It’s In Our Hands: Common Needs and Goals

Since being installed as President of the American Association for Hand Surgery in January, 2004, the year has gone by so very quickly, which is largely the result of working so closely with many dedicated and gifted individuals in our organization. I cannot begin to tell you how impressed I am with the way that your Board of Directors and Central Office personnel are working together to advance the mission of this organization. We have just emerged from the midyear Board of Directors meeting, held July 9 and 10, 2004, in Dana Point, California, and are full of enthusiasm and initiatives for the remainder of the year and beyond. I want to keep all of you in the loop, so I will summarize just a few of the initiatives and events below.

Before the Board of Directors midyear meeting convened, we participated in the second consecutive Presidential Line Summit with the leadership of the American Society for Surgery of the Hand. In attendance for the half-day meeting were Susan MacKinnon, MD (President-Elect AAHS), Ronald Palmer, MD (Vice President AAHS), Roy Meals, MD (President ASSH), David Lichtman, MD (Vice-President ASSH), Laura Downes Leeper, CAE (Executive Director AAHS), Mark Anderson (Executive Director ASSH) and myself. The purpose of this meeting was to continue to address issues of common interest to members of both organizations and to continue to develop improved dialogue. On all accounts, this was a particularly positive meeting. We recognize that the future of hand surgery is dependent upon attracting new, young surgeons into the field. As such, we have established a Joint Task Force to explore ways in which practicing hand surgeons can interface with medical students early in their careers. Additionally, it was felt that public policy and position statements regarding current aspects of upper extremity care are most positively perceived if they are agreed upon by both groups. A means of coordinating these statements was established.

We also agreed to work together on evidence analysis issues, and to continue to develop educational venues together. Finally, we agreed to keep meeting each summer to continue this beneficial tradition of cooperation and resource sharing.

The Board of Directors’ meeting served to confirm that our organization is thriving, with solid financial backing and a strong membership. We must, however, continue to find ways of getting the good word about our organization out to hand care professionals, to let them know what a great opportunity membership in the AAHS brings, and to facilitate their entry into membership. It is clear that the AAHS is recognized as an important organization representing the full cross-section of hand care professionals. Our input and participation in strategic planning for both the American Society of Plastic Surgeons and the American Summit with the leadership of the American Society for Surgery of the Hand. In attendance for the half-day meeting were Susan MacKinnon, MD (President-Elect AAHS), Ronald Palmer, MD (Vice President AAHS), Roy Meals, MD (President ASSH), David Lichtman, MD (Vice-President ASSH), Laura Downes Leeper, CAE (Executive Director AAHS), Mark Anderson (Executive Director ASSH) and myself. The purpose of this meeting was to continue to address issues of common interest to members of both organizations and to continue to develop improved dialogue. On all accounts, this was a particularly positive meeting. We recognize that the future of hand surgery is dependent upon attracting new, young surgeons into the field. As such, we have established a Joint Task Force to explore ways in which practicing hand surgeons can interface with medical students early in their careers. Additionally, it was felt that public policy and position statements regarding current aspects of upper extremity care are most positively perceived if they are agreed upon by both groups. A means of coordinating these statements was established.

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Michael and Me

‘A zeal for different opinions concerning religion, concerning government, the various and unequal distribution of property, and ambitious leaders contending for pre-eminence and power have divided us, inflamed us, and rendered us much more disposed to vex and oppress each other than to co-operate for our common good. The apportionment of taxes seems to require the most exact impartiality; yet there is, perhaps, no legislative act in which greater opportunity and temptation are given to the predominant party to trample on the rules of justice.’

In this political season, the above paragraph seems not only timely, but also uncommonly accurate. It must be referring to abortion, gay marriage, and tax cuts for the wealthy. A recent New York Times editorial perhaps? From politically motivated movies on the left to politically motivated talk radio on the right, surely this must be the bitterest and most partisan presidential campaign in U.S. history? Politics today is so fractious, so driven by special interests, that any decent person can only be disgusted by the spectacle, and long for the good old days, right?

Actually, no. The city of publication is right, but the dates are a bit off. The words are taken from Federalist paper number 10, written by James Madison, and published in the New York Packet in 1787. Madison saw then, as we must today, that the contention of many factions in political debate is not only inevitable, but it is necessary to the proper function of our republic. Too few factions, and a dominating group may impose its will on the minority; too many, and consistent policy becomes impossible. The trick is to get the right balance, between too many voices and too few; between representatives too close to their constituents and too remote. No form of government is always perfect or always wise. Yet, all in all, we don’t do too badly in the US. As Churchill put it, ours is “the worst form of government, except for all those other forms that have been tried from time to time.”

If you believe that Churchill and Madison were on to something (rather than up to something, as you no doubt suspect of whoever it is the other fellow is voting for), as I do, then it should follow that we embrace that peculiar form of loosely controlled mayhem we call the political campaign season. Don’t tune out the partisan ranting/speaking truth to power (as you prefer) of a Michael Moore or a Michael Savage. Join the debate. Support YOUR faction. Physicians have a lot to get excited about: health care financing at the state and federal level; working with government to improve the quality of medical practice; public health policies on the environment, smoking, communicable diseases, and medical research; and the treatment of global epidemics of AIDS, malaria, and the myriad diseases associated with malnutrition and poor sanitation. Not to mention the issues that affect every citizen: taxation, the economy, national defense, and global terrorism. If you’ve got a pulse, at least one of those issues has got to set your heart pounding.

And you can make a difference. First, by voting. Let me do some political math. Only about 70% of eligible voters bother to register. Of those, maybe 60% will vote this year. Just by showing up at the polls you’re going to have more influence on the process than half the potential electorate. Second, by putting your money where your mouth is. Like a candidate? Give them some money, so they can spread the word. Yet, very few people do—in most districts, only one or two percent of the electorate will bother to contribute to a campaign. Too many candidates to choose from? Then give to a political action committee that shares your ideals.

Want to go farther? Work for a candidate. Walk a neighborhood, get out the vote, march in parades. It’s a good way to get to know your local candidate better. Who knows? Next time that person has a thorny medical issue to consider, maybe they’ll even remember that nice doctor who worked so hard on the campaign, and give you a call. It couldn’t hurt.

Been there, done that, as they say. This year, I’ve gone a little overboard. I’m managing a local political campaign. It’s been a great experience (of course, even better if we win in November!). I’m no Svengali or Machiavelli, plotting crafty political strategies in smoky back rooms. The issues, I leave to the candidate. She’s the one who has to live with them. Mostly, I organize who goes where, and when, and keep a core group of volunteers motivated and on schedule. It takes about as much time as a three round a week golfer might spend on the links. I do my job, and count on my candidate to do hers, and trust, as all political campaigns ultimately must, in the wisdom of the voters. They’ve mostly done a pretty good job, these last 220 years. I don’t expect them to change habits now. And if you’re ever in town and want to talk politics, look me up.
FROM THE PRESIDENT
continued from page 1

Academy of Orthopaedic Surgeons has been sought, and we are participating in these processes. We are continuing to work closely with the American Society of Reconstructive Microsurgery and the American Society for Peripheral Nerve in our common goals. Finally, the closing session of the Board of Directors meeting was dedicated to a strategic planning session, where we focused on membership and educational issues, with a commitment to developing a strategic plan with continuity of purpose in mind. Overall, the Board of Directors meeting served as an energizer for continuing to improve the benefits to our members and to improve the working relations, and thus effectiveness, with other organizations.

Speaking of relationships with other hand care professional organizations, our involvement with the international hand surgery community was highlighted in a most successful manner with the Post-IFSSH Congress held in June, 2004 in Bucharest, Romania. This event was co-sponsored by the Romanian Society for Surgery of the Hand and the AAHS, and spanned three days after the IFSSH meeting in Budapest. It was co-chaired by

WE MUST CONTINUE TO FIND WAYS OF GETTING THE GOOD WORD ABOUT OUR ORGANIZATION OUT TO HAND CARE PROFESSIONALS, TO LET THEM KNOW WHAT A GREAT OPPORTUNITY MEMBERSHIP IN THE AAHS BRINGS, AND TO FACILITATE THEIR ENTRY INTO MEMBERSHIP.

Alexandru (Dan) Georgescu, MD (RSSH) and Jai-Young Ryu, MD (AAHS). Over 250 hand surgeons from around the world participated in this event, and it felt to be a success in all regards from everyone that participated. Most importantly, a precious relationship between the members of the RSSH and the AAHS was forged which will carry forward far into the future.

Among the upcoming activities that were approved at the Board of Directors meeting is a multilevel course on “Disorders of the Brachial Plexus.” This CME venue will be held in 2006 in Rochester, MN, and will feature experts in brachial plexus disorders from around the world presenting their experiences in both didactic and practical laboratory sessions. Please keep your eye out for this important course. Plans for the Annual Meeting in January, 2005, in Fajardo, Puerto Rico, were also reviewed. As you know, Scott Kozin, MD is the Program Chair, and he and the Program Committee are working very hard to make this the best meeting possible. In addition to the traditional plenary sessions, poster presentations and instructional courses, Peter Murray, MD is developing a recertification review course, we are adding bioskills courses, and Gail Groth, OTR/L, CHT, MHS is chairing a hands-on full-day plenary session focusing on outcomes assessment, an incredibly important and timely topic. We will have two invited lectures, which you will want to bring your family and friends to. The first is by Gavin Menzies, author of “1421: The Year the Chinese Discovered America” who will provide a riveting presentation that has posed serious questions about the early maritime discoveries that shaped our modern world. Terry Whipple, MD has agreed to share with us his profound and moving perspective on the balance of risk and benefit as it applies to the human experience—you will not want to miss this! To top this off, we have developed a social program that we are confident that you, your guests and your families will love.

The list of AAHS activities currently in play could go on and on. I just wanted to convey to you what a dynamic and active group we are, and how the future of this organization is in your hands. We represent a major aspect of the future of hand care. As I have emphasized before, it doesn’t happen by chance. It takes input and involvement. There are plenty of opportunities for you to be involved—just let us know how we can facilitate it. In the meantime, start marking your calendars for January 12-15, 2005 for the AAHS Annual Meeting in Fajardo, Puerto Rico.
AAHS 35th Annual Meeting
January 12-15, 2004
Wyndham El Conquistador Resort & Golden Door Spa
Fajardo, Puerto Rico

AAHS
Wednesday, January 12, 2005
7:30–8:30am Continental Breakfast
8:00–2:40pm Hand Therapy Day
8:00–8:05am President’s Welcome
Richard Berger, MD
8:05–8:15am This Morning in Our Hands
Gail Groth, MHS, OTR, CHT
8:15–8:45am “Two-Handed” Approach to Outcomes
Dorothy Edwards, PhD
8:45–9:15am Outcome Measures: Self-Report vs. Performance
Joy MacDermid, PhD, PT
9:15–9:45am Outcome Measures: Disease-Specific vs. Global
Peter Amadio, MD
9:45–10:45am Outcomes in Your Hands (Rotating Discussion Sessions with Measures)
Rebecca von der Heyde, MS, OTR/L, CHT, Coordinator
Arian Wolff, OTR/L, CHT
Maureen Ashe, PT, CHT
10:45–11:00am Break
11:00–11:30am How to Know if your Patient is Better
Mary Watkins, DPT, MS
11:30–12:00am What About my Patients: Outcomes in Daily Practice
Sue Michlovitz, PhD, PT, CHT
12:00–12:05pm This Afternoon in Our Hands
Gail Groth, MHS, OTR, CHT
12:05–1:00pm Lunch
Oboe Music provided by Allen Bishop, MD

1:00–2:15pm Panel of Professors: Outcomes in Your Hands
Gail Groth, MHS, OTR, CHT, Moderator
Peter Amadio, MD
Rebecca von der Heyde, MS, OTR/L, CHT
Joy MacDermid, PhD, PT
Dorothy Edwards, PhD
Sue Michlovitz, PhD, PT, CHT
Mary Watkins, DPT, MS

2:15–2:25pm The Future in our Hands
Joy MacDermid, PhD, PT

2:25–2:30pm Closing Comments
Gail Groth, MHS, OTR, CHT

2:30–2:40pm Vargas Award Lecture
Sharon Durlst, OTR

3:00–5:15pm Bioskills Workshops
1. Reconstruction
BW101 Uncemented Pyrocarbon MCP/PIP Joint System
Facility: Robert D. Beckenbaugh, MD
BW102 Universal2 Total Wrist Implant Arthroplasty
Facility: Brian D. Adam, MD
BW103 Implant Arthroplasty of the Distal Ulnar Head
Facility: Richard Berger, MD, PhD

4:15–5:15pm 2. Trauma
BW104 “Fixed Angle Fixation” of Distal Radius Fractures
Utilizing the Volar Approach
Facility: Jorge L. Orby, MD
BW105 Scaphoid Fractures and Non-Unions in 2005
Facility: Randy Bindra, MD and Joseph L. Slade, III, MD

6:00–7:00pm AAHS Welcome Reception

AAHS Thursday, January 13, 2005
7:30–8:30am Continental Breakfast
8:00–9:00am Instructional Courses

101 Tendon Transfer
Reid Abrams, MD, Moderator
Richard Lieber, PhD

102 Diagnosis and Management of Hand Infections: Current Status
Stephen Schnall, MD, Moderator
Mark Gonzalez, MD
Paul Helsom, MD

103 Money Management for Residents and Young Doctors: What Every Physician Should Know
Jeff Palm, Smith Barney
Patrick Donnelly, Smith Barney

104 Fractures of the Proximal Phalanges
Alan Freeland, MD, Moderator
Maureen Hardy, PT, MS, CHT

105 Rheumatoid Hand—Reconstruction with Arthroplasties of the Wrist, Thumb, MCP and PIP
Robert Beckenbaugh, MD, Moderator

106 Getting Your Practice Started
Jeffrey King, MD
Jose Ortiz, MD
Steven M. Meltiou, MD

9:00–9:15am President/Program Chair Welcome
Richard Berger, MD, PhD, AAHS President
Scott Kozin, MD, AAHS Program Chair

9:15–10:15am Panel: Bridging the Gap: Nerve
Susan Mackinnon, MD, Moderator
Thomas Tung, MD
Linda Douli, MD
Dean Sotereanos, MD
Allen Van Beek, MD

10:15–10:30am Break
11:00–11:15am Adrenaline in Hand and Finger Surgery: Problem or Solution
Donald Lalonde, MD

11:15–12:30pm Concurrent Scientific Paper Session
12:30–12:40pm Box Lunch
12:40–12:50pm Presidential Address
Richard Berger, MD, PhD

12:50–1:45pm Panel: Bridging the Gap—Scaphoid
Alexander Shin, MD, Moderator
Allen T. Bishop, MD
Andrew P. Gutow, MD

1:00–4:00pm Computerized Instructional Courses

1:00–4:00pm Comprehensive Hand Surgery Review Course
Peter Murray, MD
1:50–2:30pm Keynote Speaker: Terry L. Whipple, MD, FACS
   “Courage, Wisdom & Risk”

2:00–4:00pm High Field Dedicated MRI: The New Practice Standard?
   Faculty: Manish Patel, MD and Joel Newman, MD

AAHS
Friday, January 14, 2005

7:00–8:00am Annual Business Meeting Breakfast
   Attendance is limited to members only

8:00–9:00am Instructional Courses
107 Arthritis of the Wrist
   Günter Germann, MD, PhD, Moderator
108 Arthritis of the Basilar Joint of the Thumb—What’s New?
   Robert J.Strauch, MD, Moderator
   Alejandro Badia, MD
   Matt Tomaino, MD
109 Complications and Their Management
   A. Lee Osterman, MD, FACS, Moderator
   John Taras, MD
110 Pediatric Hand Trauma
   Michael Bednar, MD, Moderator
   Terry Light, MD
   Scott Kozin, MD
111 Reconstruction of the Burned Hand in Adults and Children
   Roger Simpson, MD, Moderator
   Bruce Brewer, MD
112 Update on Thumb Reconstruction
   Neil Ford Jones, MD, Moderator

8:00–4:00pm Computerized Instructional Courses

9:00–11:00am ASPN Council Meeting

9:00–10:00am Joseph Danyo
   Presidential Lecturer: Gavin Menzies
   “1421: A Historical Detective Story”

10:00–10:10am ASSH Presidential Address
   Roy A. Meals, MD

10:10–10:15am IFSSH Presentation
10:15–11:00am Break With Exhibitors

11:00–12:00pm Panel: Bridging the Gap: Tendon
   John Taras, MD, Moderator
   Milan Stevanovic, MD
   Pam Steelman, CRNP, PT, CHT

12:00–2:00pm Concurrent Scientific Paper Session

12:00–2:00pm ASRM Strategic Planning

2:00–4:00pm ASRM Council Meeting

6:30–10:30pm AAHS Art Explosion Dinner Dance

AAHS/ASRM/ASPN Combined Day Program
Saturday, January 15, 2005

6:00–7:30am Continental Breakfast/Exhibits Open

6:30–7:30 am Instructional Courses
201 Nerve Transfers
   Thomas Tang, MD
   Christine Nvovk, PT/MS
202 RSD
   Keith Bengtson, MD
   James Campbell, MD
   Jose Monsivais, MD
203 Management of Brachial Plexus Lesions: The State of the Art and a Glimpse of the Future
   Rajiv Midha, MD, MSc, FRCS(C)
   Robert Spinner, MD
204 Nerve Compression Injuries of the Upper Extremity
   A. Lee Dellon, MD
   Christopher T. Maloney Jr., MD
   Ramon A. DeJesus, MD
205 Neurotized Free Flaps
   Allen Bishop, MD
   Allen Van Beek, MD
   David Chuei-Chin Chauing, MD
206 The Most Common Investment Mistakes Physicians Make and How to Avoid Them
   Jeff Palmer, Smith Barney
   Patrick Donnelly, Smith Barney

7:30–7:40am Presidents’ Welcome
   Richard Berger, MD, PhD, AAHS President
   Robert L. Walton, Jr., MD, FACS, ASRM President
   Steven McCabe, MD, ASPN President

7:40–7:50am Presidents’ Invited Lecturer: Thomas J. Krizek, MD
   “Everything I Learned About Ethics I Learned from Sport”

8:00–4:30pm ASRM Master Series in Microsurgery
12:15–12:30 Introduction
   Greg Evans, MD
12:30–1:00 S-GAP/Inferior Gludial Flap
   Philip Blondeel, MD
1:00–1:15 Discussion
1:15–1:45 DIEP/SIEF
   Robert Allen, MD
1:45–2:00 Discussion
2:00–2:30 Fibula
   Fu Chun Wei, MD
2:30–2:45 Discussion
2:45–3:15 ALT
   Robert Walton, MD
3:15–3:30 Discussion
3:30–4:00 Gracilis Flap
   Milomir Ninkovic, MD
4:00–4:15 Discussion
4:15–4:30 Conclusion
   Greg Evans, MD

1:00–4:30pm ASPN Meeting Resumes

5:30–7:30pm AAHS/ASRM/ASPN Art Auction & Exhibit Reception

7:50–9:00am Panel: Restoration of Motor Function Following Muscle Loss
   Robert Walton, MD, Moderator
   Milan Stevanovic, MD
   William Kuzon, Jr., MD, PhD
   Dimitri Anastakis, MD

9:05–9:50am Presidents’ Invited Lecturer: Thomas J. Krizek, MD
   “Everything I Learned About Ethics I Learned from Sport”

9:40–10:15am Break with Exhibitors

10:15–11:15am Outstanding Nerve Paper Presentations

11:30am 9th Annual Day at the Links

12:00–4:30pm ASRM Master Series in Microsurgery
12:15–12:30 Introduction
   Greg Evans, MD
12:30–1:00 S-GAP/Inferior Gludial Flap
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Hand Surgery Quarterly
Autumn 2004

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Mary Lynn Brown, MD
Junior Director at Large

Mary Lynn Brown, MD was elected to the Board of Directors as Junior Member at Large in 2004. She is the first second-generation board member, having followed her father, Dr. Forst E. Brown. “Together, we represent a merger of hand surgery interests as exemplified by the membership of the AAHS, which is composed of plastic and orthopaedic hand surgeons.” She served as the Membership Chairman from 2000-2003 and is chairman of the Publicity Task Force, a joint project with the ASSH. She edits the quarterly “Around the Hand Table” discussion.

Dr. Brown attended college at Duke University, followed by Dartmouth Medical School. She stayed on at Dartmouth for the General Surgery portion of her residency before moving to the University of Pittsburgh for her Orthopaedic Residency. Next, it was on to the Mayo Clinic where she completed her hand surgery fellowship. Forsaking the cold Minnesota winters, Dr. Brown and her husband, a neuroradiologist, moved to Orlando, Florida, where she has been practicing hand surgery in a large sub specialized orthopaedic group since 1990.

Although she is in private practice, Dr. Brown still participates in training the orthopaedic residents at Orlando Regional Medical Center. Five years ago, she was asked to audition for the local ABC Network affiliate as their on-camera physician. Soon after, Dr. Brown appeared on television three evenings a week, discussing medical topics ranging from the latest treatment for glaucoma to hepatitis from manicure instruments, to yes, even endoscopic carpal tunnel release. “Although I wouldn’t want to be a newscaster full time, and the thought now of breaking news makes me cringe, it was an unbelievable experience. I think the aspect of television I enjoyed was the ability to reach thousands of people all at once, especially in a market as large as Orlando. And, despite all the negative publicity about physicians, most people truly listen when a physician is talking on television, rather than a newscaster talking about medicine.”

One of the by-products of her television experience is an interest in osteoporosis. Since quitting the television world two years ago, she has turned a half-day a week of her hand practice into running an osteoporosis clinic. She is now following over 400 patients.

Dr. Brown and her husband, Dr. Larry Sadler have two daughters, Madison, 10 and Mackenzie, 9. Most of her time outside of medicine is spent with her family or participating in sports such as running, swimming and triathlons.

**Orthopedic Hand Surgeon:**

Norwich Orthopedic Group, PC is a premier orthopedic & physiatry group with physical therapy services in Eastern Connecticut. Located close to Long Island Sound and easily accessible to major metropolitan areas in New York and Boston as well as beautiful coastal living available. An excellent opportunity exists for a fellowship trained and Board Certified/eligible Hand Surgeon. The successful candidate will have a large patient catchment area. Partnership is available at 2 years. Limited call coverage (1:8). The group is currently constructing a new medical facility. Attractive financial and benefit package.

Direct curriculum vitae to

Norwich Orthopedic Group, PC
Attention: Joan R. Dill, Administrator
2 Clinic Drive
Norwich, CT 06360

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**Denver/Boulder Colorado Orthopedic Surgeon:** The Colorado Permanente Medical Group is actively searching a BE/BC Orthopedic Surgeon to join an existing 19-physician practice to relocate to our new Boulder County facility in 2005. We are seeking candidates with hand surgery experience and/or hand surgery fellowship.

- Great call schedule.
- Competitive salary/excellent benefits.
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Office Phone: 303-344-7838, or Toll Free at 866-239-1677
Fax: 303-344-7818, or Email: eileen.t.jones-charlett@kp.org
Nerve Repair: Do You Tube?

The moderator for this discussion is A. Lee Dellon, MD, Professor of Plastic Surgery and Neurosurgery at Johns Hopkins University in Baltimore, and a Clinical Professor of Plastic Surgery, Neurosurgery, and Anatomy at the University of Arizona, Tucson, Arizona, and Director of the Dellon Institutes for Peripheral Nerve Surgery™ (disclosure statement on page 16). Joining him in the discussion are Julia Terzis, MD, PhD, Professor of Surgery, Division of Plastic and Reconstructive Surgery, Eastern Virginia Medical School, Microsurgical Research Center, Norfolk, Virginia, and Dean Sotereanos, MD, Vice Chairman, Department of Orthopaedic Surgery, Professor, Drexel University, Pittsburgh, Pennsylvania.

Dr. Dellon: Dr. Terzis, as our international historian and neuroscientist on the peripheral nerve, would you give us your perspective on the neurobiology of nerve conduits with respect to traditional nerve repair and nerve grafting?

Dr. Terzis: The use of silicon tubes for nerve repairs was introduced some twenty years ago by Goran Lundborg as an experimental model to study nerve regeneration. The tube concept was based on the assumption that nerve regeneration would be favored if the surgical trauma was minimized. A short gap between the nerve ends inside the closed tube system would allow accumulation of the neurotrophic factors that are normally synthesized in a nerve after trauma.

Various modifications, which can alter the regeneration potential by filling, for example, the chamber with laminin and/or fibronectin or filling the tubes with Schwann cells, have proved useful. Biodegradable tubes of various substances (i.e. polyglycolic acid) as well as collagen tubes have been tried.

For short distances, we can expect that the peripheral nervous system is able to elongate and axons migrate from the proximal nerve segment. Clinically, my experience is limited to two cases, both infants, where I used venous conduits and filled them with Schwann cells obtained from chopped up nerve. This has worked beautifully.

Dr. Dellon: Historically, basic research laboratories began using silicone tubes to investigate nerve regeneration across small gaps.

They began to identify, especially in Boston with Sidman’s group, that they could recognize neurotrophic factors in the tube and begin to look at how nerves sprout in a controlled environment.

Goran Lundborg helped us to show that nerves were smarter than we thought they were. He brought to us the silicone chamber model where a nerve could be put at one end and a nerve at a diagonal opposite end of a rectangle and the nerve would grow and find its opposite end.

During the period of time when Susan Mackinnon was a hand fellow with us in Baltimore we had a primate model that we knew would have a 3 centimeter gap in monkeys. And so we began to use Goran’s other approach, a vascularized pseudosynovial sheath, and we put ulnar nerves at the elbow in monkeys at either end of a 3 cm gap, never believing it would work, and at seven months we had a compound action potential. This work began with the realization that maybe primates could be as good as rats. We showed that a 3 cm gap model in primates’ nerves could actually regenerate with a bioabsorbable polyglycolic acid conduit.

This gave us the possibility to move from the silicone tube in the laboratory to longer bioabsorbable conduits as an approach for nerve reconstruction.

Dr. Sotereanos, perhaps you could share with us your first approach to attempting to reconstruct nerve gaps with conduits.

Dr. Sotereanos: Surgical techniques. I believe the key issue is why is functional restitution not occurring despite optimal surgical techniques? Goran Lundborg said that the secret of nerve repair was more than just the needle, the suture and microscope. He was the first to point out regenerative processes require strong humeral as well as cellular influences which led us to neurotrophism. Neurotrophism means that a nerve will regenerate preferentially towards a nerve with an intact distal receptor as compared to other tissue. This brings us to the growth factor stage which is supplied by target organs. An anabolic process occurs within the cell body and there is to be growth factors that promote this anabolic and regenerative activity from the soma, via retrograde axonal transport as Tom Brushart has shown. I think that the future will be brighter with these conduits than it has been in the past your classic nerve repair in a multi-fascicular nerve is that 50% to 60% of that nerve will be epineurium and not nerve structure.
In Two Infants, I Have Used Venous Conduits and Filled Them with Schwann Cells Obtained from Chopped Up Nerve, With Beautiful Motor Restoration.

Julia Terzis, MD, PhD

Dr. Dellon: I'm glad you mentioned Tom Brushart. Tom Brushart started in Massachusetts with the Harvard Group and he worked with Sidman's group in the early years and became quite interested in this work with tubes. Why would nerves not grow more than 10mm in a silicone tube model in rats but we could get it to grow 3cm in a primate? Part of the answer, I think, is that the silicone tubes are impermeable and oxygen does not get through. And that gets us down to the concept of how should you design a conduit that would be ideal in structure to permit nerve regeneration? One thing that we probably should agree upon is allowing oxygen to get into the environment for the growing nerves. Adding oxygen allowed primates to regenerate 3 times farther than rats. So the first thing is that the tubes in some fashion have to allow oxygen to get through to the sprouts. Dr. Terzis, what kind of environment do sprouts like to permit nerve regeneration?

Dr. Terzis: Well, you need a matrix which will serve as a growth terrain for regenerating sprouts. So you need, in addition to axoplasm, cytoskeleton substances, such as fibronectin and laminin, to be present. Also needed are growth factors, which are not only secreted by the denervated target, but also by the satellite “nursing” cells, namely, the Schwann cells. And I believe there will come a time that to be successful in neuroengineering you will need Schwann cells to accomplish long distance “travel” by regenerating axons. If the distances are long, the influence of the substances secreted by the denervated target would be much weaker, thus, you will need to “nourish” the growing sprouts with Schwann cell “seeding” of the tube you chose to use.

Dr. Dellon: Looking at what you said about factors within the tube that might inhibit nerve growth, the group in San Diego, with Varon and Gelberman, demonstrated that clotted blood inhibited or prevented axon sprouts from crossing the silicone conduit. However, serum or heparinized saline was a suitable environment. They felt that leaving clotted blood within a tube would be bad. That finding gets us back to some of the technical aspects of actually using tubes: slowing the tourniquet down, making sure there’s no bleeding from the end of a nerve into a tube, and then using either serum or heparinized saline to fill the tube. So what kind of things might happen that would prevent nerves regenerating through a conduit of some kind? Are there things that you think about when you want to prepare your ideal tube?

Dr. Sotereanos: Well, I think that brings us back to tissue engineering again. Initially, we started off using muscle fibers and vein grafts as conduits. The problem with those conduits was that they were not strong enough to support scarring from the outside; they collapsed. And that was a structural problem with those types of tubes. That led us to some of the more rigid types of tube, such as silicone. But we know that silicone actually can create scarring, which is not an optimal way to proceed either. You mentioned blood clotting; I think that all techniques emphasize that the tourniquet be let down, and bleeding be meticulously cauterized so there’s no bleeding from the epineurium prior to entubulating that nerve. The future will hold various diameter tubes that are rigid enough to prevent scarring growth yet not so impermeable that there cannot be diffusion of molecules and oxygen through that tube to support the growing axon.

Dr. Dellon: Dr. Terzis, you mentioned that you have used veins. If you use a vein as a conduit, there’s a possibility that the soft vein may collapse. What do you think? Do axon sprouts have enough force to push open a collapsed vein, for example?

Dr. Terzis: I have experience with two clinical cases. The first case was a newborn that had vestigial remnants of sural nerves bilaterally. Thus, I was at a loss as to how to reconstruct the upper obstetrical brachial plexus lesion. Not having available nerve graft material, I “chopped” up whatever remnants of sural nerves were there, mixed with heparinized saline, and filled the lesser saphenous veins with this and thus placed 3.5cm “venous” grafts instead of nerve grafts to achieve distal target reinnervation. The child has incredibly excellent functional results.

Dr. Dellon: Were you concerned at all about the vein collapsing?

Dr. Terzis: To avoid collapse, because the vein was actually in the sural nerve harvest site, I took remnants of the sural nerve mixed with heparinized saline and placed them into the lumen of the vein, thus providing Schwann cells for the regenerating axons. The muscle targets showed full electrogenesis and excellent function.

Dr. Dellon: That’s such an important contribution: that’s very, very important because you said two very different but critical things. First, you did something to prevent the vein from collapsing. For example, the Neurotube™ is corrugated to prevent it from collapsing. And second, Berish Strauch’s group has shown that veins up to 3cm will do well. Since you used 3.5cm, you helped it by providing Schwann cells. Did you grow Schwann cells?

Dr. Terzis: No.

Dr. Dellon: You used a separate piece of nerve that’s for manufacturing nerve growth factor, both to hold open the nerve and to provide a source of growth factor, right?
Dr. Terzis: Right.

Dr. Dellon: Dr. Sotereanos, you have had experience with a collagen tube as a conduit. When you wet the collagen tube so that the needle can go through it, does that collagen tube maintain its integrity pretty well when the soft tissues get closed over? Or does it become soft as a vein? How would you describe what happens to it?

Dr. Sotereanos: Actually I was concerned about the opposite, since the collagen tube is somewhat rigid even after you wet it. We did a case recently where we did one on a common digital nerve in the palm. It was about a 3 to 4cm defect and I was concerned that the patient wouldn’t like the palpable rigidity of that tube as opposed to it collapsing. Actually she never noticed the tube. She was a 26 year old female who I did over a year ago and she ended up with 2 point discrimination of about 8mm for a 3 to 4cm gap.

Dr. Dellon: Dr. Sotereanos, is it correct that so far there’s still no published study using the collagen tube in humans?

Dr. Sotereanos: Right, I’m not aware of any published study. I know they’ve been using it in Europe quite a bit. But I’m not aware of any series out yet here.

Dr. Terzis: What happens to the collagen afterwards?

Dr. Sotereanos: The collagen eventually resorbs. Somewhere between six months and a year and a half to two years, it begins to resorb.

Dr. Terzis: What type of collagen is it? Bovine?

Dr. Sotereanos: I’m not exactly sure what type of collagen.

Dr. Terzis: So is it compatible for use in humans?

Dr. Sotereanos: Supposedly there is not an immunologic reaction to it, nor is there a big immunologic reaction to polyglycolic acid as used in the Neuragen™.

Dr. Dellon: I’d just like to make one comment. When collagen came out as the most purified form which used to be called Zyderm, plastic surgeons were using it to inject people’s faces to fill out little wrinkles. The fact is, it is a foreign protein and the company then said that there would be less than 2% immune reactivity. But if you ask the audience at the cosmetic surgery meetings, about 20% of the people said their patients actually had an inflammatory response to the collagen.

Dr. Terzis: Right.

Dr. Dellon: 20% response to even this so called purified foreign protein. Polyglycolic acid, which is an amino acid and a sugar, is hydrolyzed. Dr. Terzis, as a neuroscientist, how does the body actually remove a foreign collagen protein and what effect will this inflammatory reaction have on axon sprouts trying to go through this area of inflammation?

Dr. Terzis: This is why I have not used the collagen tube. To me, the idea of using foreign tissue, even if it is absorbable, is of some concern. In my various travels, I have heard so many times about granulomas forming with the different types of fillers that have been used, especially for rejuvenation purposes. This is why I was interested in the fate of foreign collagen around a nerve. However, I don’t have the same concern about some blood being next to a nerve repair; as a matter of fact, I have used the bleeding that I get from nerve end preparation to obtain a fibrin clot which I don’t consider non-permissive to axonal growth.

Dr. Dellon: Dr. Sotereanos, how are you doing with your collagen tubes?

Dr. Sotereanos: Well, first of all, I don’t just use collagen tube; I use both the Neuragen™ and the collagen tube is the Neuragen™.

Dr. Dellon: I don’t have any great preference of one to the other. But the results, at least anecdotally, in my experience, have been better than primary nerve grafting. And one must also remember the morbidity of harvesting a medial ANA brachial cutaneous nerve or a sural nerve. I think the future probably won’t be polyglycolic acid or collagen. Within the biosciences we’ll find something even better and more innovative.

Dr. Dellon: I once wrote sort of a silly little paper, entitling it “Nerve Resection, a Neglected Surgical Technique”. As we all know, you have to cut back the damaged ends of the nerve to get a good nerve repair. Dr. Terzis, if you have a nerve that’s injured by glass, how far does the zone of injury go? Is it one or two millimeters? Can we tell in the operating room? And if we don’t know, is it better to resect a significant amount and close with a conduit rather than do a standard primary repair?

Dr. Terzis: I think glass laceration is different than a saw injury because with the saw injury, the extent of the injury will be much greater than with a clean cut by glass. So in a glass laceration, if it looks good under the microscope, I’ll try to do an epineurial repair, which means in my hands that I’ll try to bring together corresponding fascicular groups, and after some proximal and distal mobilization, one can achieve a tension-free repair. So if the nerve is perfectly cut, you shouldn’t need to take more than one millimeter from each end and with some mobilization, you should
be able to accomplish a decent end-to-end repair.

Dr. Dellon: Now let me just say something. Larry Zachary, who’s at the University of Chicago now and he was our Hand Fellow in Baltimore, and I took a rat sciatic nerve model and we cut it with a saw, like a cast cutter saw and we wrapped a 3.0 silk around it and with a fishing weight and dropped it off the table to simulate an avulsion model. What we showed was that you could not identify the zone of injury when you looked at it right away. Not even in 48 hours. But, at three weeks, you could see the zone of injury and scarring in the nerve and whether avulsion often went up to the sciatic notch in the rats.

So if you do decide you have an opportunity for an acute repair of an injured nerve and you have some idea of the mechanism of injury, we need to think that it may be more than just a few millimeters and stitching it back together will cause scar tissue to be repaired under tension. That’s a situation where there is a role today for conduits in the acute repair of nerves.

Dr. Sotereanos: Dr. Dellon, the problem with a lot of these patients is that they end up with significant flexion contractures after these repairs, especially in those with tendon injuries as well as nerve injuries. And often times they’re hard to mobilize back into extension. With the use of a conduit you’re not so worried about keeping the wrist flexed to enable nerve healing and you can keep the wrist at least neutral, possibly even some extension. And that also enhances post-operative rehabilitation.

Dr. Dellon: Dr. Sotereanos, tell us what you would recommend as an ideal rehabilitation protocol with nerve reconstruction with a conduit alone, and then nerve reconstruction with tendon injuries, let’s say, at the wrist, as opposed to a finger.

Dr. Sotereanos: With the conduit there won’t be as much tension on the nerve repair. And depending on my tendon repairs, I would opt not to do traditional splinting for four to six weeks. If I have a conduit, I’ll use an extension block splint at about 20 degrees. If I’m comfortable with my tendon repairs, I will let them start extending between three and four weeks. I think that will enhance outcome, providing you have good tendon repairs and you’re not worried about tension on that nerve.

Dr. Dellon: I would agree with you. Now, our recommendation for the nerve in a Neuroute is to put it 5mm inside the conduit, and I suppose the same thing has been recommended for the collagen tube. Dr. Terzis, once the nerve is cut, how long does it take for it to sprout and grow?

Dr. Terzis: We looked at this with Okajima from the Kyoto Brain Institute using an end-to-side model in the rat, and found that in 4 hours from the time of injury, there appears bulging in the proximal internodes. The nerve responds very early, and the regenerating sprouts start 3 to 4 internodes more proximally from the site of the cut. The earliest we have looked at this with transmission electron microscopy has been 4 hours, and saw the sprouts start forming.

Dr. Sotereanos: That’s truly amazing.

Dr. Terzis: And if we can stop scarring at the nerve repair site, the whole field of nerve repair will take a huge jump forwards.

Dr. Sotereanos: Yes, I think that the state of nerve repair has not really changed much since the early 70’s when Hanno Millesi did all of his great research. We’re finally speaking now about the science of nerve repair and neurotrophism and actually improving on the work of Dr. Millesi.

Dr. Dellon: So then by two weeks, we think there’s probably nerves that are two or three millimeters past the 5mm, we put them in the tube and it’s not likely they should pull out. Unless something really drastic suddenly happens, neither end of the nerve should pull out of the tube.

Dr. Terzis, when would you ever consider using a tube with a nerve injury or defect?

Dr. Terzis: To me it will make sense to use a tube in a case of a superificial radial nerve injury which is very prone to hyperalgesia and paresthesias. If that person has a history of pain, I would be definitely hesitant to sacrifice another sensory nerve to do an interposition nerve graft, as he is likely to have another site of pain. So in that case it’s an excellent indication for connecting the two ends with a tube.

Dr. Dellon: In terms of looking at evidence-based results, we’re beginning to look at these issues. In the year 2000, a randomized five center study reported the results of a prospective randomized study of nerve repair. They looked at small gaps less than 4mm all the way up to gaps of 3cm. The study showed that for small defects or large defects, there were statistically significantly better results in terms of two point discrimination and excellent results for sensory nerves in the hand when the Neurotube was used instead of traditional nerve primary repair or grafts.

Dr. Terzis: What distances?

Dr. Dellon: The distance ranged from perhaps 1mm or 2mm, which would essentially be available, or 4mm for primary repair, up to 30mm.

Dr. Sotereanos: Dr. Dellon, was that without bone injury?

Dr. Dellon: I don’t think a restriction was made on whether there was bone injury or a tendon injury. For example, the Louisville group used the tubes in replants, so some of their patients clearly had a bone injury.

It is also important to note where the bioabsorbable polyglycolic acid tube has been used successfully so far. It has been used for a mixed nerve, the ulnar nerve in
monkeys, and digital sensory nerves in people with defects less than 3cm. The Neurotube also has been used for the inferior alveolar nerve, a cranial nerve which provides sensation to the lip. It’s been reported now for a plantar digital nerve. In motor nerves, it’s been used for the facial nerve with Steve Metzinger, a plastic surgeon, and his wife, an ophthalmologist, in a rabbit model. It’s been used successfully for the facial nerve, by the group in Turino, Italy – Bruno Battiston and Massimo Navissano. We’ve used it in the axilla for motor and ulnar nerves in a 53 year old man who has recovered EMG positive evidence motor recovery in the muscles of his forearm, and that is a mixed nerve in a human. We have also used it for the spinal accessory nerve in someone who has gotten back EMG results and clinical evidence of trapezius function. So there’s evidence today for success in humans for both sensory, motor and mixed nerves with the Neurotube—the polyglycolic acid tube—but not yet with the collagen tube.

**Dr. Terzis:** So, in the 53 year old, you were able to get motor function back in the forearm?

**Dr. Dellon:** Yes, and he can flex his wrist and fingers.

**Dr. Terzis:** But pretty much he will not get the intrinsic function back at this level at 53 years of age.

**Dr. Dellon:** No we don’t expect that he would.

**Dr. Terzis:** Right.

**Dr. Dellon:** I don’t think we would have expected him to get his forearm muscles, but the monkeys at one year had EMG evidence of first dorsal interosseous and abductor. They have a shorter distance to grow, of course, in the little monkeys.

**Dr. Sotereanos:** Dr. Dellon, I think that the future will show more success for older adults with these types of biological conduits.

**Dr. Dellon:** I would agree with you. And now that I turned 60 years old in April, I’m reaching that category where I hope my nerves can still regenerate.

**Dr. Sotereanos:** My results have been similar to yours. I’ve been very pleased with the use of these conduits. I have a technical question for you. You said you used two tubes for the ulnar nerve? I know that there is a 7mm and an 8mm neuro tube....

**Dr. Dellon:** One of the current advantages of the collagen tube is it comes in larger diameters. Neuro Regen, the company that works to make the polyglycolic acid tube, won’t have the larger tubes out until the end of September. They’re supposed to be 4mm and 8mm tubes. In the absence of a bigger tube, I’ve used them as you would use interfascicular sural nerve grafts for the distal median nerve. In two patients, I’ve actually used four separate bioabsorbable polyglycolic acid Neurotubes where we can separate the fascicles and have an idea of where they’re going.

*continued on page 12*
Dr. Sotereanos: But given a wider diameter tube is coming out, you would opt to use that instead of two tubes in the future?

Dr. Dellon: Yes, I would. And when Dr. Mackinnon and I did our first median nerve reconstructions, we only had four that were median nerves. Back then, we would take a sheet of polyglycolic acid and roll it the way you’d roll your own cigarette and we would either suture it or then weld it with a hand held cautery. And we actually put the entire median nerve into one large conduit. Three of the four patients did really well, and one did not. So in terms of the future, an interesting biologic question to answer would be a model where in a large animal model you could take, say, a sciatic nerve and give it a choice of four separate smaller fascicles or regenerating into one large empty space. We don’t know which truly would be better for the nerve yet. Secondly, to follow what Dr. Terzis said, if you just put some type of growth factor in the tube, you might stimulate things that you don’t want to happen. But in surgery you cut back to get a healthy piece of nerve. If you took a 6cm tube and took little slices of peripheral nerve and put them every centimeter to provide a center for the Schwann cells to produce, we may be able to extend this gap.

Dr. Terzis: I think I’m getting some idea now that if the distance is less than 3cm—even in older patients if it’s short gaps—one may opt to use your tube. Although, recently there is a trend in the repair of brachial plexus lesions to move away from interposition nerve grafts in favor of multiple intraplexus transfers.

Dr. Dellon: But how are you going to relate that to the tubes, Dr. Terzis?

Dr. Terzis: What I am wondering now is, whether in the future, with the exception of global palsies, there will be less need of nerve grafts and more need for intraplexus transfers and even the use of tubes as bridges. We have seen in the last 20 years that whenever we are forced to use grafts, we don’t do as well with direct repairs.

The logical extension, Dr. Terzis, is that we should leave perhaps a 2mm or 3mm gap between the ends of the nerve joined by some type of conduit so they can better know where they’re ultimately going by the neurobiology rather than by us. If you would use a tube in a primary acute nerve injury, why not use a tube for your junction in a nerve transfer?

Dr. Terzis: And I refer once more to the work we did with Ken Smith and DeMadinacelli, who was very averse to leaving any gaps between the nerve ends. But, I would have no problem in a protected environment, leaving some small space between the nerve ends.

Dr. Dellon: I think somewhere between 2mm and 5mm. The analogy I like to use when I teach is if you’re driving your car on wet pavement and the car in front of you tries to stop and the red lights come on, well, if you’re far enough back you can see the red lights, which would represent trophic factor, and you can make some adjustments. But as you know, the Schwann cell takes some hours to regulate and make this stuff and the proximal end takes some hours for the axons to sprout. And if you are...
Research Grants and Awards

The Orthopaedic Research and Education Foundation
Announces Available Funding for 2005 –
Applications are due in 2004

Applications for grants and awards that advance musculoskeletal research are available to individuals working at institutions in the United States, orthopaedic organizations, and orthopaedic societies.

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Individuals and Orthopaedic organizations interested in obtaining funding for 2005 may download applications and find deadline information and grant and award descriptions at www.oref.org.

Please direct any questions to Carmen Metoyer, Grants Secretary, at metoyer@oref.org or (847) 384-4351.
riding too close to that other car the red light may come on but you may have already been crashed into the back of the car and not have had time to make the appropriate adjustment. So you don’t need to be 100 yards behind the car but maybe 20 or 30 would be enough.

Dr. Terzis: Do you use the microscope when you do your tubing?

Dr. Sotereanos: These days, if I were going to do a primary neuropathy, I don’t feel that I would use a microscope. When I’m using the entubulation method, I usually use a 4-power loupe technique. I don’t feel that a microscope is absolutely necessary but if I have a microscope in the room and it’s convenient, I prefer to use a microscope, even with entubulation.

Dr. Terzis: Thank you, Dr. Sotereanos.

Dr. Dellon: I would agree with him, by the way.

Dr. Terzis: And if your wrist is cut and the median nerve is cut, how would you advise your doctor to repair it?

Dr. Dellon: I would first share with you what Drs. Berish Strauch and David Chiu have said, because they’re not here right now, that if they have their own index or thumb digital nerves cut, they would not use a vein because it does not recover sufficient critical discrimination function. They’re happy to use them for other nerves, perhaps for pain control.

Dr. Terzis: Right.

Dr. Dellon: So I wanted to say that for them and for myself, I would actually be very happy to have a conduit other than silicone. Goran Lundborg has had to go back in half his patients, remove their silicone, and Dr. Mackinnon and I use silicone as a model for chronic nerve compression. So, I would want a bioabsorbable tube placed between my two median nerve ends if it
were less than 3cm. If we had a big bioabsorbable tube by then, fine, and if not, I’d rather have four small tubes.

Dr. Sotereanos: Dr. Terzis, I feel the same way. Knowing the results of middle-aged adults with primary neuropathy of the median nerve at the wrist, I would definitely want an entubulation technique. I think that this is where the future lies, and the results will be at least as good, and likely better, than primary nerve repair.

Dr. Dellon: Well, Dr. Terzis, if we’re called into assist you in an emergency situation where your median nerve is in trouble, now you’ve already had your rotator cuff, now that’s what we should do for your median nerve.

Dr. Terzis: I won’t answer that because I’m still asking my second question. Do you believe you generate more scar by putting three or four tubes to orient the bundles in your median nerve, rather than one tube? What do you think happens in those?

Dr. Dellon: Well, I think you and Hanno Millesi have done a very wonderful job of showing us that we can, and this gets back to what Dr. Sotereanos said. First of all, we all have to be trained to use the microscope but once you develop that gentleness of handling tissues, I believe, with or without the microscope, you can operate in the interfascicular plane and separate some fascicles without causing much damage. And if you can isolate with an interfascicular graft or several small tubes, I do not think that you create worse scarring.

Dr. Terzis: So you think the bioabsorbable material in between your regenerating axons will just dissolve and will not cause additional scarring. Have you re-exposed any of these repairs?

Dr. Dellon: I’m glad you asked that because I have hanging on my wall of the office the photographs that Susan and I took at one year from our monkeys and we used our best technique to repair those ulnar nerves. We went back at a year and there are such large, in continuity neuromas in those ulnar nerves. Compared to the tubes, of which we have the same photographs and the same power, there’s large incontinuity neuromas in the nerves that she and I tried our best to repair. Where the tube was, there’s just a nerve. So, it was very different. It was humbling for us, as microsurgeons, to go back and look at the difference in scarring when the nerve was placed within a tube and with an entubulation technique, compared to not.

Dr. Terzis: Well, that’s an important statement Dr. Dellon, you made. And what is the difference between the Neuragen and the Neurotube?

Dr. Sotereanos: The Neuragen is collagen based. The Neurotube is polyglycolic acid. They’re both bioreabsorbable.

Dr. Terzis: Has there been a study, Dr. Sotereanos, on the one versus the other as far as scar formation?

Dr. Sotereanos: No, there has not been any study; at least I’m not aware of any in the literature that’s compared the two. Both of them are in their relative infancy.

Dr. Terzis: That will be nice to try both of these tubes in the same patient, Dr. Sotereanos, if you have a patient with a sharp laceration.

Dr. Sotereanos: I have one case where that was sent to me, actually, by John Taras. He had a flexor pollicis longus injury combined with a digital nerve that he used a conduit for and he used the Neuragen for.
He had to go back and tenolyze the flexor pollicis longus at about three months or so after the tendon injury. And when he went back, the tube was completely resorbed and you could not tell that there was ever a nerve injury.

Dr. Dellon: That’s great.

Dr. Sotereanos: I viewed his intraoperative slides, which were very interesting. And I’m sure the same thing would occur with the Neurotube. I don’t think it makes a difference which product is used; the results have been very similar.

Dr. Dellon: And in contrast, Goran Lundborg has found when he goes back that there’s a covering around the silicone as you would expect just like around our breast implants. Then, when he peels that away and removes the tube, there is a little narrowed area underneath the tube with increased vascular markings, representing inflammation from relative ischemia, but also there is a beautiful nerve that’s grown back through that without any incontinuity neuroma formation.

Dr. Terzis: Do you know that this type of work has been presented over the last 10-15 years? Millesi calls this newly formed nerve, a neuroma.

Dr. Dellon: He calls it neuromatous regeneration.

Dr. Terzis: Right.

Dr. Dellon: He just hasn’t really had a chance to see it, he’s just speaking theoretically.

Dr. Terzis: But, I think both of you have made very important statements about the clinical use of tubes, especially in the example that deals with a distal laceration in the wrist. And the question now is, when we do grafts for much more complex lesions, should we actually wrap the repair sites, or, should we

## Coding Corner

### Nerve Repair: Do You Tube?

The topic for this issue’s Coding Corner highlights one weakness of the CPT system: while you may choose to use a synthetic tube for nerve repair, you cannot code for it (yet). Unfortunately, new technology frequently becomes available before appropriate CPT codes can be created. Until such codes are created, use of the “neurorrhaphy with nerve graft” family of codes most closely approximates the procedure when a nerve tube is used and consequently is the best way to code for such work.

Also note 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 nerve repair procedures, the “neurorrhaphy” family of codes is relevant. These are the codes from 64831 through 64999. The code 64831 is used for repair of a digital nerve; 64832 is an add-on code to reflect repair of each additional digital nerve. For repair of a common sensory nerve in the hand or foot, the code 64834 is appropriate. Repair of the median motor branch and ulnar motor branch in the hand corresponds to codes 64835 and 64836, respectively. For repair of each additional nerve in the hand or foot, the add-on code is 64837 for each additional nerve.

Repair of nerves elsewhere in the body, including the lower.

### Neurorrhaphy in the Hand or Foot

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<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>69990</td>
<td>Use of an operating microscope</td>
</tr>
<tr>
<td>64831</td>
<td>Suture of digital nerve, hand or foot; one nerve</td>
</tr>
<tr>
<td>64832</td>
<td>Each additional digital nerve; list in addition to code for primary procedure</td>
</tr>
<tr>
<td>64834</td>
<td>Suture of one nerve, hand or foot; common sensory nerve</td>
</tr>
<tr>
<td>64835</td>
<td>Suture of median motor nerve to thenar muscles</td>
</tr>
<tr>
<td>64836</td>
<td>Suture of ulnar motor nerve to intrinsic muscles</td>
</tr>
<tr>
<td>64837</td>
<td>Suture of each additional nerve in the hand or foot; list in addition to codes 64834 through 64836</td>
</tr>
</tbody>
</table>

### Neurorrhaphy in the Arms, Legs or Face

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>64840</td>
<td>Suture of posterior tibial nerve</td>
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<tr>
<td>64856</td>
<td>Suture of major peripheral nerve, arm or leg, except sciatic; including transposition</td>
</tr>
<tr>
<td>64857</td>
<td>Same as above (64856) except without transposition</td>
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<tr>
<td>64858</td>
<td>Suture of sciatic nerve</td>
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<tr>
<td>64859</td>
<td>Suture of each additional major peripheral nerve; list in addition to code for primary procedure</td>
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<td>Suture of brachial plexus</td>
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<tr>
<td>64862</td>
<td>Suture of lumbar plexus</td>
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<tr>
<td>64864</td>
<td>Suture of facial nerve; extracranial</td>
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<tr>
<td>64865</td>
<td>Suture of infratemporal nerve, with or without grafting</td>
</tr>
<tr>
<td>64866</td>
<td>Anastomosis; facial-spinal accessory</td>
</tr>
<tr>
<td>64868</td>
<td>Anastomosis; facial-hypoglossal</td>
</tr>
<tr>
<td>64870</td>
<td>Anastomosis; facial-phenic</td>
</tr>
</tbody>
</table>
extremity and face, are included in the summary table below.

Note that three additional codes can be used if special measures are necessary to effect nerve repair. If the nerve repair requires secondary or delayed suturing, the code 64872 should be used. If extensive mobilization or transposition of the nerve is required for its repair, 64874 is applicable. The code 64876 applies if bone shortening is performed to acquire necessary length for a tension-free nerve repair.

Use of an interpositional nerve graft involves the family of codes from 64885 through 64907. Codes are organized according to whether the graft is greater or less than four centimeters in length and also according to where the nerve repair is located. The body is divided into three general regions: head or neck; hand or foot; and arm or leg. Additionally, a distinction is made according to whether a single cable graft is required or whether multiple strands or used. The 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 procedure of a nerve pedicle transfer, code 64907 is appropriate.

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 your office a few days after sustaining a palmar distal forearm laceration which damages the median nerve and the palmar cutaneous sensory nerve. Later that week, you perform a direct repair of the median nerve and the palmar cutaneous branch using the operating microscope.

Solution:

64856 Median nerve repair (“suture of major peripheral nerve, arm or leg”)

64859-51 Palmar cutaneous repair in the distal forearm (“suture of each additional major peripheral nerve”)

69990 Use of operating microscope for median nerve

69990 Use of operating microscope for palmar cutaneous nerve

Note that while repair of the palmar cutaneous nerve may seem to fit code 64834 (“repair of common sensory nerve”), this code also specifies hand or foot—and in the example, the nerve is being repaired in the distal forearm, so the 64859 code is a better fit.
Does Hand Therapy “Work”? Sure...

“…Red is gray and yellow white, But we decide which is right. And which is an illusion?”

Those of us who grew up as ’60s kinda kids were inspired by the words from songs of groups like the Moody Blues. (The Day Begins, from Days of Future Passed, 1967).

Those words are the most rudimentary way to think about “Evidence Based Practice” (EBP), the big buzz of this decade. Sackett and his colleagues (2000) described evidence based practice (medicine) in their text as “the integration of best research evidence with clinical expertise and patient values.” We would all like to believe our clinical practices have always set high standards and been THE model for EBP. So what’s the big deal? We have performed therapy techniques for years, including those in specific protocols outlined in books and espoused at meetings. If the literature is searched, there is little in the way of high level randomized controlled trials that have investigated these techniques. There are a myriad of journals publishing information on tests and measures and interventions—the quality and relevance of clinical trials is probably improving.

So, what can be done for us to keep up to date and include “best evidence” in our practice? There are more publications and legitimate on-line sites addressing EBP. The April/June 2004 issue of the Journal of Hand Therapy, edited by Dr. Joy MacDermid, is devoted to EBP and includes 12 systematic reviews on extracorporeal shock wave therapy for shoulder tendinitis, diagnostic tests for carpal tunnel syndrome, hand therapy for CTS, interventions to increase range of motion, effectiveness of workplace interventions, early mobilization following hand fractures and other topics.

Systematic reviews are done in a variety of ways but include similar elements to judge the value and utility of published research. A clearly defined question is developed and searches are performed in electronic databases such as Medline and CINHAL. An example of a question and search terms could be:

Are nonsurgical interventions effective to restore range of motion in patients who have sustained fracture, fracture dislocation/joint injury and other soft tissue injuries of the upper extremity? (Michlovitz et al 2004)

Sample search terms: Elbow AND splint AND contracture.

Relevant abstracts are selected and then full articles reviewed that meet the criteria established in the question; then these articles are scored. The systematic reviews in the Journal of Hand Therapy looked at (and scored) the papers on: study question, study design, subjects, intervention, outcomes measures, data analysis and conclusions. A determination was also made for each article on Sackett’s Level of Evidence (for the Orthopaedic Surgeon readers you will note that this is now done in Journal of Bone and Joint Surgery for the research articles) ranging from the highest level e.g. the well-designed randomized controlled trial to the lowest level, e.g. using information from basic science research or expert opinion. For the interested reader, there are web sites and texts available to describe these concepts (see list at the end of this article).

An important component of EBP is how we select to measure the effectiveness of our intervention e.g. therapy or surgery. In order to determine if an intervention is effective or not, tests and measures of outcome must be selected that show adequate:

- Reliability (the extent to which a measure is consistent and free from error)
- Validity (extent to which an instrument measures what it is intended to measure)
- Responsiveness to change (part of validity; ability of an instrument to detect change over time) (Portney and Watkins, 2000)

Selection and utility of these tests and measures for clinical practice are the topic of the Hand Therapy Day, January 12, 2004 at Wyndham El Conquistador Resort & Golden Door Spa in Fajardo, Puerto Rico. Come join us and enjoy the program that was developed by Gail Groth, OTR/L, MS, CHT.

Come learn from “some faces” that are new to the AAHS meeting, but certainly not new to our literature. They include:

Joy MacDermid, BScPT, PhD, developer of the Patient Rated Wrist Evaluation and Guest Editor of the issue of the Journal of Hand Therapy on EBP, from McMaster University, the “home” of EBP.
Mary Watkins, DPT, MS (MGH Institute of Health Professions, Department of Physical Therapy, Boston, Mass) co-author of a clinical research text.

Dorothy Edmunds, PhD, Principal Investigator Community Participation and Quality of Life Laboratory: Washington University, St. Louis

...and some AAHS familiar faces.

Selected references


BMC Musculoskeletal Disorders www.biomedcentral.com (I suggest checking out details of the website for policies on their review and publication process)

PEDro rates articles on therapy interventions and includes clinical practice guidelines. www.pedro.fhs.usyd.edu.au

Information on Sackett’s Levels of Evidence www.cebm.net/levelsofevidence.asp

Rebecca L. von der Heyde, MS, OTR/L, CHT

Personal: I grew up in Chicago as the daughter of Lutheran educators who taught me the value of diligence, integrity, and happiness in life and work. I moved on to Purdue University to become a boilermaker and a Chi Omega, and proceeded to St. Louis to pursue Occupational Therapy. I have had wonderful opportunities here, the most fulfilling of which was meeting my husband who inspires me on a daily basis and encourages me in all endeavors.

In the past year, I have moved from management to full time academia. My assignment includes gross anatomy, kinesiology, and splinting... a match too good to be true!

Education: Purdue University, West Lafayette, IN (1994); Bachelor of Arts in Health, Kinesiology, & Leisure Studies; Washington University, St.Louis, MO (1997); Master of Science in Occupational Therapy

Employer: Assistant Professor of Occupational Therapy, Maryville University, St. Louis, MO; PRN Therapist, Milliken Hand Rehabilitation Center, The Rehabilitation Institute of St. Louis; Co-founder/Partner, Advanced Rehab & Therapy Seminars (ARTS), St. Louis, MO.

AAHS Involvement: Affiliate Member, 2004; AAHS Therapy Day 2005: Outcomes in Our Hands, Scheduled Presenter/Faculty

Best Part of My Job: Sharing my passion for occupational and hand therapy. Academia lends the autonomy to continue clinical practice, which, in turn, adds to the knowledge shared in the classroom. Students express their appreciation of faculty who maintain clinical practice, and hand therapy will benefit from students who pursue research. Research and education ultimately benefits our patients.

Major Accomplishments: I attribute my accomplishments to the incomparable mentors that have guided my path. With the help of Christine Novak and Dr. Susan Mackinnon, I published my first article on nerve graft donor site recovery in 1999. I published two articles on goniometry with Gail Groth in 2001, and helped coordinate a national continuing education course on flexor tendon injuries in 2002. My most recent accomplishment was the successful completion of the CHT exam this past November.

Clinical Specialties: Traumatic hand injuries, flexor tendon repairs, tendon transfer, and advanced splinting techniques. I have to admit that I also loved management and the pursuit of cost-effective health care.

Greatest Challenge: The education of others. Imparting knowledge to patients from diverse backgrounds and students with distinct learning styles requires consistent effort and honest reflection.

Three Words That Describe Me: Organized, passionate, and self confident.
leaving space in between them? These are very important questions for those of us that spend 18 hours putting nerves together.

**Dr. Dellon:** But, Dr. Terzis, you just said you have two and a half years left, so we need your help figuring out the rest of these questions for us.

We’re going to thank each of ourselves for taking this time for this panel. I hope to see you in Puerto Rico for the American Association for Hand Surgery meeting.

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**Disclosure Statement:** A. Lee Dellon, MD discloses that he has a proprietary interest in the bioabsorbable, polyglycolic acid conduit named the Neurotube™.