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World Society for Reconstructive Microsurgery

World Society for Reconstructive Microsurgery

Message from the Editor

It is with great pride and humility that I write to you as President of the WSRM. As a university student in 1973, I observed the early days of replantation and microneural repair at Duke University Medical Center under the leadership of James Urbaniak. Now, 40 years later, I have a profound responsibility to the members of the WSRM to direct the continued growth of microsurgical reconstruction. The early days were filled with triumph and tribulation. The creation of microsurgical instruments and microsutures, avoidance of thrombosis, and defining clinical indications for the use of the operating microscope were a few of the challenges of our founding fathers and microsurgical pioneers. We are now several years beyond a half century since Julius Jacobsen introduced the concept of microsurgical vascular repair - yet many challenges remain for all of us. Will Vascularized Composite Allotransplantation evolve as a standard of care? Will tissue engineering obviate the need for donor sites - in other words; can we pull a vascularized tissue engineered product "off the shelf" for reconstructive needs? Will we make the strides needed in microneural repair and neural regeneration, especially for the patient affected by brachial plexus injury - allowing for near normal function? Will reconstructive surgery remain financially viable in the arena of changing world economics relating to health care policy and payment? Are younger surgeons as excited about committing themselves to this line of work as generations before them? The answers will come as they have in the past - from our members committed to making a difference, performing complex operations that may intimidate some of our colleagues in multiple specialties. All of you have courage and passion - real passion for microsurgery - or you would not subject yourself to the "all or none" phenomenon (it lives or it dies … there is no in between).

Before I outline my goals for my Presidency, I want to congratulate Robert Walton and his entire team for an outstanding meeting in Chicago this past July. "Achieving Normal" was a spectacular theme, and those who attended the meeting paid tribute to the superb scientific program and social events, by remaining in their seats, packing the auditorium during the closing session that summarized what we mean by "achieving normal." More than defining whether or not we achieve normal, we set the reconstructive stage for the next act in our collective performance of scientific and clinical achievement. We defined the problems that face us - a productive and meaningful exercise for sure. Finally, I want to recognize my predecessor, Kazuteru Doi for an outstanding job during his two - year presidency. His commitment to WSRM's expansion and success was evident during council meetings, and through constant communication with members and our administrative staff under the capable direction of Krista Greco. It is the collective efforts of Robert Walton and Kazuteru Doi that validated the impact and importance of our society. I offer my gratitude and promise to continue this momentum. I am counting on your support and "collective wisdom" to make sure that the WSRM has an exciting future.

L. Scott Levin, MD, FACS
Editor - in - Chief, President

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What's New in Microsurgery?

A New Clamp for Microsurgical Anastomoses

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Abstract

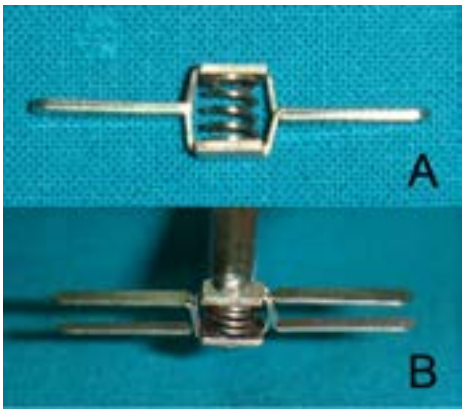
Every tissue transplant has its donor vessels, artery and vein, which should be anastomosed to recipient vessels. A new instrument, the double transverse microvascular clamp (DTMC), has been developed to be applied simultaneously as one clamp to both the artery and its accompanying vein. The transverse design of this clamp keeps the artery separate from its vein, allowing each anastomosis to be performed more easily. The limited clamp surface area minimizes the glazing and blurring effects. Applying only one clamp to the two vessels presents more work space and overcomes the crowdedness caused by the use of two single clamps. Using a DTMC on both the recipient and donor vessels provides optimal suture maneuverability and ideal work situation compared with the use of two double approximating clamps. We believe this DTMC would be a valuable addition to the microsurgical instruments market.

Introduction

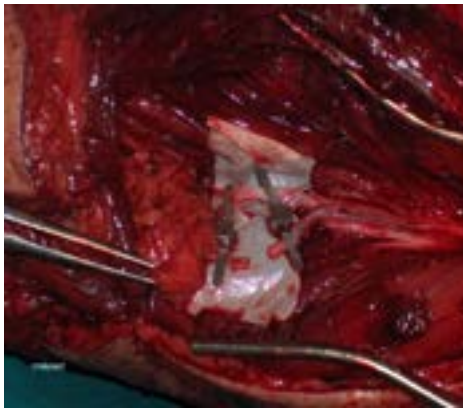
The early history of microsurgical tools is full of imaginative new ideas and technical solutions that can be clearly identified from the instruments in use today. Nowadays, microsurgical experiments are under way in such areas as sutureless anastomotic techniques, technical flap monitoring methods, robotic, and endoscopic-assisted microsurgical applications to increase the success rate, further miniaturize instruments for magnification and gain more comfortable working positions for the surgeon.1-5 Although there is universal use of the double approximating microvascular clamp, however, the obligatory use of two clamps simultaneously on the two arteries and the two veins for anastomoses may have the problems of covering a large surface area in an already limited field and the blurring effects under the microscopic eyepieces from the glossy metal surfaces of the clamps. If double approximating micro-clamps are not available or not preferred, the surgeon may have to use four single clips, which will also present the aforementioned problems. A new microvascular clamp that allows simultaneous application to both the artery and its accompanying vein was developed for the sake of minimizing the space occupied by surgical instruments, reducing blurring effects, and maximizing suture maneuverability and the ideal work space and conditions.[6]

Material and Methods

The DTMC is made of corrosion resistant light thin steel and can be applied, as a single clamp, to both the artery and its accompanying vein during microsurgical anastomotic procedures. The instrument has been registered in the Patent Office of Munich, Germany as number 200 08 743.3. The DTMC consists of a central opening and closing part and two transverse limbs arising from each side of the central part **(figure 1A)**. The closing and opening movement of the central part is achieved through the action of a fine coil fixed to the inner surfaces of its upper and lower plates **(figure 1B)**. Each transverse limb consists of two blades (jaws) arising from the central part in a crossed fashion. The crossing of these two blades permits the closure and opening of the limbs through the action of the coil. There are two clamp sizes with different lengths of the transverse limbs and different closing forces. The closing force in each clamp was technically adjusted and tested to be suitable to occlude an artery within one transverse limb and a vein in the other limb. The first clamp size (DTMC1) is suitable for vessel diameters of 1 to 2 mm, whereas the other size (DTMC2) is suitable for vessel diameters of 2 to 3.5 mm.



The instruments had been clinically applied in microvascular anastomotic procedures using prototypes provided by Accurate Scientific Surgical Instruments Corporation (ASSI, New York, USA). Once inset of the harvested flaps and their donor vessels within the recipient area and its vessels was completed, the clamps were applied using a conventional non-toothed forceps **(figure 2)**.



Basically, one clamp had been applied to the donor artery and vein and another to the recipient vessels. Artery-to- artery and vein-to-vein end-to-end anastomoses were completed under the microscope using the posterior-wall-first anastomotic technique **(figure 3)**.

Objective microsurgical operative circumstances were reported as clamp application and manipulation, operative field crowdedness, suture maneuverability, clamp metal surface blurring effects, ease and time of anastomoses, success rate, and clamp re-application if required.

Results

The design of the DTMC permits simple convenient application and removal especially in the common narrow fields of microsurgery using the conventional non-toothed forceps. The instrument rests comfortably in the operative field. It presents a few millimeters separation between the artery and its accompanying vein which provides more space for each vessel manipulation and micro-dissection and facilitates the micro-anastomoses. The slim longitudinal axis of the clamp with its two wings allows clear visualization of the vessels to be anastomosed and presents little metal surface area with little blurring effect. Although histological patterns and musculatures of the arteries and veins differ, the fixed closing force of the two wings presents good vascular occlusion for both vessels with no endothelial injuries, as proved by the absence of thrombosis in the anastomotic trials. The small clamp size provides more working space to accommodate the other microsurgical instruments throughout the procedure and permit easy performance of the different operative steps such as vascular trimming, dilatation, and irrigation. The manipulation of the suture threads, needle, and needle holder between the applied two clamps was ideal, with clear visualization facilitating successful performance of the micro-anastomoses **(figure 4)**.

Discussion

Surgeons are generally the first to identify the need for a new instrument that could perform a certain function in a better way. Reported innovations of microsurgical instruments have led to advances in microscissors, microforceps, or microneedle holders, but not to the microvascular clamps since the development of the double approximating clamps of Acland.7-10 The Acland clamp has two parallel limbs for clamping two similar vessels, a movable transverse bar, and sometimes a notch for holding the stay suture. Although some modifications to this clamp were reported,11 and some single clips are available commercially, the microsurgical instrument market may need a double clamp that is significantly smaller, thinner and easier to use.

This DTMC permits the application of only one clamp to the two vessels through only one compressing movement to its central part. Its small size can overcome the crowdedness caused by the use of two clips or one double approximating clamp in the limited operative field of anastomoses, which is already occupied by the neighboring tissues and other microsurgical instruments during the procedure. Using one DTMC on each of the recipient and donor vessels provides an ideal work situation and optimal suture maneuverability compared with the use of two double approximating clamps. With the DTMC, anastomosis by the posterior-wall-first technique was very comfortable with no need for vessel rotation or the flap overlap. The two clamp sizes are applicable for most vessel sizes and both are thinner, smaller, and lighter than the different sizes of the double clamps currently on the market. The overall small size of the clamp can provide easier suture maneuverability and produce less blurring effects from its metal surface. If re-application of a clamp is needed after testing the anastomosis to perform extra sutures, the DTMC could be used as a single clamp with easy and simple application. Microsurgeons can experience, while using this clamp, that it is applied simply and simultaneously to an artery and its accompanying vein, keeps the artery apart from the vein to perform each anastomosis easily, and that it is ideal for the common narrow fields of the microvascular anastomoses, with less crowdedness than is provided through the use of two double approximating clamps or four single microclips.

References

1. Maitz PK, Trickett RI, Dekker P, et al. Sutureless microvascular anastomoses by a biodegradable laser-activated solid protein solder. Plast Reconstr Surg 1999;104:1726–1731
2. Pickett JA, Thorniley MS, Carver N, Jones DP. Free flap monitoring in plastic and reconstructive surgery. Adv Exp Med Biol 2003;530:717–724
3. Krapohl BD, Reichert B, Machens HG, Mailänder P, Siemionow M, Zins JE. Computer-guided microsurgery: surgical evaluation of a telerobotic arm. Microsurgery 2001;21:22–29
4. El-Shazly MM, Kamel AH, El-Sonbaty MA, Zaki MS, Frick A, Baumeister RG. Endoscope-assisted lymphatic microanastomoses: concept, results, expectations, and applications. J Reconstr Microsurg 2003;19:381–384
5. El-Shazly MM, El-Sonbaty MA, Kamel AH, Zaki MS, Baumeister RG. Microvascular anastomosis in an optical cavity: is it possible? Plast Reconstr Surg 2004;113:294–298

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6. The double transverse microvascular clamp; a new instrument for microsurgical anastomoses. J Reconstr Microsurg, 2012, 28:577-580
7. Van Twisk R. A combination of scissors and micro-forceps: a new microsurgical instrument. Br J Plast Surg 1984;37:631–632
8. Hedén P. A triangular cutting arteriotomy scissors facilitating end-to-side anastomoses. Plast Reconstr Surg 1992;89:353–355
9. Vickers DW. A new microsurgical needle holder. Aust N Z J Surg 1977;47:381–384
10. Acland RD. Microvascular anastomosis: a device for holding stay sutures and a new vascular clamp. Surgery 1974;75:185–187
11. Hendel PM, Buncke HJ. Use of a tilted double clamp in microvascular anastomosis. J Microsurg 1980;1:470-474

Congress Update

Robert L. Walton, MD, FACS

WSRM Congress 2013

Some might call it a "Perfect Storm," and most would agree that the recent WSRM Congress in Chicago (July 11-14, 2013) was a resounding success on many levels. The setting was idyllic; a warm sunny Chicago with flowers blooming on the medians, sparkling skyscrapers, lake waters splashing on sandy beaches, sports venues, museums, shopping, the Taste of Chicago, and much more. The Fairmont Hotel, situated at the head of Chicago's Magnificent Mile, served as the congress headquarters providing comfortable and reasonably priced accommodations with meeting venues that were spacious, within close proximity to each other, and audiovisual services that were "user friendly".

Importantly, the scientific program exceeded all expectations - the cumulative result of detailed, comprehensive planning, inclusion of an unprecedented number of world leaders in Complex Reconstruction, and fabrication of a comprehensive scientific program that included practical approaches to complex defect/deformity management, futuristic applications of new technologies, and historical perspectives on successful reconstructive ventures. The scientific program centered on the theme of "Achieving Normal" in reconstructive surgery. The invited lectures and panels embraced this theme providing attendees a comprehensive overview of state-of-the-art in Complex Reconstruction. A highlight of the meeting was the 'Best Normal' competition that showcased six, rather extraordinary, peer-selected complex case presentations. Drs. Eduardo Rodriguez and Amir Dorafshar received first prize for their case involving total face transplantation. The meeting concluded with a wrap-up session that explored the realities of "achieving normal" using current techniques and technology and defining areas that fell short of achieving the ideal.

In total, 580 attendees from 34 countries partook the meeting. There were 160 speakers, 28 scientific panels, 13 invited lectures, 19 instructional courses, and 19 free paper sessions. A total of 634 abstracts were submitted for presentation out of which 196 were accepted for podium presentation (31%) and 93 for poster presentation.

Feedback from the meeting has been uniformly positive with many respondents praising the stimulating meeting format and content. These commentaries will provide important guidance to the meeting organizers of WSRM 2015 in Mumbai.

As Meeting Host, I am deeply indebted to Krista Greco and Caitlin Carnes and the rest of the Medical Association Management Team (MAM) for their tireless efforts in coordinating the program and social events. I am also very appreciative of the fine work of our International Program Committee, and especially wish to acknowledge President Kazuteru Doi and Drs. David Chang and Scott Levin for their invaluable advice and counsel during the planning of the meeting. Many thanks and plaudits to the extraordinary efforts of the invited faculty and presenters who provided content and commentary, and who, in essence, were the heart and soul of the meeting. Lastly, I wish to express my thanks and appreciation to the American Society for Reconstructive Microsurgery and WSRM for their generous financial support of WSRM 2013.

Perhaps the Saturday night Gala at the renowned Field Museum provided the best commentary on WSRM 2013. With over 250 attendees present, the evening embodied the penultimate fusion of international camaraderie, intellectual discourse, constructive argument, new and rekindled friendships, levity, good food, good drink, fireworks, and just plain fun. Indeed, a perfect storm.

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WSRM Congress 2015

The 8th World Congress of the World Society for Reconstructive Microsurgery (WSRM) is slated to be held at Mumbai, from 19th to 22nd March 2015. The WSRM conference has become one of the largest scientific conferences of microsurgery including the research and clinical fields of all varieties of reconstructive surgery. This is the most exciting event happening every two years and will bring together practitioners, researchers and educators from around the world who are engaged in reconstructive microsurgery. As have other congresses in the past, this congress, too, will be a true forum where academicians as well as practitioners from all around the world will exchange their knowledge and experiences and thereby continue to build up and take ahead the "Microsurgery Community." The proposed theme for our conference is "**Looking Back: Surging Ahead.**"

The CONFERENCE VENUE is **HOTEL GRAND HYATT**, Mumbai, which is a multi-dimensional lifestyle complex, within minutes of the domestic and international airports and numerous local attractions. Figures 1 and 2 show the Grand Ball Room and adjacent areas.

The core committee includes:

1. Dr. Ashok Gupta:
   Host Chairman
2. Dr. Hoshi Bhathena:
   Reception Committee Chairperson
3. Dr. Amresh Baliarsing:
   Secretary General
4. Dr. Vinay Jacob:
   JT. Secretary General
5. Dr. Samir Kumta:
   Chair Scientific Com
6. Dr. Milind Wagh:
   Co-Chair Scientific Com
7. Dr. Prabha Yadav:
   Chair Workshops / Courses
8. Dr. Vinita Puri:
   Chair Website & E-Communications
9. Dr. Bijoy Methil:
   Co-Chair Website & E-Communications
10. Dr. Vinay Shankhdhar:
    Treasurer
11. Dr. Kanchan:
    Chair Cultural Program

Proposed Topics for the Scientific Program are:

1. Complications in Microsurgery
2. Composite Tissue Allo-transplantation
3. Head and Neck Reconstruction
4. History of Microsurgery
5. Micro-lymphatic Surgery
6. Micro-neural Surgery
7. Pediatric Microsurgery
8. Robotic Microsurgery
9. Super Microsurgery
10. Surgical Pearls & Nightmares
11. Tissue Engineering
12. Training: Global perspective
13. Wartime and Mass Casualties
14. Widening Scope of Microsurgery

We propose to hold a preconference flap dissection workshop and a cadaver dissection workshop. We also expect to release a handbook on clinical microsurgery.

An expression of interest has been shown by over 500 delegates to attend the conference from all over the world, and we anticipate many more. Many world experts and key opinion leaders have already promised commitment to being here in Mumbai for WSRM 2015 and sharing their knowledge and expertise. We hope all of you will become a part of what promises to be a very valuable educational activity, an inspiring occasion for learning, active stimulating academic discussions and interaction/networking with international guests.

Please do visit the website www.wsrm2015.net which gives more details.

Liaison Update

Microsurgery in Europe

Alexandru Georgescu, MD, European Representative

The EUROPEAN FEDERATION OF SOCIETIES FOR MICROSURGERY was created on February 10, 1990, by a group of countries, as the expression of their willingness for alliance in scientific cooperation.

The Federation joins together European national microsurgery societies, which are interested in promoting a high quality degree of education for their members, by permanently increasing their level of knowledge and their commitment to caring and helping the patients.

The Federation was created at Prof. Alain Gilbert's initiative, who was the first Secretary General until 2008, followed by Prof. Bruno Battiston until 2012, and then Prof. Alexandru Georgescu, who is active Secretary General nowadays.

Now the federation has 12 active full members, the Danish Society, the French Society (GAM), the German Speaking Group (German Society, Switzerland Society, Austrian Society), the Hellenic Society, the Italian Society (SIM), the Portuguese Society, the Romanian Society, the Scandinavian Group (Sweden Society, Finland Society, Norway Society, Iceland Society), the Spanish Society, the Turkish Society, the United Kingdom Society and 1 associated member, which awaits the full membership status.

As a result of the continuous endeavors to stimulate the cooperative relationships between European microsurgeons enhanced in the last period of time, the Polish Society for Microsurgery was re-established and is now a full active member of EFSM.

The Serbian microsurgeons, which have a longstanding tradition and important contribution in this field, reunited in an association and applied EFSM for membership.
The members of the Council are Alexandru Georgescu (Secretary General), Bruno Battiston (Past-Secretary General), Alex Muset (President of the next EFSM Congress), Ileana Matei (Treasurer), Stefano Geuna and Mihai Ionac (EMTRA delegates), Pierluigi Tos (Informatic Committee) and Panayotis Soucacos (Historian).

The Federation is aiming to open new perspectives for the younger microsurgeons, by promoting cultural and scientific interchanges, by facilitating them the access to science, to the newest discoveries and techniques, and by teaching them how to choose and apply these methods in the best interest of the patient. The microsurgeons are encouraged to abide by a high standard of personal, professional, moral and ethical conduct.

In fact, the members of the federation are trying to create a new way of scientifically reasoning for the younger generation of microsurgeons, by keeping the best from the past and by embracing and improving the future.

The Federation aims to create and implement a unified algorithm for patient care that could be disseminated and applied by all the members, and also to support and research the development of new and improved methods of treatment.

More information regarding the EFSM can be found on the site www.efsm.eu.

In the biennial congress of the Federation and in other scientific manifestations hosted by the different member societies, invited are microsurgeons not only from Europe, but the organizers also welcome and encourage a large international participation.

The EFSM XIIth Congress will take place next year, in April 3-5, 2014, in Barcelona, Spain, and will be preceded by a Pre-Congress European Microsurgical Training and Research Association meeting, on April 2. The scientific program will be structured in various interesting round tables, panels and free papers, which will include the following topics: experimental microsurgery, training in microsurgery, head and neck reconstruction, upper limb tumors, obstetric palsy, upper and lower limb traumas, free muscle transfers for the upper limb reconstruction, replantation, foot reconstruction, peripheral nerves (research and clinical presentations), lymphatics, perforator flaps in limbs and breast reconstruction, vascularized bone transfers and also presentations on new technologies. The registration for the congress and accommodation will be open January 31, 2014, and the submission of abstracts is already possible since August 15, 2013. More information about the upcoming congress is available at: www.efsm.eu/efsm2014. The purpose of this scientific event is to exchange valuable information, to create links generated by the same ideas and beliefs, to allow a better understanding of the complexity of the microsurgical profession and to guarantee that microsurgery remains a well respected and recognized profession.

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The EFSM organized panels during other congresses, the last one being held during the FESSH Congress, Antalia, Turkey, May 29 - June 1, 2013.

In the pursuit to find new ways to make known the purposes and aspirations of the Federation, and also to keep the members up-to-date with the most important data and research in microsurgery all over the world, a new cooperation agreement was established: in 2013 the Journal of Reconstructive Microsurgery (JRM) became the official journal of the European Federation of Societies for Microsurgery.

The Federation intends to get actively involved in the World Society for Reconstructive Microsurgery (WSRM)'s activities, and according with the actual bylaws the representative of the European microsurgeons, the Secretary General, is a permanent member in the WSRM Council.

Also, another very important point on the Federation's agenda is the massive involvement in organizing and supporting various specialty courses, such as those which took place in Timisoara, Romania, Italy and Greece.

The EFSM accredited the 2-years educational programme International Master Degree in Reconstructive Microsurgery, a complex clinical and practical initiative which reunites as international faculty prestigious specialists from Italy, Belgium, Finland, Spain, France, Mexico, UK and Japan.

In conclusion, we hope that these new cooperation agreements will be mutually beneficial, creating the possibility to unite in thoughts and practice this very heterogeneous group of specialists. ■

Microsurgery in North America

Matthew M. Hanasono, MD, North American Representative

American Society for Reconstruction Microsurgery (ASRM) Pre-Meeting Symposium

The American Society for Reconstructive Microsurgery (ASRM) sponsored a very successful Pre-Meeting Symposium on July 11, 2013, immediately preceding the WSRM 2013 Congress. The "ASRM Day" emphasized new innovations in reconstructive microsurgery. The program included instructional videos depicting flap dissection and operative techniques involving complex facial reconstruction, lymphovenous bypass and lymph node transfer, breast reconstruction, nerve transfer, and total facial transplantation by master surgeons, and was moderated by Michael Neumeister, MD, Immediate Past-President of the ASRM. Following the video presentations there were panels on Complex Reconstruction of the Lower Extremity and Complex Reconstruction of Head & Neck Deformities featuring state of the art approaches to managing reconstructive challenges utilizing an interactive case presentation format.

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Breast Reconstruction Awareness (BRA) Day

On October 16, the ASRM supported Breast Reconstruction Awareness (BRA) Day. The purpose of this event is to encourage women to be proactive in the early detection of breast cancer and to understand their options for breast reconstruction. In the United States, it has been found that less than 25 percent of women know the range of breast reconstruction options following mastectomy, and only 22 percent are familiar with the quality of outcomes that can be expected. The ultimate goal of this initiative, led by the American Society of Plastic Surgeons (ASPS) is to not only educate women about breast reconstruction but to improve access to reconstructive surgery. More information can be found by visiting: www.bradayusa.org.

ASRM 2014 Annual Meeting

Registration is now open for the ASRM 2014 Annual Meeting. The Annual Meeting will be held on the beautiful Hawaiian island of Kauai at the Grand Hyatt Kauai Resort & Spa. Liza Wu, MD, is the program chair and plans to focus this year's meeting on looking toward the future of reconstructive microsurgery. The meeting will feature integrated panels with the American Society for Peripheral Nerve (ASPN) and American Association for Hand Surgery (AAHS), in which facial reanimation and limb transplantation versus prosthetic rehabilitation will be discussed, respectively. The program will also feature updates from the American Society of Lymphatic Surgery (ASLS) as well as the American Society for Reconstructive Transplantation (ASRT). Kauai is known as the Garden Isle, and there should be ample time to explore and enjoy this beautiful setting during the meeting. More information can be found by visiting: http://www.microsurg.org/events/meetings. ■

Mini Reviews

Schwann Cell Senescence: A New Consideration in Nerve Repair and Grafting

Gwendolyn Hoben, MD, PhD; Amy M. Moore MD; Matthew Wood PhD, and Susan E. Mackinnon, MD

Washington University School of Medicine, Department of Surgery, Division of Plastic Surgery, St. Louis, MO

When approaching a complete motor nerve injury, there are several factors critical to the outcome: time from injury, distance to the target muscle, technique of the repair, and patient characteristics. Timing of the repair is critical. Delays in repair and associated prolonged periods of denervation lead to loss of muscle mass and integrated motor function. Attempting to re-innervate denervated muscle after 12-18 months is futile due to changes at the muscle level. While timing of treatment is crucial, the distance to the target muscle is dependently related. Injury to the ulnar nerve in the axilla is much less likely to have a positive outcome in the hand than an injury to the nerve at the wrist because the rate of innervation, approximately 1mm/day or 1in/month, is inadequate to reach the muscle before muscle loss. A long regeneration distance makes it unlikely that axons will reach the target muscles in time. Besides timing and distance, the repair technique and patient age play a role. Increased surgical experience and younger patients are associated with improved outcomes. *Despite taking all of these factors into account, there are still other variables at play. New evidence suggests that changes in the regenerative microenvironment may also be important in the clinical outcome, most notably is the phenomenon referred to as Schwann Cell (SC) senescence. The goal of this review is to introduce SC senescence, summarize recent data relating to its effect on nerve repairs, and to offer clinical nerve grafting techniques to improve regeneration.*

The regenerative microenvironment of the injured nerve is composed predominantly of SCs, fibroblasts, macrophages, and a milieu of growth factors, extracellular matrix components, cell adhesion molecules and matrix metalloproteinases that contribute to regeneration. One of the most studied components is SCs. In the uninjured nerve, SCs provide growth and structural support to the axons. They are responsible for myelination, creating extracellular matrix, and secreting neurotrophic factors. After an injury, their gene expression and function change dramatically. They change to a regenerative phenotype, begin proliferating, increase migratory activity toward the

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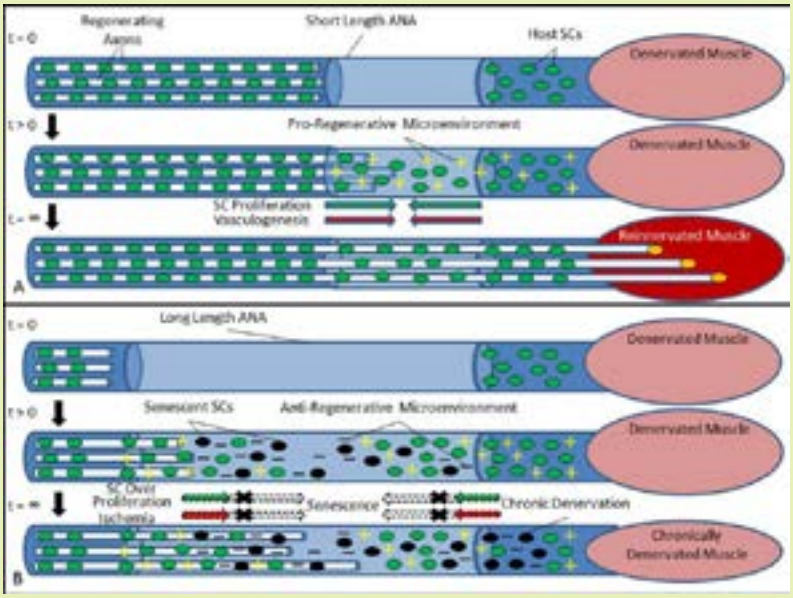
injury site, and secrete growth factors beneficial to nerve regeneration. SCs are also responsible for mechanical cues to regeneration: clearing axonal debris and laying down laminin to guide growing axons. The benefit of SCs is clear when comparing nerve autografts (isografts in animal models), which contain native SCs, to acellularized nerve allografts (ANAs). In animal models, isografts regenerate 50-100% more nerve fibers, likely attributable to the presence and function of viable SCs.

Beyond the simple presence of SCs, the SC must be in the regenerative phenotype. However, new evidence indicates that in certain nerve injuries, the SCs undergo senescence. Senescence is permanent growth arrest associated with a change in the secretory phenotype of the cell. These changes are typically induced by replicative exhaustion and chronic cellular stress, both of which are characteristics of the nerve injury environment. Senescence also increases with age and may be an explanation why we see slower, less effective regeneration in older animals. Senescent SCs have reduced proliferation, decreased growth factor production, and result in poor myelination. In parallel to the aging SC, a likely reason for these changes in the nerve *injury* microenvironment is chronic cellular stress; sources of which include inadequate growth conditions secondary to ischemia and prolonged signalling for proliferation. As the nerve gap lengthens and there is a greater regenerative distance, the factors leading to chronic cellular stress increase. Greater distances mean increased proliferative burden on the SCs to fill the gap. Further, the longer gap involves a greater distance from the vascularized nerve ends, resulting in an ischemic environment with reduced nutrient support.

Evaluating the results from long nerve gap (>30mm) models and the difficulty with regeneration across ANAs at this distance was the impetus to look for senescence. Long nerve gaps are a clinical challenge and at a cellular level are also highly conducive to cellular stress. In contrast, there are numerous successful strategies to repair short gap (<30mm) injuries to small diameter nerves with the use of autografts, conduits and ANAs. However, in moving to the long gap injuries (>30mm) and especially larger diameter nerves, only autografts have shown consistent successful outcomes. Autografts, however, do come at a price: donor site morbidity and increased operative time compared to using an "off-the-shelf" product.

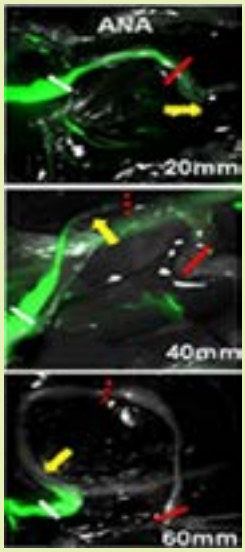
To better understand regenerative failure associated with long gap nerve repairs, our group examined acellular nerve allografts ranging in length from 20-60mm in a rat sciatic nerve transection model. After 10 weeks, nerve regeneration in the 60mm ANA grafts was inferior to that in the 20mm grafts. Additionally, the length of the axon regeneration front was directly affected by the length of the graft. In a 60mm ANA, the axonal front was only 5mm while that in the 40mm ANA was nearly 20mm. In contrast, the axonal front completely cleared the 20mm gap. These surprising data indicated that the regenerative microenvironment worsened as the length of the ANA increased, so we hypothesized that senescence may be a contributing factor. SCs from the distal nerve graft were evaluated for protein and genotypic markers of senescence: senescent associated □-galactosidase, p16, interleukin-6, and interleukin-8. In long ANAs, the expression of these senescence-associated markers increased with increasing distance from the proximal edge of the injury **(Figure 1)**.



Additionally, electron microscopy (EM) showed changes associated with senescent cells: altered chromatin and abnormal extracellular matrix.

The proteins secreted by SCs are of the utmost importance for the regenerative microenvironment provided to axons. Given the reduced nerve growth found in the long ANAs, especially at the distal end, it would be expected that the quantities of neurotrophic growth factors produced by senescent SCs were altered. Gene expression analysis in an in vitro model of senescent SCs showed altered expression for glial-

derived neurotrophic factor (GDNF), nerve growth factor (NGF), and brain-derived neurotrophic factor (BDNF) compared to normal SCs. GDNF has been found to have a direct trophic effect on dorsal root ganglion cells, motor neurons, and autonomic neurons. NGF is important in sensory and sympathetic nerve fiber growth. It guides axon growth, and it has been found to have increased secretion in SCs near the distal end of injured nerves. NGF also increases SC secretion of BDNF, a neurotrophic factor that targets motor neurons and increases both myelination and the diameter of regenerated nerves. Senescence-related decreases in the local concentration of these growth factors could strongly impair axon growth **(Figure 2)**.



Another clinical scenario conducive to chronic cellular stress is "banking" a nerve graft for future reconstruction. "Banking" a nerve graft involves performing a proximal nerve coaptation to a donor motor nerve and allowing the nerve to regenerate over time through the graft. Traditionally, banked nerve grafts did not include a distal connection of the graft. For example, in the case of a panbrachial plexus injury where a free functional muscle transfer is anticipated for elbow flexion, a long nerve graft may be connected proximally to a donor nerve (i.e. intercostal nerves) and banked in the subcutaneous tissue. This banked nerve is then monitored with a Tinel's sign to determine when sufficient axons have regenerated to power the transferred muscle. A study from our group in 2002 looked at long isografts (8cm) connected end to side to the sciatic nerve and connected distally end to end to the tibial nerve in a rat model. One of the experimental groups was similar to a banked nerve in that the distal end was not connected to the posterior tibial nerve but instead left free. Compared to the group that had a distal coaptation, there were 80% fewer regenerated nerve fibers. In retrospective analysis of those nerve samples, the group without a distal coaptation showed senescent changes on EM while the distally connected nerve graft did not. Similar results were also found on retrospective analysis of nerve graft samples taken from a primate study: the proximal trunk of the facial nerve was transected and grafted with a 10cm sural autograft and either connected distally or not. Again, the lack of a distal connection resulted in senescent changes in the SCs. In the situation of a banked nerve there is no distal nerve end to provide healthy SCs or increased vasculature to supply appropriate blood and nutrients to cells within the graft, thus contributing to chronic cellular stress even in the case of an autograft that has SCs.

Senescence due to chronic cellular stress fits into the current paradigms of nerve repair. Shorter gaps result in less cellular stress and have better prognosis, while the worsened prognosis of nerve repairs in long gap injuries and older patients fits well with senescent changes. As we learn more about this process and what variables lead to senescence, these lessons can be applied to clinical practice. Future work is needed to examine strategies to prevent senescence in long gap injuries and better engineer ANAs to be more effective. Moreover, senescent changes in the other cells involved in nerve regeneration, fibroblasts and endothelial cells, also need to be examined. The evidence of senescence in banked grafts is highly suggestive that connecting a banked nerve graft distally could be beneficial in reducing the chronic cellular stress environment and thus, better maintaining the axons for regeneration. There are many questions yet to be answered regarding SCs and senescence but the evidence is mounting that senescent SCs are another critical variable in nerve repair.

References

Bunge, R.P., The role of the Schwann cell in trophic support and regeneration. J Neurol, 1994. 242(1 Suppl 1): p. S19-21.

Campisi, J. and F. d'Adda di Fagagna, Cellular senescence: when bad things happen to good cells. Nat Rev Mol Cell Biol, 2007. 8(9): p. 729-40.

Goheen-Robillard, B., et al., End-to-side neurorrhaphy and lateral axonal sprouting in a long graft rat model. Laryngoscope, 2002. 112(5): p. 899-905.

Mackinnon, S.E., et al., A study of neurotrophism in a primate model. J Hand Surg Am, 1986. 11(6): p. 888-94.

Moore, A.M., et al., Acellular nerve allografts in peripheral nerve regeneration: a comparative study. Muscle Nerve, 2011. 44(2): p. 221-34.

Saheb-Al-Zamani, M., et al., Limited regeneration in long acellular nerve allografts is associated with increased Schwann cell senescence. Exp Neurol, 2013. 247C: p. 165-177.

Figure Legends

Figure 1: ANAs were placed in Thy 1-GFP expressing rats such that the growing axonal front shows green fluorescence, the most distal axonal front at 10 wks is indicated by the yellow arrow, the solid white line is the proximal coaptation and the solid red line is the distal coaptation. The hash marked red line indicates the graft suture line. These images show that the axonal growth front is inversely related to the length of the graft.

Figure 2: ANAs lack SCs and thus, require host SCs to populate the graft and support axonal regeneration. A) In small volume grafts, normal levels of host SC proliferation are sufficient to populate the graft. These SCs create a regenerative microenvironment sufficient to successfully reinnervate the target muscle. B) In large volume ANAs, the volume to be filled and the length for revascularization is so great as to create significant chronic cellular stress, resulting in SC senescence. The lack of a regenerative microenvironment prevents successful reinnervation.

Reconstructive Microsurgery - Mini Case Report

Hospital General "Dr. Manuel Gea González", México City, México.
Authors: Alexandro Aguilera, Javier López, Adriana Guerrero.

A 9-year-old patient suffered irreplantable amputations by a meat grater. He was received at our emergency department 10 hours after the accident.

(Fig. 1). He was taken to the operating room, where after debridement, we could preserve the first digit; the fifth digit had an intraarticular fracture at the PIP joint which was fixed with K-wires; and the second, third and fourth fingers were lost. Here is the immediate postoperative result.

(Fig. 2). Four months after the first surgery, a double second toe transfer was performed. Here is the postoperative result six months after the accident

(Fig. 3). He is now in a rehabilitation program, with a near normal range of motion and with no morbidity in the donator area. **(Fig. 4).**

Discussion

Severe hands injuries are less common in developed countries due to better working conditions and better safety measures. Nevertheless, in other parts of the world these severe injuries are common. The first contact physician must be trained to take the best reconstructive option, decide what must be preserved at all cost, and identify the damaged parts that need to be removed. In this case, we present a 9-year-old patient with a severe hand injury, which after the first surgery resulted in a metacarpal hand. We received him 10 hours after the accident making the second, third and fourth fingers no replantables. After the initial surgery we decided to performe a double second toe transfer taking in mind the idea of the "acceptable hand" described by del Piñal, which consists of a hand with three fingers with near normal length, with near normal PIP joint function, good sensibility, plus a functioning thumb.

As described by Fu-Chan Wei, selection of the toes to be transferred depends on the number of amputated digits and the level of amputation. The second toe is an ideal option for multiple finger reconstruction. A double second toe transfer performed in one stage surgery has the advantage to achieve better aesthetic and functional outcomes, better and faster adaptation to the reconstructed fingers, giving the patient the ability to recover fine manipulation, and with a good rehabilitation program even a powerful grip or a wide range of grasping.

Conclusions

The number of amputated digits and the level of amputations is the key element in determining the best reconstructive method. The selection and placement of the toes are key elements to successful reconstruction. In this case we present a double toe transfer as described by Fu-Chan Wei, which can be performed safely in young patients as a one-stage surgery with goof functional and aesthetic results. A good rehabilitation program is mandatory to achieve a near normal range of motion.

References

1: Severe Mutilating Injuries to the Hand: Guidelines for Organizing the Chaos. Francisco del Piñal. Journal of Plastic, Reconstructive & Aesthetic Surgery (2007) 60, 816-827.

2: Simultaneous Double Second Toe Transfer for Reconstruction of Adjacent Fingers. O. Koray Coskunfirat, Fu-Chan Wei, Chih-Hung Lin, Hung-Chi Chen, and Yu-Te Lin. Plastic and Reconstructive Surgery, April 1, 2005.

3: Aesthetic Refinements in Toe-to-hand Transfer Surgery. Fu-Chan Wei, Hung-Chi Chen, David Chwei-Ching Chuang, Seng-Feng Jeng and Chih-Hung Lin. Plastic and Reconstructive Surgery. September 1996.

4: Reevaluation of the Technique of Toe-to-Hand Transfer for Traumatic Digital Amputations in Children and Adolescents. Fu-Chan Wei, M.D., and Samir Mardini, M.D. Plastic and Reconstructive Surgery. December 2003.

Interesting Case

Radial to Ulnar Nerve Transfer to Restore Hand Intrinsic Muscle in the Case of Proximal Median and Ulnar Nerve Combined Injuriest

Division of Plastic Surgery, Washington University School of Medicine

Authors: Benjamin Z. Phillips, MD, Michael J. Franco, MD
Andrew Yee, BS, Ida K. Fox, MD, FACS

Background

Proximal ulnar nerve injuries result in profound dysfunction of the hand due to loss of intrinsic muscle function. Isolated proximal ulnar nerve injury has recently been treated with distal nerve transfer of the terminal anterior interosseous (AIN) nerve to the deep motor branch of the ulnar nerve to restore this critical function.[1,2] However, combined proximal median and ulnar nerve injuries pose a unique dilemma not amenable to this treatment strategy.

Case Description

An 18-year-old male presented with a significant upper extremity laceration and was found to have transection of the median and ulnar nerves just at the level of the elbow. The median nerve was repaired with interposition grafts, and the ulnar nerve was transposed and repaired directly.

Due to the length of the patient's arm and the proximal nature of the injury, a staged direct radial to deep motor branch of ulnar nerve transfer was performed in an attempt to restore some intrinsic hand function. Branches of the donor radial nerve (extensor indicis proprius (EIP), abductor pollicis longus (APL) and extensor pollicis brevis (EPB) branches) were transferred via a trans-interosseous membrane route and directly coapted to the distal deep motor branch of the ulnar nerve at the mid-forearm.

At one year post-operatively, the patient continues to gain extrinsic median and ulnar innervated function due to the direct nerve repairs. He has also recently begun to show signs of early intrinsic muscle reinnervation with ability to place and hold in the intrinsic plus position (flexion at metacarpal phalangeal joint with simultaneous extension at interphalangeal joints) and a twitch of first dorsal interosseous function.

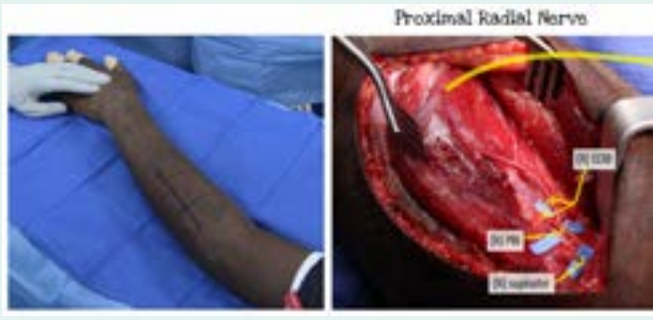
Conclusion

For proximal combined median and ulnar nerve injuries, distal redundant radial nerve (EIP, EPB and APL) to deep motor branch of ulnar nerve transfer via a direct coaptation may offer timely reinnervation of the hand intrinsic musculature. While a similar radial to ulnar type transfer has been described via use an interposition graft[3], we believe this is the first report of a direct coaptation (via tunneling through the interosseous membrane) and will allow for quicker recovery of this critical function. Tendon transfers may also be done (especially in cases of later presentation), but often require wrist fusion to allow for sufficient donor tendons in the case of combined injuries[4].

Significant motor retraining and physiotherapy will be required to optimize results. At this early time point, the patient still has significant clawing and weakness, but with time and motor reeducation, we hope that anti-claw static and other procedures will not be required.

Figure 1-initial injury and pre-transfer

Fig 2- Radial Nerve



Interesting Case - *continued from pg 12*

Fig 3- Radial Nerve distal branches

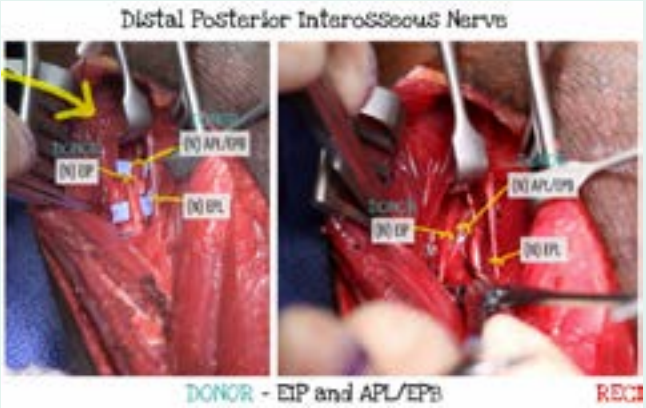


Fig 4- Ulnar nerve

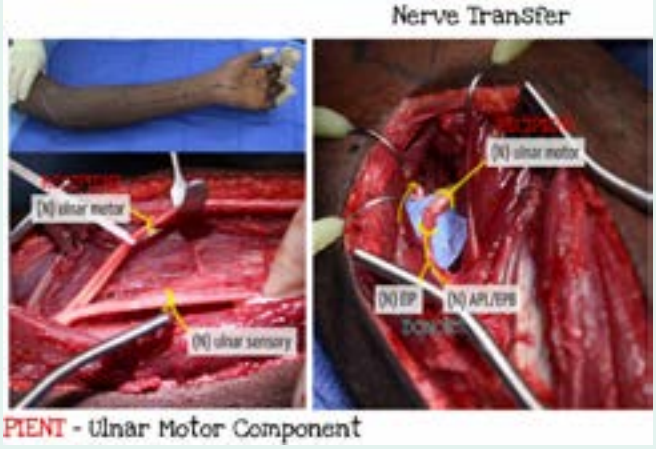


Fig 5- Early clinical results

Annotated Bibliography

1. Post R, de Boer KS, Malessy MJ. Outcome following nerve repair of high isolated clean sharp injuries of the ulnar nerve. PLoS One. 2012;7(10):e47928.

This article is a meta-analysis of proximal ulnar nerve repairs with attention to the outcomes of hand intrinsic function. The authors conclude that proximal ulnar nerve injuries likely would benefit from attention to procedures to improve distal intrinsic muscle recovery such as a distal nerve repair.

2. Novak CB, Mackinnon SE. Distal anterior interosseous nerve transfer to the deep motor branch of the ulnar nerve for reconstruction of high ulnar nerve injuries. J Reconstr Microsurg. Aug 2002;18(6):459-464.

This article describes use of a distal median (using the donor expendable pronator quadratus branch of the terminal anterior interosseous nerve) to ulnar nerve transfer. Coaptation to the recipient ulnar nerve deep motor branch is done at the distal forearm. Results are favorable with some restoration of ulnar intrinsic muscle function and no donor site deficits.

3. Tung TH, Barbour JR, Gontre G, Daliwal G, Mackinnon SE. Transfer of the extensor digiti minimi and extensor carpi ulnaris branches of the posterior interosseous nerve to restore intrinsic hand function: case report and anatomic study. J Hand Surg Am. Jan 2012;38(1):98-103.

This article describes a case report and anatomic study regarding use of radial to ulnar nerve transfers to restore ulnar intrinsic function in the case of combined proximal ulnar and median nerve injury. The authors use the extensor carpi ulnaris and extensor digiti minimi branches of the posterior interosseous branch of the radial nerve as the donor nerve. Transfer to the deep motor branch of the ulnar nerve is performed via subcutaneous tunneling about the ulnar aspect of the forearm. A 10 cm interposition graft was used.

4. Sammer DM, Chung KC. Tendon transfers: Part II. Transfers for ulnar nerve palsy and median nerve palsy. Plast Reconstr Surg. Sep 2009;124(3):212e-221e.

This article describes tendon transfer strategies for treatment of nerve injuries including combined ulnar and median nerve injuries. A wrist fusion is generally required and the priorities include restoring grip, pinch and opposition. The following tendon transfers can be performed: extensor carpi radialis brevis, brachioradialis or extensor indicis proprius to flexor pollicis longus for pinch; extensor carpi radialis longus to flexor digitorum profundus for grip; extensor carpi ulnaris or extensor indicis proprius to the thumb base for opponensplasty and then static anti-claw procedures can also be completed.

New Members January - September 2013

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Asha Cyriac, MD	India
Yener Demirtas, MD	Turkey
Ashwini Dash, MD	India
Edmund Ek, MD	Australia
Mohammed Hassan El-Fahar, MD	Egypt
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Babu Rao Ravuri, MD	India
Michel Saint-Cyr, MD	United States
Jesse Selber, MD, FACS	United States
Kumar M. Senthil, MD	India
Vinay Kant Shankhdhar, MD	India
Minoru Shibata, MD	Japan
Hiroo Suami, MD, FACS	United States
Chieh-Han John Tzou, MD, PhD	Austria
Alex K. Wong, MD, FACS	United States
Kyoung Moo Yang, MD, PhD	Korea
Jewel Raj Zachariah, MD	India

Candidate Applicants

Alexander T. Nguyen, MD	United States
Daniel A. Osei, MD	United States
Lars Johan Marcus Sandberg, MD	United States
Pankaj Tiwari, MD	United States

Membership News

NEW MEMBER BENEFIT TO BE LAUNCHED IN NOVEMBER!

As world leaders in reconstructive microsurgery, our collective expertise in the field is unparalleled. Our connection to each other is our most powerful resource.

We must do better to leverage this expertise and to strengthen our connections within WSRM. We need to embrace the power of our collective community by sharing critical WSRM news, celebrating our individual and collective accomplishments, sharing cases and engaging in didactic discussion, and making decisions together … all in real-time. This kind of visibility to each other and more globally will enhance the WSRM and the value we each derive from it.

We aren't able to accomplish these goals through e-mail, fax, or US Postal – and being global only exacerbates the need to look beyond these mechanisms for "community management".

forMD is a community management platform that helps medical associations and societies increase engagement, raise awareness and strengthen their relationships with their members. Numerous medical alumni programs and societies are using it now.

Through **forMD** we can add value to our membership at no cost to our members by cultivating relationships and community.

Soon you will receive notification from the Central Office and **forMD** on how to begin utilizing this tool and keeping connected!

L. Scott Levin, MD, FACS
President

WSRM Endorsement Microsurgery Seminars, Meetings & Workshops Worldwide

WSRM is making an effort to show its support of the various microsurgery activities and meetings that take place around the world. Please visit www.wsrm.net to view the endorsement guidelines. A formal request must be submitted addressing the guidelines stated and your qualifications. The WSRM will not endorse a meeting within the same region and within one year of the biennial congress. The WSRM will only endorse national meetings.

Mark Your Calendar

Future WSRM Congresses

2015 WSRM World Congress
March 19 - 22, 2015
Mumbai, India
www.wsrm2015.net

2017 WSRM World Congress
Summer, 2017
Seoul, Korea

2019 WSRM World Congress
Summer, 2019
Shanghai, China

Global Meetings*

*The posting of these meetings does not define the WSRM as a sponsor or endorser.

American Society for Reconstructive Microsurgery
January 11-14, 2014
Kauai, Hawaii
www.microsurg.org

57th Annual Meeting of Japan Society of Plastic and Reconstructive Surgery
April 9 - 11, 2014
Nagasaki, Japan
jsprs57@c-linkage.co.jp

25th Annual EURAPS Meeting
May 29-31, 2014
LACCO AMENO, Isle of ISCHIA (Na), Italy
http://www.euraps.org/meetings/

12th ESPRAS QUADRENNIAL MEETING: EDINBURGH 2014
July 6-11, 2014
Edinburgh International Conference Centre
www.espras2014.org

News from the Executive Council

2013 - 2015 Executive Council

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News from the Executive Council

2013 - 2015 WSRM Committee Roster

This is official notification to the membership of the members that have been appointed to serve in the standard committees of the WSRM. Please help us applaud those members who have volunteered their time to serve on a committee to better the organization.

Scientific Program Committee
Ashok Gupta, MD, Host Chairman
Amresh Baliarsing, MD
Samir Kumta, MD
Prabha Yadav, MD
Bijoy Methil, MD
Vinay Shankhdhar, MD

Membership Committee
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Raja Sabapathy, MD (India)
Peirong Yu, MD (USA)
Joon Pio Hong, MD (Korea)
Hung-Chi Chen, MD (Taiwan)

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William Pederson, MD (USA)
Marco Innocenti, MD (Italy)
Chih-Hung Lin, MD (Taiwan)
G. Balakrishnan, MD (India)

Constitution and Bylaws Committee
Milan Stevanovic, MD, Chairman (USA)
Batia Yaffe, MD (Israel)
Damien Grinsell, MD (Australia)
Katerina Vlastou, MD (Greece)
Michael Zenn, MD (USA)

Know someone who wants to become a member? The application process is simple, and applications can be obtained at www.wsrm.net and submitted via email, mail or fax to the Central Office. Applications are accepted and reviewed on a continual basis, so we encourage applicants to submit the information as soon as possible to start taking advantage of the membership benefits.

World Society for Reconstructive Microsurgery

Fall / Winter 2013 - Volume 4 / Issue 5

Purpose

The object of the Society shall be to stimulate and advance knowledge of the science and art of Microsurgery and thereby improve and elevate the standards of practice in this field of surgical endeavor. The Society shall be the highest medium of recognition in the field of Microsurgery as evident by superior attainment and by contribution to its advancement. It shall provide an international forum for the exchange of ideas and the dissemination of innovative techniques.

The WSRM Newsletter is published two times yearly for members of WSRM, a non-profit organization. Subscriptions are included in the annual membership dues. All correspondence, address changes, and news for upcoming events should be addressed to:

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