate between Robert Szabo, MD, President of ASSH and A. Lee Osterman, MD, incoming President of AAHS on evidence-based medicine. David Ring, MD, will moderate the panel on the controversy regarding the treatment of peripheral neuropathies, specifically carpal tunnel syndrome and ulnar neuropathy at the elbow. The afternoon session will be devoted to the interdisciplinary efforts of therapists and physicians and will include a workshop on splinting as well as two outstanding courses on therapeutic approaches for the treatment of distal radius fractures and stiff joints.

Subsequent days will consist of even more instructional courses and panels on a variety of topics ranging from management of sports injuries to treatment of congenital hand problems. The ever popular Hand Review Course will be chaired by Peter Jebson, MD and present expert views on important topics in hand surgery in a didactic series of lectures. The meeting will commence on Saturday with AAHS, ASPN and ASRM Combined Day. The keynote presentation on Saturday will prove to be an exciting and informative lecture by a prominent national figure. Overall, this is a meeting that should not be missed. It is a wonderful time to establish new friendships and to meet up with old friends in the relaxing surroundings of beautiful Florida. I look forward to seeing all of you in Boca Raton. We will do everything we can to make you feel at home and ensure that this will be an outstanding educational event.

KEVIN CHUNG, MD

Kevin C. Chung, MD, MS
AAHS Program Chair

AAHS 40th Annual Meeting

January 6–9, 2010
Boca Raton Resort and Club
Boca Raton, FL

Wednesday, January 6, 2010

Specialty Day Program

Examining the Evidence in Hand Surgery

7:00–7:30am **Continental Breakfast**

7:30–8:30am **Session: President and Program Chair Welcome**
Nicholas B. Vedder, MD, FACS, AAHS President
Kevin Chung, MD, Program Chair
Peggy Boineau, OTR, CHT, ASHT President
Gretchen Kaiser, OTD, OTR/L, MBA, CHT, Specialty Day Chair

8:30–9:30am **Panel: Flexor Tendon Surgery in the 21st Century**
Thomas Trumble, MD, Moderator
Peter Amadio, MD, Rebecca von der Heyde, PhD(c), OTR/L, CHT

9:30–10:30am **Panel: Medical-Legal Issues in Hand Surgery**
James Chang, MD, Moderator
Ronald Palmer, MD, Mark Rekant, MD, L. Andrew Koman, MD

10:30–10:45am **Coffee Break**

10:45–11:15am **Discussion & Debate: Evidence Based Medicine – The Be All and End All?**
Jesse Jupiter, MD, Moderator
Robert Szabo, MD, MPH, A. Lee Osterman, MD

11:15–12:00pm **Panel: What is the Evidence in Treating CMC Arthritis?**
Michael Neumeister, MD, Moderator
Alejandro Badia, MD, Robert Beckenbaugh, MD, Joseph Slade, III, MD, Susan Michlovitz, PT, PhD, CHT

12:00–1:00pm **Past Presidents Lunch**
(Invitation only)

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1:00–2:00pm **Panel: What is the Evidence in Managing CTS and Ulnar Neuropathy at the Elbow?**
David Ring, MD, Moderator
Joseph Slade III, MD, Joseph Imbriglia, MD, Joy MacDermid, BScPT, PhD

2:30–3:30pm **Hand Surgery Endowment Board of Governors Meeting**

2:00–4:00pm **AAHS Instructional Course**

101 Splinting for Stiffness (Workshop/Lab)
Aviva Wolff, OTR, CHT, Chair
Gretchen Kaiser, OTD, OTR/L, MBA, CHT, Paul Brach, PT, CHT

4:00–5:00pm **AAHS Instructional Courses**

102 Advances in Therapy: What is the Evidence for Treating Distal Radius Fractures?
Tambra Marik, OTD, OTR/L, CHT, Chair
Kristin Valdes, OTD, OTR, CHT, Nancy Wesolowski, OTD, OTR/L, CHT

103 Therapeutic Approaches to Treating Joint Stiffness
Chair: Ann Lund, OTR, CHT
Cynthia Cooper, MA, OTR/L, CHT, Jeffery Cowdry, OT/L, CHT

5:30–6:30pm **Hand Therapist Reception**

6:30–8:30pm **AAHS Welcome Reception**

Thursday, January 7, 2010

7:00–8:00am **AAHS Instructional Courses**

104 Wide Awake Hand Surgery
Donald Lalonde, MD, Chair
Matthew Concannon, MD, Amanda Higgins, BScOT, OT

105 Treatment of Regional Pain Syndrome: How I Do It
Catherine Curtin, MD, Chair
William Dzwierzynski, MD, L. Andrew Koman, MD, Marilou Rubright, MS, OT/L, CHT

106 Nerve Transfer Strategies
Thomas Tung, MD, Chair
Allen Bishop, MD, Linda Dvali, MD, Christine Novak, PT, MS, PhD(c)

107 Distal Radius Fracture: The New and Old
Steven Haase, MD, Chair
Jesse Jupiter, MD; David Dennison, MD; Nancy Davidson, MOTR/L

108 Bioskills Session: Collagenase Injection and Manipulation Training
A. Lee Osterman, MD, Chair
Instructors: Lawrence Hurst, MD

8:00–8:30am **Continental Breakfast**

AAHS Session A

8:30–9:00am **President and Program Chair Welcome**
Nicholas B. Vedder, MD, FACS, AAHS President
Kevin Chung, MD, Program Chair
Robert Szabo, MD, ASSH President

9:15–10:15am **Hand Journal Editorial Board Meeting**

9:00–9:45am **Panel: Advances in Treating Dupuytren's Disease**
Warren Hammert, MD, Moderator
Vincent R. Hentz, MD, Lawrence Hurst, MD, Maureen Hardy, PT, MS, CHT

9:45–10:45am **Scientific Paper Session: A1**
David Smith, Jr., MD, Moderator

11:00–11:30am **Presidential Address**
Nicholas B. Vedder, MD, FACS

11:30am–12:30pm **Panel: Treatment of the PIP Joint**
Steven Moran, MD, Moderator
Reid Abrams, MD, Nash Naam, MD, Cynthia Cooper, MA, OTR/L, CHT

1:30–2:30pm **Panel: Soft Tissue Coverage of the Hand**
Michael Sauerbier, MD, Moderator
Nicholas B. Vedder, MD, FACS; Kodi Azari, MD; Douglas Sammer, MD

AAHS Session B

9:00–9:45am **Panel: Management of Hand Injuries in Athletes**
Dean Sotereanos, MD, Moderator
Daniel Nagle, MD, Paul Brach, PT, CHT

9:45–10:45am **Scientific Paper Session: B1**
Robert Russell, MD, Moderator
Jaimie Shores, MD, Co-Moderator

11:30am–12:30pm **Panel: What is New for the DRUJ?**
Richard Berger, MD, PhD, Moderator
Jennifer Moriatis-Wolf, MD, Jorge Orbay, MD

1:30–2:30 pm **Panel: Evidence in Treating Scaphoid Fractures and Nonunions**
Elizabeth Ouellette, MD, Moderator
William Geissler, MD, Eric Hofmeister, MD, Scott Duncan, MD

3:00–4:00pm **AAHS Instructional Courses**

109 Financial Strategies for Physicians in an Unstable Banking Environment
Grant Conway, President, Physicians National Bank

110 Life Financial Goals for Physicians and Their Practices
Jeff Palmer, Morgan Stanley Smith Barney

Friday, January 8, 2010

7:00–8:00am **AAHS Instructional Courses**

111 Treatment of Ulnar Sided Wrist Pain
Brian Adams, MD, Chair
Jeffrey Budoff, MD, Marco Rizzo, MD

112 Management of Fractures and Dislocations About the Elbow
Peter Murray, MD, Chair
Neal Chen, MD, Randall Culp, MD, Georgette Fogg, OT/L, CHT

113 Current State of Kienbock's Disease Treatment
Kyle Bickel, MD, Chair
Jeffrey Friedrich, MD

114 Bioskills Session: Distal Radius Fracture Fixation

115 Bioskills Session: Updated Fixation Techniques for Distal Radius Fractures
Scott Kozin, MD, Chair
Miguel Pirela-Cruz, MD, Robert Medoff, MD, A. Lee Osterman, MD

AAHS Session A

8:30–9:15am **Panel: Update on Outcomes Research in Hand Surgery**
Joy MacDermid, BScPT, PhD, Moderator
Steven McCabe, MD, Brent Graham, MD

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Friday, January 8, 2010

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9:15–10:15am **Scientific Paper Session: A2**
William Swartz, MD, Moderator
Donna Breger Stanton, MA, OTR/L, CHT, Co-Moderator

10:45–11:15am **Scientific Paper Session: A3**
Wyndell Merritt, MD, Moderator
Robert C. Chadderdon, MD, Co-Moderator

11:15am–12:00pm **Danyo Lecture: Transformation of Medical Education and Transformation of Health Care—A Critical Link**
Richard Berger, MD

AAHS Session B

8:30–9:15am **Panel: Advances in the Treatment of the RA Hand**
W.P. Andrew Lee, MD, Moderator
Robert Goitz, MD, Vincent R. Hentz, MD, Ann Lund, OTR, CHT

9:15–10:15am **Scientific Paper Session: B2**
C. Lin Puckett, MD, Moderator

10:45–11:15am **Scientific Paper Session: B3**
James Hoehn, MD, Moderator
Susan Michlovitz, PT, PhD, CHT, Co-Moderator

11:15am–12:00pm **Danyo Lecture (Unopposed Session A)**

12:00–12:30pm **Annual Business Meeting (AAHS Members Only)**

12:45–2:45pm **AAHS Board of Directors Luncheon**

AAHS Instructional Course

1:00–5:20pm **Comprehensive Hand Surgery Review Course**
Peter Jebson, MD, Chair

1:00–1:20pm **Tumors of the Hand and Wrist**
Edward Athanasian, MD

1:20–1:40pm **Compressive Neuropathies & CRPS**
Christopher Pederson, MD

1:40–2:00pm **Thumb Basal Joint Arthritis and Inflammatory Arthritis**
Gregory Merrell, MD

2:00–2:20pm **Distal Radius Fractures**
David Bozentka, MD

2:20–2:40pm **Distal Radioulnar Joint (DRUJ)**
Peter Jebson, MD

2:40–3:00pm **Scaphoid Fractures and Non-Unions, Kienbocks Disease**
Robert Goitz, MD

3:00–3:20pm **Carpal Instability, Wrist Arthritis**
Jose Ortiz, Jr., MD

3:40–4:00pm **Fractures of the Metacarpals and Phalanges**
Jerome Chao, MD

4:00–4:20pm **Flexor & Extensor Tendon Injuries**
Loree Kalliainen, MD

4:20–4:40pm **Infections of the Hand**
E. Gene Deune, MD

4:40–5:00pm **Congenital Hand Differences**
Robert Havlik, MD

5:00–5:20pm **Tendonopathies and Dupuytren's Contracture**
Miguel Pirela-Cruz, MD

7:00–10:00pm **AAHS Awards Dinner and Dance**

AAHS/ASPN/ASRM Combined Day

Saturday, January 9, 2010

6:30–7:00am **Continental Breakfast with Exhibitors**

7:00–8:00am **AAHS/ASPN/ASRM Instructional Courses**

201 Congenital Hand Differences: How I Do It
Amit Gupta, MD, Chair
David Netscher, MD, Dorit Aaron, MA, OTR, CHT

202 Endoscopic Cubital and Carpal Tunnel Release
M. Ather Mirza, MD, Chair
Daniel Nagle, MD, Tyson Cobb, MD

203 Advances in Brachial Plexus Paralyses Reconstruction
Susan Mackinnon, MD, Chair
Gregory Borschel, MD, David Chwei-Chin Chuang, MD

204 Current Approaches to Functional Muscle Transfer to the Extremity Following Nerve Injury
Neil F. Jones, MD, Chair
Allen Bishop, MD, Milan Stevanovic, MD, Gregory Dumanian, MD

205 Intraoperative Neurophysiology
David Houlden, PhD, Chair
Leo Happel, PhD, Allen Van Beek, MD

206 Obstetric Brachial Plexus Lesions
Martijn Malessy, MD, Willem Pondaag, MD, Chairs

8:15–9:15am **AAHS/ASPN/ASRM Joint Panel: Partial Nerve Injuries Are Never Easy**
Moderator: Allen Van Beek, MD
Susan Mackinnon, MD, Peter Amadio, MD, Thomas Trumble, MD, L. Scott Levin, MD, Christine Novak, PT, MS, PhD(c)

9:30–9:45am **Presidents Welcome**
Nicholas B. Vedder, MD, FACS, AAHS President
Howard Clarke, MD, ASPN President
William Zamboni, MD, ASRM President
Michael McGuire, MD, ASPS President 2009-2010

9:45–10:45am **AAHS/ASPN/ASRM Joint Presidential Keynote Lecture**
Paul Farmer, MD, PhD

10:45–11:45am **AAHS/ASPN/ASRM Joint Outstanding Papers** H

Nerve Transfers

This edition of the Around the Hand Table focuses on the relatively new topic of nerve transfers that is just now becoming mainstream. Our moderator is Susan Mackinnon, MD, Sydney M. Shoenberg, Jr. and Robert H. Shoenberg Professor and Chief, Division of Plastic and Reconstructive Surgery, Washington University School of Medicine, St. Louis, MO. Joining her on the panel are hand surgeons Justin Brown, MD, Assistant Professor of Neurological Surgery, Washington University School of Medicine, St. Louis, MO; Gregory Dumanian, MD, Associate Professor of Surgery and Program Director of Plastic Surgery, Northwestern Feinberg School of Medicine, Chicago, IL; Douglas Sammer, MD, Assistant Professor of Surgery, Washington University School of Medicine, St. Louis, MO; Alexander Shin, MD, Professor of Orthopedic Surgery, Division of Hand Surgery, Mayo Clinic, Rochester, MN; and hand therapist Christine Novak, PT, MS, PhD(c), Research Associate, University Health Network, Toronto, ON.

Dr. Mackinnon: This is the first time—to my knowledge—that there's been a round table on nerve transfers. I thought it would be good to go around the table and just talk for a couple of minutes or so on what nerve transfers mean to you, what is you're overall "gestalt". And then we'll go through indications and timing and specifically nerve transfers with respect to amputations; median to radial nerve transfer; AIN transfers for ulnar nerve injuries, and then nerve transfers for brachial plexus issues and postoperative management and re-education issues.

Dr. Dumanian: For me, a nerve transfer is a method to regain function that had been lost due to an amputation of an upper extremity. Specifically, when an upper extremity is amputated at the gleno humeral level, we still have intact but divided musculocutaneous radial, median, and ulnar nerves. A nerve transfer allows us to get the function back out of the nerve. After successful reinnervation of a nearby but otherwise functionless muscle, the median, radial, ulnar, and musculocutaneous nerves have the ability to cause an EMG signal to occur and thereby drive a myoelectric prosthesis. I am also using nerve transfers to reduce the pain of neuromas caused by amputations.

Dr. Mackinnon: That's a very interesting concept. I wouldn't have thought about nerve transfers for an extremity that isn't even there. We'll talk about that further in our discussion. Justin, what do nerve transfers mean to you?

Dr. Brown: Nerve transfers are, in many cases of nerve injuries, the most promising reconstructive strategy to restore the most physiological function back to that extremity. And one of the things I like about nerve transfers over tendon transfers is what I refer to as the functional exchange rate. With the benefits of cortical remodeling, we can expect that a nerve with a single function can be transferred into a nerve with more complex functions and the brain can figure it out. For example, when the ECRB wrist extensor is transferred into the AIN—a one-function wrist extension nerve branch is turned into a multi-function nerve now providing independent flexion of the first 3 digits.

Dr. Shin: When you say nerve transfer, I think of it a little more simplistically. A nerve transfer is the transfer of all or part of a functioning but less important nerve to a more important but denervated nerve. So it's in more of the classical sense of trying to get function back in a denervated nerve by borrowing a piece of a working nerve from somewhere either in the upper extremity or the inter-plexal or extra-plexal area.

Dr. Mackinnon: Christine, what's your take on this idea of nerve transfer?

Ms. Novak: I think it is along the same lines as what Alex has just outlined. It is really getting function, whether it's muscle or sensory, from perhaps a less critical nerve more distal to the site of injury.

Dr. Sammer: At the level of the brachial plexus, nerve transfers are commonly done. But in the forearm and hand it's a new idea, and I think most surgeons are still more comfortable with tendon transfers than they are with nerve transfers. That being said, there are many potential advantages to nerve transfers. For example, complications such as transfer rupture, tendon adhesions, and the difficult task of tensioning the tendon transfer are not issues with nerve transfers. Furthermore, you don't have to immobilize the extremity, so unlike tendon transfers you can combine nerve transfers with joint releases or contracture releases. The idea of using nerve transfers in combination with or instead of tendon transfers in the forearm and hand is a paradigm shift. I think their use will grow, although I don't think it's going to happen immediately.

Dr. Mackinnon: I would add to all of the above the idea of taking a proximal level injury and turning it into

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"IT IS IMPORTANT THAT NERVE TRANSFERS BE TAUGHT TO SURGEONS [ENABLING THEM] TO DEAL WITH COMPLEX BRACHIAL PLEXUS PATIENTS WITH A NICE RECIPE OF TRANSFER TECHNIQUES."

SUSAN MACKINNON, MD

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a distal level injury. Secondly, working in the normal non-injured area, and out of the injured area. I would emphasize one of the things you said, Doug: it allows reinnervation of the normal tendon/muscle tendon unit to maintain all the biomechanics of the normal muscle unit. We know this is important in order to try to keep sarcomeres at their ideal length for maximal function.

Dr. Dumanian: And keep in mind a point made earlier. I have been employing nerve transfers with the concept that if you give an amputated nerve somewhere to go, it tends to solve the problem of neuroma pain in a large mixed sensory and motor nerve. So the concept of not just dunking it somewhere quiet, but actually regaining some function of it with a transfer actually quiets the symptomatic nerve ending down.

Dr. Mackinnon: It gives it something to do then. A job to do, a place to go.

Let's talk about the way nerve transfers started, and that is exactly as Doug was saying, at the level of the plexus and then moving down the arm and into the forearm and hand. We will then talk a little about motor re-education, postoperative management, and finally the new concept of nerve transfers for the upper extremity when the upper extremity is actually amputated. Alex, could you lead with some thoughts on indications for nerve transfers in brachial plexus injuries?

Dr. Shin: I think the most important thing about nerve transfers, is that it is one tool in reconstructing patients with brachial plexus injuries. The other tools that are available include nerve grafting from viable nerve roots, or combinations of nerve transfers with nerve grafting, and even adding things that are more complicated, such as free functioning muscles like a gracilis muscle. In terms of use of nerve transfers, I think they add an exciting mix to nerve grafting, and even in situations where nerve grafting cannot be done, such as avulsion injuries of the brachial plexus, nerve transfers offer hope in patients that have absolutely none in terms of regaining some basic functions. So in a complete brachial plexus injury that is seen within 6 months, the options for nerve transfers can include use of: the spinal accessory nerve; intercostals nerves; the phrenic nerve, which has been popularized in China; or the contralateral C7, also popularized in China. Even in partial plexus injuries, borrowing portions of a working ulnar nerve or median nerve can be done to restore upper extremity function.

Dr. Mackinnon: Alex, what are your favorite nerve transfers for an upper plexus injury?

Dr. Shin: For an upper trunk plexus injury, if we're talking a strict C5 and C6 avulsion injury, I think that you have several options. One of the more classic ways of dealing with this is what they call the triple nerve transfer, which would include the spinal accessory distal portion transfer to the suprascapular nerve, a triceps branch transfer to the axillary nerve done posteriorly, and finally, a transfer of a portion of the working ulnar nerve to the biceps motor branch.

Dr. Mackinnon: I would add to that the idea of trying not to downgrade accessory nerve function by doing an end-to-side repair. I make an actual divot into the accessory nerve and sew the suprascapular nerve end to side into a cut into the accessory nerve. I then make a proximal crush to the entire accessory nerve. This results in suprascapular nerve recovery with less deficit in the trapezius muscle. And then of course, the double fascicular operation innervates the brachialis nerve as well as the biceps nerve.

Dr. Shin: I think the concept of the end-to-side was initially quite popular because you wouldn't have to take down the recipient nerve. But a true end-to-side really doesn't work. You have to actually make an epineurotomy and damage the recipient nerve a little. In our practice we've found that the end-to-side really has not been as beneficial as has initially been reported, and in my discussions with other end-to-side enthusiasts, most of those surgeons—particularly in Asia—have fallen away from the end-to-side technique.

On your second question about the double nerve transfer, I think initially that has had a very logical and enthusiastic following. And we have been looking at that very carefully in the study that we recently submitted for publication. We compared a double Oberlin technique, where we do an ulnar and median nerve fasical transfer to the biceps and brachialis motor branch, respectively, and we have not been able to show any statistical difference in biomechanic strength analysis in the 2 groups. And so even though we continue to use a 2-fasical technique, perhaps we're not getting the results that we want biomechanically. We have to really think carefully about perhaps using this as a second nerve transfer for something else. But at the present time, our data shows that a single ulnar nerve fascicle has given torque elbow flexion strength and supination equally to that of the double technique.

"AN IMPORTANT TAKE AWAY MESSAGE FROM THIS IS NOT NERVE TRANSFERS VERSUS GRAFTING VERSUS TENDON TRANSFERS, BUT REALLY THE SYNTHESIS OF THESE THREE DISCIPLINES."

JUSTIN BROWN, MD

Dr. Mackinnon: The stimulus for the idea of innervating the brachialis as well as the biceps was because of the reports of some M3's function with just the single procedure of FCU fascicle-to-biceps nerve. It was because of those poor results with the single fascicular transfer that I introduced the double fascicular transfer. I've actually had one patient, maybe two patients, where even the double hasn't been successful. Most of them, however, almost have normal elbow flexion with a double fascicular transfer.

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HAND TABLE

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Dr. Shin: I have one comment. You asked what's my favorite nerve transfers to do, and I think it's really important that we become fascile with multiple nerve transfers, and know the multiple options—especially in brachial plexus, because each one of these patients is so very different. The importance of seeing these patients early, operating on them within 6 months if possible, and just doing a very critical exam is key to determining what other options are available. Offer these patients as much as you possibly can, and really discuss with them in a very open fashion to determine what their best transfers or nerve grafting or any other strategies for reconstruction should be.

Dr. Mackinnon: Alex, I didn't ask you about lower plexus injuries. How do you manage a lower plexus injury?

Dr. Shin: I think with lower plexus injuries, for example a Klumpkies or lower trunk injury, our preference is to consider tendon transfer options that would either be the classical ones in terms of trying to gain finger flexion and stability, and intrinsic stability versus the one such as the brachialis tendon transfer for finger flexion. I have not had good success with the more distal nerve transfers compared to the tendon transfer options.

Dr. Mackinnon: Here's a procedure that I love for lower plexus, and that is taking the nerve to the brachialis muscle and transferring it over to the anterior interosseous nerve and pronator nerve in the level of the distal arm. I then add a tenodesis of the profundus tendons. So you get pronation and anterior interosseous nerve function by taking the brachialis nerve and transferring it to the component of the median nerve to the AIN and pronator. Then follow it up with some tendon transfers for ulnar extrinsic function.

Dr. Shin: I think that's a very novel and very interesting concept. I am more of a classic hand surgeon, thinking that I could take the brachialis, prolong it with a tendon graft, and go right into the flexor digitorum profundus and get finger flexion that occurs sooner and is more reliable. Or doing other tendon transfers such as ECRL to FDP's, as well as other type of things to do tenodesis or passive Zancolli transfers to put the hand in the better position. And I think really until we have better studies looking at these patient groups, you and I will never know which of the two techniques is better.

Dr. Mackinnon: Well, I can't tell you about reliability of the brachialis nerve to the AIN and pronator nerves because I've only done it in a few patients, but it has worked beautifully in all of them. So you're right, a brand new idea and we need more follow-up on that.

Ms. Novak: How long is it before you see recovery?

Dr. Mackinnon: We've been starting to do motor re-education very early, thinking we're training the brain early, but in general it's about 8 months to get the function back. So it does take longer than a tendon transfer, but the results are smoother, I think, because you're re-innervating the same muscle/tendon unit.

Dr. Shin: I think that a comparison and such a statement really can't be made until a true study is done, but I think that tendon transfers still also work quite well. Until we have a good prospective randomized study looking at the same patient population with enough numbers, we really can't say if one is truly better than the other.

Dr. Dumanian: I have a question for Alex and Susan. I've had several children with arthrogryposis with no elbow flexion. They do have some radial and spinal accessory function. Have you tried any transfers for patients with congenital defect to re-establish elbow flexion in these patients?

Dr. Shin: I have some colleagues in Taiwan that have been very aggressive with the use of free functioning muscles to recreate a biceps or really something to create an elbow flexor using a spinal accessory, and they so far have been very enthusiastic about those type of surgeries.

Dr. Dumanian: The patients that I did, I did try the end-to-side spinal accessory and, as Alex was saying, I didn't get enough power on the gracilis. I got some EMG function but no active motion. So sometimes I wonder if I had gone end-to-end to the end of the spinal accessory with a nerve graft, whether that would have powered it to improve manner. So the last one I did, I did the tie technique and brought the radial nerve anterior from the arm and used that to power the gracilis.

"WHEN THERE'S AN AMPUTATED NERVE AND THERE'S A VERY PROXIMAL AMPUTATION... I'M NOT ASKING RE-INNERVATED MUSCLE BIO-AMPLIFIERS TO MOVE A JOINT, I JUST NEED AN ELECTRIC SIGNAL AFTER THE TRANSFER."

GREG DUMANIAN, MD

Dr. Mackinnon: Excellent. Let's move down the extremity now, and Doug, can I ask you what your thoughts are on nerve transfers for patients with ulnar nerve injuries?

Dr. Sammer: In a patient with a high ulnar nerve injury, in whom a return of intrinsic hand function is unlikely, I like the AIN to deep motor branch of the ulnar nerve transfer. I think it's an advantageous nerve transfer for a couple of reasons. For one, the tendon transfer options for ulnar nerve palsy are not as reliable as those for radial nerve palsy, for example. With tendon transfers, you can correct clawing, improve pinch, and re-integrate finger flexion. However, the natural fluidity of the hand is never restored. This single nerve transfer has the ability to improve all of those aspects of intrinsic hand function. The other advantage is that unlike some other forearm level nerve transfers, there is really no donor deficit with the AIN to deep motor branch transfer. Because this transfer burns no bridges, you can always fall back on or augment

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later with the standard tendon transfers.

Dr. Shin: Doug I have a quick question for you. I've tried some of the AIN-to-deep motor branch transfers, and by the time I dissect out the AIN and try to transfer it over, I have this very tiny branch of the AIN, and then I have the deep motor branch of the ulnar nerve and it looks like sticking a small single fascicle nerve into this bigger nerve that has a huge mismatch. And then sometimes it's hard to reach it. Some of my colleagues have even come back a little bit proximal, cut the AIN more proximal to get a little larger nerve and nerve grafted it. What are your tricks on trying to reach it and how does that affect the outcomes?

Dr. Sammer: Well, if you divide the AIN more proximally you may have a bigger nerve, but you lose length. And I think in spite of the size mismatch you want to go as distal as you can in the AIN, to make it a tension-free transfer. I dissect it into the pronator quadratus for a couple of centimeters until it starts branching, and then divide it at that point. But to really make it a tension free transfer, you also have to go quite proximal on the deep motor branch.

For this, I start at Guyon's canal with a release of the deep motor branch. It is easy to find the deep motor branch if you retract the entire ulnar neurovascular bundle ulnarly, and find the branch diving under the hypothenar origin. After releasing the deep motor branch, I trace it proximally by intermittent neurolysis. So it's not a true continuous internal neurolysis, but rather a way of keeping track of the correct fascicles as I'm moving proximally along the nerve.

The dissection continues a few centimeters proximal to the takeoff of the dorsal cutaneous branch. The dorsal cutaneous branch peels right off the main nerve, and at this point the motor fascicles lie just radial to the dorsal cutaneous branch fibers, and ulnar to the sensory fibers within the main nerve. Once you are well proximal to the dorsal cutaneous branch takeoff, the motor branch can be divided and neurolysed proximal to distal in preparation for transfer. There are a few plexi that have to be divided when doing this. This gives you a lot of length and a truly tension-free transfer. There is some degree of size mismatch though.

Dr. Mackinnon: I like your idea, Doug, of decompressing the recurrent motor branch as it turns around the hook of the hamate. There definitely is a size mismatch, about 600 fibers in the AIN and about 1200 in the deep motor branch of the ulnar nerve. Justin, you've done a lot of these—any tips, comments, thoughts on this?

Dr. Brown: Thoughts on the size mismatch... as Doug was mentioning, as you follow the nerve into the pronatorquadratus, the further you follow it, the more fascia the nerve picks up as it segregates into its individual branches. So if you actually follow the nerve until it begins to divide into different branches to innervate different parts of the muscle and cut it there, beyond where it begins to segregate, you can get a much better size match. You get a little bit more length and then you get something that matches that motor branch of the ulnar nerve better. Certainly you don't have any more axons than you did before, but technically it makes the coaptation a little bit easier.

Dr. Mackinnon: So you have more surface area by going distally on your donor, and less surface area by going proximally on your recipient, which helps with the matching?

Dr. Brown: Right. The other thing I think worth discussing here is those intermediate level injuries where the ulnar nerve can be repaired or can be grafted. We're not convinced of how great of a result we're going to get, and the idea of the reverse end-to-side transfer. And this seems to me an ideal situation for that sort of transfer. If you can take the distal AIN, swing this over end to side to potentially contribute these axons to the native motor axons of the grafted ulnar nerve, the question is whether we get a better result. This is something I've tried just recently, so I haven't seen results on this. Susan, you've done this as well, have you seen results from this?

Dr. Mackinnon: Justin is talking about a reverse end-to-side where you take a normal donor nerve and sew it end-to-side into a dennervated nerve, hoping to push nerve fibers into that dennervated nerve. This has been described by various people here and there for the last few years. We've just done an animal model where we've shown that it actually does work. If you open up the perineurium, the nerve fibers facing a dennervated nerve will regenerate into the denervated nerve and regenerate distally. So it can help to supercharge that ulnar nerve. Because the ulnar nerve is sitting in its normal position, you need a small graft to get from the anterior interosseous nerve up and over to the motor side of the ulnar nerve. But I think it's an idea that is brilliant and, given the experimental studies we've seen, will become the way we manage ulnar nerves when we think that we need some help with intrinsic muscle protection and function.

"FOR NERVE TRANSFERS, IN ADDITION TO MUSCLE REINNERVATION, THE MOST IMPORTANT CONCEPTS TO CONSIDER ARE CORTICAL CHANGES, ALTERED MOTOR PATTERNS AND NEUROPLASTICITY."

CHRISTINE NOVAK, PT, MS, PHD(C),

Christine, can I ask you to comment on AIN-to-deep motor branch of the ulnar nerve, because I know you've seen a number of these cases.

Ms. Novak: In my experience, patients who have these transfers get good motor recovery of the intrinsic muscles, but not perfect. Perhaps the difference in the number of available regenerating axons is partially responsible for this "less than perfect" recovery or perhaps it's related to the complex actions of

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the ulnar innervated intrinsic muscles compared to the pronator quadratus. I think that these patients have better functional recovery than with tendon transfers alone. Overall, I think that patients are quite satisfied with their motor recovery and I have heard no complaints regarding donor morbidity.

Dr. Mackinnon: The first one I did was April the 23rd of 1991, and I continue to do them—distal AIN-to-ulnar. The results I get usually are good, occasionally they're really good, but usually they're fair to good. And I have augmented them with extensor indicis proprius tendon transfer for thumb pinch, and extensor digiti quinti over to EDC to the 5th finger for a Wartenberg's deformity. But I very much think it's a useful procedure.

Ms. Novak: I have one more comment regarding the motor re-education and strengthening. It is important to remember that the cortical map and motor patterns are now altered. Initially, contraction of the intrinsic muscles is initiated by contraction of the "donor" AIN, so resisted pronation would elicit a contraction of the ulnar innervated intrinsic muscles. I think that when re-innervation of the intrinsics is evident, resisted pronation is often stopped. But I think that you can continue to increase the strength of the intrinsics as they're re-innervating by continuing exercises that combine resisted pronation and pinching.

Dr. Mackinnon: Let's talk about a high radial nerve injury. Justin, do you want to lead off on that?

Dr. Brown: Sure, I'll lead off on that. This is certainly one of the more controversial nerve transfers that we discuss, and I think it well illustrates the point that we were discussing earlier, which is, when is a nerve transfer better and when is a tendon transfer better? This is something that will pan out over the next few years. But median to radial... some of the criticisms it receives is the fact that you're using an agonist to re-innervate an antagonist. However, when we look at the tendon transfer correlate of that, it doesn't seem to be much of a problem median to radial, biceps to triceps. So I think that that argument against it is not a valid one.

The other issue with this of course is, with nerve transfers, there is always a concern of a failure, which you can certainly avoid with the tendon transfer. But in the face of distal nerve transfers most of the time these work quite well, and in the forearm we've got several robust nerve branches of the median nerve that we can easily move over and directly re-innervate the key nerves for finger extension and wrist extension. And I think that the results you get, although I haven't seen as many of the tendon transfers as others have, the results you get, again, are a bit more physiologic wrist extension and finger extension. The thumb comes back, the fingers and the wrist go up together, and the patient has a much more normal hand function than they would have had otherwise. But the cost of this, of course, is the risk of a failure.

Ms. Novak: I think one of the issues following nerve transfers compared to tendon transfers is the time required for muscle reinnervation and functional recovery.

Dr. Brown: Right.

Ms. Novak: Generally the nerves that are transferred as the donor are similar to the tendons used for tendon transfers, it's just simply that you're transferring the nerve rather than the tendon.

Dr. Mackinnon: I think we know that radial nerve tendon transfers are in general very, very good. The times when I like to use a nerve transfer instead of a tendon transfer for this problem are in patients that have a very stiff hand, maybe even RSD from the more proximal nerve injury. They just aren't candidates for tendon transfers. So in those cases, as we talked about earlier in our discussion, they can start moving without restrictions in a week. However, it does take months, I would say 10 to 12 months, to have these nerve transfers work.

Although we're seeing earlier recovery now that we've started early motor re-education, it definitely takes longer to recover than with tendon transfers. However, when the patient has a stiff hand or RSD and they're not a candidate for tendon transfers, I would not do long nerve grafts for radial nerve function now. I would do a median to radial nerve transfer. I like the idea of taking the pronator teres up and over to the extensor carpi radialis brevis tendon as a tendon transfer, at the same time as I do the median to radial nerve transfer as long as they don't have a very stiff hand and can tolerate this wrist tendon transfer.

Dr. Shin: I actually have a little bit of a different philosophy. I love nerve transfers, and I think that when you think about nerve transfers you have to balance a lot of different issues. I think the radial nerve is one of the most forgiving nerves to graft. You can take a high radial nerve and do a nerve graft and actually get fairly decent results compared to grafting the ulnar nerve or the median nerve. If I have a patient that has a radial nerve segmental injury less than about 10 months from time of injury, I would really consider nerve grafting. And then if they don't want nerve graft-

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ing or the time has been too long, I think the tendon transfers have just been outstanding. They can be done anytime, so with indications of a stiff hand or an RSD you could actually still wait and try to get that stiffness out and work through that RSD and then eventually go back to those tendon transfers later. My biggest issue about the median nerve portions-to-targeted finger extension, thumb extension, or a wrist extension would be, what happens if your nerve transfers fail and you take out the branch to the flexor carpi radialis and you don't have that flexor carpi radialis anymore, or that palmaris or the flexor digitorum superficialis branch? What do you do then?

Dr. Brown: One of the things that we are able to do in the nerve transfers in the forearm and hand is really

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select exactly what fascicles you're taking. And when you come down the median nerve, you have your branch to the pronator, and then the next branch that comes off is to the wrist flexors and you can often separate these out so you have a couple of fascicles to FCR and one to palmaris longus and then you move your way distally and you have a couple different branches that head off to the FDS. So you can intentionally select a few branches and leave something that you know that you can transfer later and salvage a failure with. So I think that is something that you can prepare for prior to one of these operations.

Dr. Mackinnon: When I have done these median to radial nerve transfers, I've always left myself a backup. For example, the FCR/PL nerve fascicle is together. When there's a PL, I always leave PL nerve fascicle because if the nerve transfer doesn't work, it's such a great, easy transfer for EPL function. There are 2 branches to FDS, and there's a couple of fascicles to FCR as well. So as we talked about earlier, the farther distal you go on your donor nerve the more branches you get. And you can perform neurolysis back and leave a branch to that FCR. And when you take one branch to FCR but leave the other, then the denervated endplates within the FCR cause the innervated nerves near it to collaterally sprout. So I guess that's really one of the tricks that I don't think we've emphasized enough—do the inter-fascicular splits so you're always leaving yourself a backup. However, if you have to go back and do pronator teres tendon transfer for wrist, then that becomes more difficult to do. So I try to do the pronator teres to ECRB tendon transfer at the same time as the nerve transfer.

Dr. Shin: One of the issues that I personally have seen in patients that have had partially de-nervated FCR's is when you are ready to do a nerve or a tendon transfer, and preparing the flexor carpi radialus and freeing it up and mobilizing it, I've actually had some of them, as I'm pulling tension on it, actually avulse proximally because the portion of the de-nervated muscle has changed the way it attaches to the tendon, and it actually avulsed the flexor carpi radialus or the palmeris longis from its proximal attachment in trying to do the tendon transfer.

Dr. Dumanian: I have a question for the panelists. I do many of my nerve transfers in amputees, while you are doing them in people with hands. In several of my nerve transfers in patients with hands, my patients had some significant dysesthesias. Any thoughts on managing it, expectations, or any tips for me?

Dr. Shin: I think for the radial nerve injury, they will still continue with their radial nerve sensory dysesthesia because, in just doing the tendon transfers, you have not addressed the sensory component of the radial nerve.

Dr. Mackinnon: We haven't talked about sensory transfers at all yet. For sensory recovery in radial nerve palsy we take the lateral antebrachial cutaneous nerve and transfer it into the radial sensory nerve. And then we take the distal portion of the lateral antebrachial cutaneous nerve and turn it end to side into the radial sensory nerve because we do know that there is some moderate amount of end to side collateral sprouting for sensory. I would emphasize that our whole panel agrees that without an injury to a motor nerve you don't get spontaneous end-to-side sprouting. But the distal end of the LABC, which is now defunctioned, can be sewn end-to-side to the radial sensory to return some sensation to the LABC territory. Initially, I just did the motor transfer and then patients would say, "well my hand works great, but I don't have any sensation on the dorsum of my hand."So now we've been adding the LABC to the radial sensory end-to-side transfer.

Dr. Brown: I think sensory nerve transfers often are a bit more straightforward than the motor transfers. We know that our priority is always going to be the first 3 digits if at all possible, and then we work our way back from there. For upper plexus injuries, and I think Susan you introduced this, to be able to get inside the median nerve itself and separate out the 3rd web space, which usually remains innervated with good sensation—you cut that and move it over in the wrist to the 1st web space—is an excellent transfer.

Dr. Mackinnon: Justin, you're doing that transfer in the distal forearm then?

Dr. Brown: In the distal forearm at the level of the wrist, yes.

Dr. Mackinnon: I've also taken the 3rd web space branch of the median nerve in brachial plexus injuries over, as Justin described, end to side to the radial side of the median nerve, and also over to the sensory component of the ulnar nerve for high ulnar nerve injuries.

"A NERVE TRANSFER IS THE TRANSFER OF ALL OR PART OF A FUNCTIONING BUT LESS IMPORTANT NERVE TO A MORE IMPORTANT BUT DENERVATED NERVE."

ALEX SHIN, MD

Dr. Sammer: I think that's a nice way to do it, taking the portion of the median nerve going to the 3rd web space and bringing it over to the sensory portion of the ulnar nerve in an end-to-end fashion. But then you've got a deficit in the (less important) 3rd web space. One option for that is to dissect out the distal stump of the 3rd web space portion of the median nerve that you've divided, and then turn it back in end-to-side fashion into the remaining median nerve. And you can also take the DCU and bring it over to the median nerve in an end-to-side fashion.

Dr. Mackinnon: It's interesting because Viterabo of course reintroduced the idea of end-to-side repair in 1991 and now almost 2 decades later I think most people will agree that you do get some amount of sensory spontaneous collateral sprouting but not motor without

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injury to the donor motor axons. If we have a divided distal sensory nerve either from a graft donor site or a nerve transfer, we take the distal end of the sensory nerve and sew it end to side into an adjacent normal nerve, or into a nerve that we know will have sensation eventually forthcoming. And there was an excellent article in Pain in 2008 by Dorsi that shows that dysesthesia occurs in the denervated distal sensory nerve and it can be very painful. So by turning that denervated distal sensory nerve end-to-side to a normal sensory nerve you satisfy that distal nerve.

Christine, could you tell us a bit about your thoughts on sensory and motor re-education and how we should be managing these nerve transfers in the post-operative period?

Ms. Novak: For nerve transfers, in addition to muscle reinnervation, the most important concepts to consider are cortical changes, altered motor patterns and neuroplasticity. The cortical changes occur early with the nerve injury and continue with nerve regeneration, motor reinnervation and recovery. After seeing many patients with nerve transfers, the most important change in my practice is recognition of how important the cortical component is and the importance of cortical retraining and remapping, not only in patients with nerve transfers but with any nerve injury. I think that is a key concept for rehab following nerve transfers. The retraining following nerve transfers is similar to retraining following tendon transfers. Transfers that use synergistic donor muscles or nerves are easier to retrain than a transfer from an antagonistic muscle or nerve donor. Strategies of retraining can begin pre-operatively, when you're talking to the patient about doing the nerve transfers. They can begin doing bilateral co-contractions of the donor and the recipient muscle. In this way, the patient gets a chance to start learning about how they are going to recruit the reinnervated muscle. Initially, recruiting the newly reinnervated muscle contraction of the muscle from the donor nerve is necessary. A bilateral contraction assists in understanding the relearning strategy from the uninjured side and then in the future can include bimanual tasks.

Dr. Sammer: Chris, what is the role of biofeedback, and what type of biofeedback do you think works well?

Ms. Novak: I think biofeedback is a great idea and really works well for motor retraining. You can use EMG biofeedback machines, with audio or visual feedback, or once the muscle is reinnervated and you can see a contraction, the patient can look at the muscle and have their own visual feedback loop by looking at the contraction of that muscle. Biofeedback machines can be used to increase the strength of a contraction or decrease the strength of contractions. For example, patients will sometimes have co-contraction from antagonistic muscles and if you have a newly re-innervated muscle that's weak and you have strong co-contraction from an antagonistic muscle, then biofeedback can help to decrease the action of the antagonistic muscle so that you can actually strengthen the re-innervated muscle. I think though that biofeedback is just one of many strategies and once a contraction is visible, the patient can actually use visual feedback. The important consideration is to teach the patient an exercise program that they can continue at home and not be dependent upon therapy or a biofeedback machine.

Dr. Mackinnon: Christine, what do you think of the idea of starting sensory or motor re-education before you actually have reinnervation in order to keep the cortex "thinking" about that particular function? Do you think there's any merit in that?

Ms. Novak: I do think there is merit in that. The best outcome depends on good cortical remapping and reestablishment of motor patterns and strategies to optimize this. In terms of motor reeducation, contraction of the muscles from the donor nerve before you actually see a contraction in the reinnervated muscle will help to strengthen the newly reinnervated muscle fibers. Incorporating this into a normal movement pattern will help to establish the whole motor loop.

Dr. Mackinnon: Christine, what do you think about mirrors for re-education?

Ms. Novak: Mirror retraining involves movement or an action of the unaffected hand which is visualized in a mirror and so the patient appears to see the actions of the contralateral limb. For example, in a patient with a left AIN-to-deep motor branch of the ulnar nerve, a mirror would be placed between the two hands, the patient would do a pronation and pinching task in their right hand, so that in the mirror it appears to be their left hand doing the task. Also, if they can, the patient may try to mimic the action, on the other side of the mirror, but what they're seeing visually is the right hand through the mirror. I think that's a great strategy for retraining and it has been used extensively in rehabilitation following stroke. It goes back to the idea of cortical retraining and remapping. I think all the strategies that you can use to increase cortical remapping and to input normal motor patterns are going to be useful for the patient. So whether you use bimanular tasks or bilateral contractions, whether you use biofeedback or mirror training, they're all going to work to increase the cortical component with motor recovery.

"IN A PATIENT WITH A HIGH ULNAR NERVE INJURY, IN WHOM A RETURN OF INTRINSIC HAND FUNCTION IS UNLIKELY, I LIKE THE AIN TO DEEP MOTOR BRANCH OF THE ULNAR NERVE TRANSFER."

DOUGLAS SAMMER, MD

Dr. Mackinnon: Excellent. Any other questions for Christine about post-operative management?

HAND TABLE

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Ms. Novak: I would just like to add one more thought, particularly with brachial plexus injuries. It is important to remember the muscles that are weakened simply from disuse. Many patients with brachial plexus patients haven't reached overhead in 12 to 18 months since their injury, and therefore the scapular muscles, particularly the middle and lower trapezius and serratus anterior muscles, are going to be weak; not from injury but from disuse. To maximize shoulder function after injury, it is necessary to strengthen not only the reinnervated glenohumeral muscles but also those that were not injured but are weak from disuse. Careful evaluation of the scapular muscles is necessary to identify the weak muscles and then to begin strengthening exercises to correct muscle imbalance and re-establish normal movement patterns.

Dr. Mackinnon: Greg, you've been using nerve transfers in an extraordinarily novel way for motor recovery with prosthesis in the upper amputations, and for pain relief in forearm extremity amputations. Could you tell us a bit about what you're doing with nerve transfers with the amputees?

Dr. Dumanian: Sure. When there's an amputated nerve and there's a very proximal amputation, there are still innervated muscles nearby but which have no function. Without a humerus, the pectoralis has no function: without a forearm, the biceps and triceps have no function. And we thought that these would be good targets to use muscle to be a bio-amplifier for the very small nerve signal which is still existing all the way to the end of the nerve. When I see an amputee, I try and figure out if there is an active nerve ending near the end of the amputation. A few patients have had their arm amputations as well as nerve avulsions from the spine. So if I have a Tinel's sign that's fairly distal in the level of the amputation and they tell me they can still feel their 5th finger or their index finger, I know that the nerve is active at that spot. And I've done nerve transfers on amputated nerves 3 or 4 years later and still regained the function that had been in that nerve. But the target for these nerve transfers is something that's still under cortical control at the time of surgery. If the target muscle to receive the transfer and to be the bioamplifier of the signal of the amputated nerve is the pectoralis major, they should be able to fire it at the time of surgery.

Dr. Mackinnon: That's fascinating. There has been some experimental work to suggest that a motor nerve that's divided isn't going to be useful after a period of time, which intuitively doesn't make sense to me. It would seem that what you're telling us is that even with very prolonged times of transection of the nerve, that's still a good motor lead out and that it can be used to motor something like a free muscle or for a bioprosthesis. Is that correct?

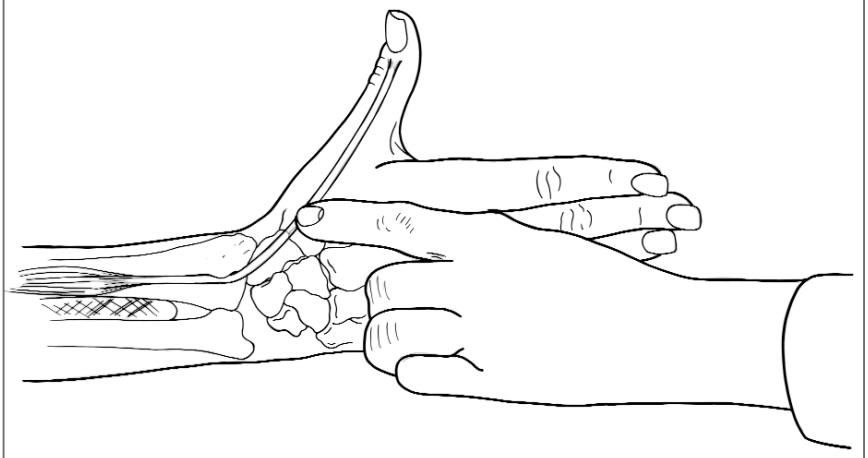
Dr. Dumanian: That's totally correct Susan. One of the things about the surgeries that we're doing here is that it's a numbers game. We're taking tens of thousands of axons and all we're trying to do is get a signal out of it so the efficiency of the re-innervation process is not nearly as important. Let's say, in an amputated nerve you have dieback of axons, but there's still going to be some motor axons at that level. So I'm not asking these re-innervated muscle bio-amplifiers to move a joint. I don't need motor strength, I just need an electric signal after the transfer.

Dr. Mackinnon: Greg, can you tell us about using nerve transfers for painful amputation stumps?

Dr. Dumanian: Sure. Based on the bionic arm procedures we're doing for amputees, in the 70 or 80 nerve transfers that I've done—not

"My hands are drawing!"

(what patients tell us a lot)



"EXAMINING THE EPL TENDON"

By Miguel Pirela-Cruz, MD

In the great tradition of hand surgeons' drawing we invite any readers to submit drawings they would like to share with the readership of the hand newsletter. Cartoons, drawings of patients' hands, cases and other drawings are welcome. Please add a short caption or description. High rez PDFs or JPGs can be sent to me via the Central Office. —Steve McCabe, MD

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patients, but individual transfers—even though there's a huge size mismatch between the large amputated nerve and the small nerve I'm coapting it to, I haven't been creating any symptomatic neuromas despite this mismatch in size. I haven't gone back a single time for a symptomatic, painful neuroma from my surgery. So I have these patients with trans-radial amputations where they have mixed major nerves, either their ulnar, median, or radial, and I've tried to use the same concepts. We don't have prosthesis to drive with this increased information from a nerve transfer but I'm trying to just control their symptoms. So I took a median nerve in several cases where the median nerve neuroma was causing a lot of pain under their prosthesis, and I transferred it to the AIN. And soon after the transfer, their residual FPL moved when they were thinking to move their thumb intrinsics. They don't have a hand but when I'm asking them to abduct their thumb, the median nerve through the AIN is causing thumb abduction that's showing up in their FPL. But more importantly it solved their painful neuroma. In several cases, I've controlled symptomatic ulnar nerve and median nerve neuromas with nerve transfers to a motor point more proximally located in the forearm. I have tried transfers of the ulnar nerve to a small motor fascicle to the FCU, and they seem to have worked.

Dr. Mackinnon: I think that is absolutely brilliant. I know that we've taken painful nerves and attached them to a long nerve graft. Many people have used that as a strategy, and we call it the Wandering Nerve Graft, to allow those sensory nerves that are cut and producing neuroma pain, to go somewhere. But what you're doing with your technique which is tremendously clever, is taking those sensory nerves and letting them grow down a motor nerve and direct sensory fibers to motor endplates.

Dr. Dumanian: And we know that even in a "motor nerve," half of those fibers are still sensory. So it's going to re-innervate the Golgi bodies and whatever other sensory nerve endings that are going into the muscle. So for many reasons, I think conceptually it's been working and it's a relatively straightforward procedure, especially in an amputee where you're not really losing anything.

Dr. Shin: Yes. I think the most important thing is for our membership to understand that there are options, multiple options, for brachial plexus injuries, for distal nerve injuries—but timing is everything. This means early evaluation to an appropriate person, or just getting the information out that in 2009 and 2010, we can think outside the box to try new options to get patients better results. This information, even if it's only to the hand surgeons that previously felt that there was nothing to be done for brachial plexus injuries, or no good results for ulnar nerve, high ulnar nerve, or median nerve injuries, can show them that there are options available that really can challenge dogma.

Ms. Novak: I think that one of the most the important concepts to recognize is the cortical changes that occur with nerve injury, and the amount of plasticity that we have. To maximize functional outcome after nerve transfers you need to include strategies that take into consideration the new cortical re-mapping that occurs and reestablishment of new motor patterns. Patient education and a good home program are essential.

Dr. Brown: I think that one of the important take away messages from this is not nerve transfers versus grafting versus tendon transfers, but really the synthesis of these three disciplines. That the best results are not often going to come from just one intervention, but potentially nerve transfers followed by tune ups with tendon transfers, or just bringing all three of these concepts together.

Dr. Mackinnon: I think that's a very good point. I know, for example, that in a high median nerve injury I would use the nerve to the ECRB and transfer that nerve over to the nerve to the pronator because there's nothing really easy to fall back on in the line of tendon transfers with respect to pronation. In a high median nerve I would consider using the dorsal cutaneous branch of the ulnar nerve over to the radial side of the median nerve. Tendon transfers can restore all the other median nerve functions. So mixing together nerve grafts, nerve transfers, and tendon transfers for many of these complex injuries seems logical.

Finally, it is important that nerve transfers be taught to surgeons that otherwise would not do brachial plexus surgery. I know that there have been some neurosurgeons who have said a downside of nerve transfers is that we don't need to work in the damaged plexus at the supraclavicular level and are not training surgeons to operate directly on the injured plexus. Something can be said for that, but also I think it may mean that in the next 20 years we'll see many more extremity surgeons able to deal with these complex brachial plexus patients with a nice recipe of transfer techniques to expand the care for this patient population.

So here it is 2009, and we're having our first round table conversation about nerve transfers. I think we all have a similar feeling that hand surgeons had after the World War when having their first conversations about tendon transfers.

Thank you all for a fun and stimulating discussion. H

Nerve Transfers

Because the topic for this issue of *Hand Surgery Quarterly* is nerve transfers, it seemed logical to discuss the codes relevant to brachial plexus surgery and neurorrhaphy using nerve grafts. In general, the codes used for these procedures are examples of nerve surgery, typcially either direct repair or nerve grafting. In past few years, synthetic nerve tubes have become available and are being used more frequently as substitutes for autogenous cable grafts. A code family for neurorrhaphy with "nerve graft or vein" now also includes "or with conduit," which accounts for the use of synthetic nerve tubes.

Remember that when the operating microscope is used, the code 69990 may be added to reflect use of this equipment. This code applies specifically to use of the microscope and is not appropriate if only loupe magnification is employed. It should not be listed with a -51 modifier and it can be listed as an additional code for every distinct procedure that requires its usage.

For brachial plexus repair procedures, the code 64861 applies. Note that some additional codes may be relevant, given that brachial plexus surgery is often complicated. Specifically, 64872 refers to suture of nerves requiring secondary or delayed closure (listed separatley in addition ot the code for the primary repair). The code 64874 corresponds to nerve repair requiring extensive mobilization or transposition of the nerve (also to be listed separately in addition to the code for the primary repair). Code 6876 applies when shortening of a bone is required (also listed separately). Brachial plexus surgery may require cutting through the clavicle for exposure, and in this case, code 23480 is appropriate.

LEON S. BENSON, MD

In cases where the brachial plexus is exposed for the purpose of a neurolysis or decompression, code 64713 is appropriate.

Use of an interpositional nerve graft for the brachial plexus area involves the family of codes from 64892 through 64907. Codes are organized accorded to whether the graft is greater or less than four centimeters in length and also according to where the nerve repair is located. Additionally, a distinction is made according to whether a single cable graft is required or whether multiple strands or used. These specific codes are also summarized in the table below.

Note that if a nerve pedicle transfer is performed, code 64905 applies. For a second stage proce-

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Brachial Plexus Surgery

69990	Use of an operating microscope
64861	Repair, brachial plexus
64713	Neuroplasty, brachial plexus
64872	Suture of nerve requiring secondary or delayed closure; list in addition to code for primary procedure
64874	Suture of nerve requiring extensive mobilization or transposition or nerve; list in addition to code for primary procedure
64876	Suture of nerve requiring shortening of bone of extremity; list in addition to code for primary procedure
23480	Osteotomy, clavicle, with or without internal fixation

Neurorrhaphy With Nerve Graft, Vein Graft, or Conduit

64885	Nerve graft (includes obtaining graft), head or neck, up to 4 cm in length
64886	Same as above (64885) except graft is more than 4 cm in length
64890	Nerve graft (includes obtaining graft), single strand, hand or foot, up to 4 cm in length
64891	Same as above (64890) except graft is more than 4 cm in length
64892	Nerve graft (includes obtaining graft); single strand; arm or leg; up to 4 cm in length
64893	Same as above (64892) except graft is more than 4 cm in length
64895	Nerve graft (includes obtaining graft), multiple strands (cable), hand or foot, up to 4 cm in length
64896	Same as above (64895) except graft is more than 4 cm in length
64897	Nerve graft (includes obtaining graft), multiple strands (cable), arm or leg, up to 4 cm in length
64898	Same as above (64897) except graft is more than 4 cm in length
64901	Nerve graft, each additional nerve; single strand; list in addition to code for primary procedure
64902	Nerve graft, each additional nerve; multiple strands; list in addition to code for primary procedure
64905	Nerve pedicle transfer; first stage
64907	Nerve pedicle transfer; second stage
64910	Nerve repair; with synthetic conduit or vein allograft (eg nerve tube), each nerve
64911	Same as above (64910) except with autogenous veing graft (includes harvest of vein graft), each nerve
64999	Unlisted procedure, nervous system

CODING CORNER

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dure of a nerve pedicle transfer; code 64907 is appropriate.

Also note in particular the codes 64910 and 64911. These are the two codes that specifically account for use of either veing allograft or synthetic conduits, both of which function as nerve "tubes." These codes have been added specifically to account for the synthetic tube products that are now commonly available.

The last code of the nerve repair group is 64999, which is listed as "unlisted procedure, nervous system." While it might be tempting to use this code for use of a nerve tube or any of the more complicated procedures above, it is always better to try to match the operation you have performed as closely as possible with a specific code that already exists. Insurance companies frequently pay very little for the "unlisted procedure" code. Furthermore, if payment is forthcoming for an "xx999" code, excessive documentation is usually necessary which, at the least, will greatly delay reimbursement.

You Code It

A 26 year old male presents to with a stab wound to the axilla. While undergoing emergency vascular repair, you are consulted to assesss the brachial plexus injury. The plexus is lacerated but is the nerve ends are directly amenable to repair and you proceed with neurorrhaphy after getting better exposure by resecting part of the clavicle.

Solution:

64861	Repair, brachial plexus
23480-51	Osteotomy, clavicle, with or without internal fixation
69990	Use of operating microscope H

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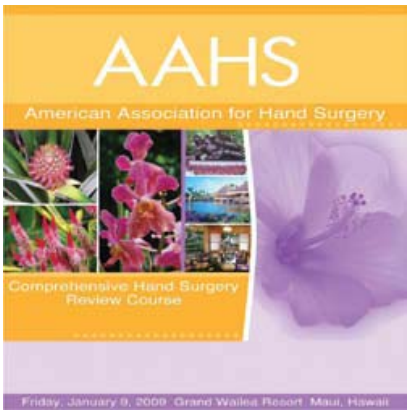

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Richard Berger, MD, PhD	berger.richard@mayo.edu	Wrist surgery
Kyle Bickel, MD	kbickel@sfhand.com	Vascularized bone graft reconstruction for carpal pathology; complex fracture management in the hand and wrist; and arthroscopic wrist ganlion excision
Allen Bishop, MD	bishop.allen@mayo.edu	Brachial plexus reconstruction; carpal vascularized bone grafts; and microvascular free tissue transfers
James Chang, MD	changhand@aol.com	Dupuytren's Contracture; thumb reconstruction; flexor tendon surgery; trapezial excision arthroplasty; and medial epicondylectomy
Kevin Chung, MD	kecchung@med.umich.edu	Rheumatoid and congenital
Tyson Cobb, MD	tycobb@mchsi.com	Endoscopic Cubital Tunnel Release
E. Gene Deune, MD	egdeune@jhmi.edu	Congenital hand anomalies; upper and lower extremity reconstruction for deficits due to trauma; cancer resecation; and neurological disorders (i.e. brachial plexus)
Scott H. Kozin, MD	SKOZIN@shrinenet.org	Pediatrics
Don Lalonde, MD	drdonlalonde@nb.aibn.com	Wide awake approach to hand surgery
W. P. Andrew Lee, MD	leewp@upmc.edu	Post traumatic hand reconstruction; mini incision carpal tunnel release
Susan Mackinnon, MD	mackinnons@wustl.edu	Ulnar nerve surgery
Nash Naam, MD	drnaam@handdocs.com	SLAC wrist reconstruction; vascularized bone graft in treating scaphoid nonunions; ulnar shortening & radial shortening; PIP & MP joint arthroplasty; LRTI; arthroscopy of the CMC joint of the thumb
Daniel J. Nagle, MD	OOGIEN@aol.com	Wrist arthroscopy; endoscopic carpal tunnel release
Michael Neumeister, MD	mneumeister@siumed.edu	Basilar joint arthroplasty; peripheral nerve decompression
Jorge Orbay, MD	jlorbay@aol.com	Wrist fractures
A. Lee Osterman, MD	loster51@bellatlantic.net	Advanced wrist arthroscopy and small joint arthroscopy. Can also mentor a topic such as DRUJ problems, or wrist fracture.
Julian J. Pribaz, MD	jpribaz@partners.org	Soft tissue reconstruction; microsurgical reconstruction; spare parts surgery and extremity reconstruction
Michael Raab, MD	mikeraab1@earthlink.net	Corrective osteotomy (volar or dorsal) of distal radius malunion with iliac crest bone grafting
Jaiyoung Ryu	jryu@adelphia.net	Wrist reconstruction; distal radius fracture; and scaphoid fracture/nonunion
David Slutsky, MD	d-slutsky@msn.com	Use of volar wrist portals for wrist arthroscopy and arthroscopic repair of dorsal radiocarpal ligament tears; nonbridging external fixation of intra-articular distal radius fractures; nerve conduction studies for hand surgeons; and comparison of NCS and PSSD for the diagnosis of CTS
William Swartz, MD	william.swartz@verizon.net	Tendon transfer and ulnar nerve
Thomas Tung, MD	tungt@wustl.edu	Brachial plexus and nerve transfers
Joseph Upton, MD	jupton3@earthlink.net	Congenital hand surgery
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