The MASSACHUSETTS GENERAL HOSPITAL SURGICAL SOCIETY Newsletter

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MGH SURGICAL SOCIETY REUNION 2011

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We hope you enjoy the reunion photos on this cover and on the back page of this issue. If you would like an electronic copy of any of the photos, please contact us.

Message from the Chairman Keith Lillemoe.

It is hard to believe that I have just completed my first 6 months as Chief of Surgery at the MGH. It is a tremendous honor to lead this fine department and it has been a real pleasure to get to know the outstanding people within the department and throughout the institution. Although I am still on the steep slope of my learning curve, I have already had the opportunity to experience a number of memorable events including the MGH 200th anniversary celebration, the recognition of the MGH as the second-ranked hospital in the US News and World Report, the opening of the Lunder Building, a state-of-the-art inpatient/outpatient facility, the Festschrift and dinner for Andy Warshaw, recognizing his retirement from clinical activity and 14 years as Chief and the MGH reception at this fall's ACS meeting. Another real pleasure was to participate in my first MGH Surgical Society Reunion in September. It was great for me to get to know so many of the alumni of our residency and fellowship programs. I so enjoyed hearing about your careers and recollections of your time at the MGH. A highlight of the event was the generous gift of Charles Ferguson and his family to recognize his father, Ira Ferguson and Les Ottinger by establishing an endowment to support resident education and encouraging other alumni to join them in building the fund. I certainly look forward to future meetings of the MGH Surgical Society and hope to continue to use this newsletter as an opportunity to update you on the ongoing activities here at the "General". I also hope that you keep in touch with us.

The last 6 months have been highlighted by a number of personal accomplishments for members of the department. Patricia Donahoe, the Marshall K. Bartlett Professor of Surgery has been recognized with the 2012 Society of University Surgeons Lifetime Achievement Award. Pat will be recognized at the Academic Surgical Congress in February of 2012. Carlos Fernández-del Castillo was honored by the MGPO with the Brian A. McGovern, M.D., Award for Clinical Excellence and by Harvard Medical School with the Charles J. McCabe, M.D. Faculty Prize for Excellence in Clinical Teaching Award as selected by the 2011 graduating class. Finally, the future is very bright as 2011 graduating Chief Resident, Harald Ott, currently a cardiothoracic fellow, received a prestigious NIH Young Investigator Award for his research in critical organ reengineering.

It has also been a time of transition beginning with the graduation of 9 outstanding senior residents in June who all have gone onto great fellowships. July saw the beginning of careers as MGH surgeons for 8 new surgical interns, who like their Chief of Surgery are learning both the MGH way of clinical practice and the history of this fine institution. We have also added 6 new surgical faculty – Peter Hedberg, Dante Yeh and Peter Fagenholz in Trauma, Emergency Surgery and Surgical Critical Care, Parsia Vagefi in Transplant, Suzanne Coopey in Surgical Oncology and Philip Chang in Burns, of which 3 are MGH alums. This September marked the retirement of Ashby Moncure from clinical practice and his move to Savannah, Georgia. His wisdom, encouragement and sound judgment will be missed by all. Finally the recent passing of one of the real surgical giants of the MGH, Dr. John F. Burke, has left a huge void at the institution.

The department has been very fortunate with respect to academic recognition with the naming of 4 new Harvard professorships. Two of these were gained through the transition of existing professorships to new recipients. Jerry Austen has transitioned to the Edward D. Churchill Distinguished Professor of Surgery and Andy Warshaw to the W. Gerald Austen Distinguished Professor of Surgery to allow Thor Sundt and myself to now hold these two prestigious Harvard professorships, respectively. Furthermore we have established the new Warshaw Family Professorship and the Robert L. Linton Professorship at Harvard Medical School with the new appointees being David Rattner and Rich Cambria, respectively. These changes have resulted in Harvard Professorships for the Chiefs of the Divisions of Cardiac, General, and Vascular Surgery. (Obviously it is our goal to have a HMS Professorship for all our divisions.). It is a particularly great honor for Rich Cambria as this comes during his year as President of the Society of Vascular Surgery, a position also once held by Dr. Linton.

The most important event however over these months has been the very favorable review by the Residency Review Committee for Surgery of the Department's General Surgery Residency. As you all are aware a few years ago, the program was placed on probation for work hour concerns. The efforts put forth by our new program director, Dr. John Mullen and his four associate program directors, Drs. Cristina Ferrone, Virendra Patel, Marc de Moya, and Dean Donahue as well as our Director of Surgical Education, Jenny Doyle, directed by Dr. Warshaw has more than addressed the deficiencies resulting in this outstanding review and an unprecedented 5-year cycle of approval. We are all very excited about this achievement, particularly as we move forward to the intern applicant process that begins this December. The results of the last several matches, despite the probation, have been outstanding and will set the bar high for the future, but I am confident that we will see the most outstanding applicants and successfully recruit the very top candidates to the MGH. There are still many challenges in surgical education, but I remain confident that this residency will always be a program of great pride both for the institution and for our alumni. We certainly encourage you to send the best candidates from your own academic institutions to look at our program. They will not be disappointed.

Finally, just a few comments about my vision for the Department in the future. We all know we are facing a very challenging time in surgery. Healthcare reform, decreasing reimbursement and a multitude of other yet unknown challenges are certainly coming. Yet it is clear that surgical quality, patient safety, and providing "value" in patient care will always be the prime determinants of a successful institution. For these reasons, the establishment of the Codman Center for Clinical Effectiveness in Surgery lead by Matt Hutter and with representatives of all the divisions, has put our department in a position where we will not only lead the way in defining surgical quality here at the MGH but for surgical specialties across the United States. We face challenges but we fully expect the MGH Department of Surgery to be the leaders in solving these problems.

I also remain optimistic about the future because of the quality of the leadership and the clinical and academic talent within our divisions and in our multiple sub-specialty programs. The best of clinical care, strong educational programs and the innovative clinical and basic science on-going at the MGH sets us apart from other surgical programs. Add this to the strong administrative team that we have assembled and I believe the department is well-positioned to tackle any challenge going forward. In closing, I feel very blessed to be the Chief of Surgery at the MGH and am extraordinarily excited about the future of the department and the MGH. I pledge to make you proud of your "home" institution.

Finally, I hope you will take the time to find a copy of the December issue of ***Annals of Surgery***. You will enjoy a paper authored by Greg Ruhnke and Andy Warshaw entitled "A most unusual patient at the MGH". I am sure it will bring back fond memories. Happy Holidays! ♦

Message from the President Denny Lund

July 1, 1980: I arrived at the MGH bright and early for the first day of internship – the greenest of the green. The MGH, Man's Greatest Hospital, and I was starting a surgical internship there. Boy, was I looking forward to that . . . and was I scared. I could calm myself a bit, though, because I wasn't really the greenest of the green; I had done 3rd year clerkships at the MGH, so I knew some of the players and how to get around. Along with the other interns, I received 7 short white coats, 7 pairs of white pants with button flies and 7 Nehru-collared shirts that snapped up the front. These were the surgical residents' unmistakable "toad skins," that made us all look like ice-cream deliverymen. Also, just to make sure I knew I was a "resident," I received a key to an on-call room, combination to a mailbox and instructions as to where the 10 o'clock meal was held.

My first assignment was to be the Blue Team intern on the West Surgical Service. Back in those days, the service was split into Blue, which included thoracic surgery patients, and Red, which included vascular surgery cases. Other patients were assigned based on when they came into the clinic or the Emergency Ward. I was really excited to start with this rotation because Charlie McCabe, with whom I rotated as a student and someone who had a profound impact on my decision to become a surgeon, was the West Chief. Also, it was the service on which I rotated as a medical student, so I already had loyalty to the West. Very soon into the rotation, Cam Wright, the Red Team intern, and I found that Charlie came loaded for bear. He wanted no mistakes and nothing overlooked.

I'm sure the first day of internship gives everyone indelible memories. Mine include 2 memorable patients: The first was a woman who had developed a disastrous complication of her abdominal wall after having had multiple surgeries. Her abdomen was covered with Marlex mesh and was granulating. Day 1 she had a fever. So after I drew blood cultures and a CBC and ordered a chest X-ray, I distinctly remember heading into the call room to consult the Washington Manual on the correct dose of acetaminophen. It was going to be a long 5 years. Before I left the service, we would remove the mesh and skin graft the huge hole left behind – a most interesting, and sanguineous, undertaking to be sure.

The other most memorable patient was a young man whom I shall call Mr. Chan (name changed to protect the innocent, among other things). Mr. Chan was an Asian refugee who had the misfortune of perforating a duodenal ulcer soon after coming to the US and prior to my arrival on the service. After a series of complicated operations, I inherited him with a number of sump drains coming out of his abdominal wall draining bile and pancreatic juices. He had been NPO on TPN for many weeks, but because of a recent fever, his central line had been removed. Much to my chagrin, at approximately midnight of my first night on call, the nurse called me to tell that his IV had infiltrated and she would need me to restart one for him. Remembering that my senior resident had told me to call him if I needed him, but to remember "it was a sign of weakness," I trundled off to start Mr. Chan's IV. He was a very nice young man, and I got to know him quite well over the ensuing 4 hours as I struggled and finally succeeded in threading an IV into one of his tiny, exhausted veins. Later during the rotation, I remember scrubbing on his amazing reconstruction in which Charlie McCabe and Andy Warshaw created a Roux-en-Y loop of bowel and sewed it to the tiny patch of duodenum that he had left which included his Ampulla of Vater. Needless to say, he had a stormy and complicated course, but I remember very well walking through the White lobby 8 months later and hearing someone yelling "Dr. Lund, Dr. Lund." It was Mr. Chan calling my name to tell me that he was about to leave the hospital for the first time in over a year.

Thirty-one years later, I am honored to be starting my term as the President of the MGH Surgical Society. I think that those of you who are reading this all feel the profound impact that the institution has had on us. This was brought back for me this past September, as we gathered for the MGH Surgical Society Reunion. Jo Buyske, Tom Dodson and Rich Cambria put together a remarkable program for the reunion that was a mix of work and presentations from many of our illustrious graduates as well as from current faculty in the Department of Surgery. This gathering included a celebration of the 200th anniversary of the establishment of the hospital and an introduction to the new Paul Russell Museum commemorating the history and many medical advances of the hospital. We also had an opportunity to honor Andy Warshaw for his tremendous service as outgoing department chairman and to greet Keith Lillemoe, the new department chairman. The future of the department has never looked brighter.

Finally, the reunion allowed us the opportunity to share the camaraderie we built during those years of residency. It was tremendous to see friends and faces from the past, and to relive the old "war stories," just as we did at the 10 o'clock meal. I'm looking forward to leading the Society, and hoping we can continue to forge bonds of friendship with our colleagues who share the heritage of training in Surgery at the MGH.♦

(left) Ashby Moncure on the occasion of his final retirement from the MGH after 51 years of service.

(right) (l to r) Roman DeSanctis, Jerry Austen, Bill Daggett and David Sachs at the dedication of the W. Gerald Austen, M.D. Inpatient Care Pavilion which includes 150 beds on 5 floors offering cutting-edge, patient- and family-centered care.

Rebuilding the human heart: First steps based on native matrix scaffolds Harald C Ott '11

Background

Heart failure is the leading cause of death and disability in the Western World. According to the American Heart Association, nearly 5 million people are in heart failure and about 550,000 new cases are diagnosed each year in the United States alone. The definitive treatment is heart transplantation; yet, donor organ shortage and the need for immunosuppression limit clinical impact and outcomes. As a result, each year 25-50,000 patients in the US die while waiting for a donor heart. Autologous tissue-engineered hearts stemming from a patient's own cells could potentially overcome all these hurdles by providing viable tissue grafts regenerated on demand, not requiring immunosuppressive therapy.

Functional myocardium consists of contractile cells embedded in an extracellular matrix (ECM) scaffold. On a whole organ level, this ECM scaffold outlines the skeleton of the heart including chambers, vasculature, valves, and myocardial fiber direction. Significant advances in the field of cardiac stem cell biology led to the identification of several potential cell types that could be used for cardiac regeneration. Furthermore, somatic cells can now be reprogrammed into induced pluripotent stem (iPS) cells that are genetically identical to the adult organism, thereby holding great promise for both the development of clinically relevant cell candidates. *In vivo*, these cells can give rise to all germ layers, including the germ line. *In vitro*, iPS cells have been differentiated into multiple cell types including cardiomyocytes. To date, iPS-derived cardiomyocytes have already been assembled to viable tissue i*n vitro*. Numerous previous approaches have engineered viable heart tissue, albeit not to the level of clinical application. Creation of myocardium beyond 200μm in thickness, however has been limited by an inability to create the ECM scaffolds necessary to support the high oxygen and energy demands of contracting cardiomyocytes.

As an alternative technology, we used native ECM scaffolds from decellularized whole cadaveric hearts to support the formation of >500μm functional myocardium via seeding and engraftment of fetal cardiomyocytes. In preliminary experiments, the resulting constructs contracted spontaneously, and responded to electrical, and pharmacological stimuli. Constructs developed an intrinsic rhythm, and generated minimal pump function. In order to move these promising results closer to translation, the next necessary steps are to generate ECM scaffolds of human size and to seed these with necessary cardiac precursor cells from human adult derived cells (i.e. patient derived cells).

Perfusion Decellularization – A Novel Approach to Generating Cardiac Scaffolds

Several milestones in myocardial tissue engineering have already been met, but the concept to engineering a whole heart for transplantation seems futuristic at best. Myocardial tissue formation requires growth conditions with imposed mechanical load, a suitable biological matrix for structural support, and electrical stimulation. Past endeavors have overcome these hurdles, and generated constructs resembling native myocardium (based upon force-length relationships, morphology, histology, and response to extracellular calcium and β-adrenergic agonists and antagonists). However, prior to the creation of an appropriate ECM scaffold with intact vascular and valvular architecture, tissue size has been dramatically limited due to requirements imposed by metabolic needs of cardiomyocytes: the growth of thick (>200μm) myocardium is dependent on an ECM scaffold with intact vasculature that allows for perfusion in culture and immediate reperfusion upon implantation.

Perfusion decellularization of solid organs and subsequent cell seeding of native organ matrixes is a novel approach to tissue engineering. In 2008, we first reported perfusion-decellularization as a technique to generate acellular whole organ scaffolds from cadaveric organs. In this approach, decellularizing agents were delivered via the organ's innate vasculature, and were thereby equally distributed across the entire thickness of whole organs. Applying physiologic perfusion pressures, decellularization solutions effectively permeate the tissue via arteries, arterioles and capillaries, and remove cellular debris via the venous system, thus minimizing scaffold exposure to decellularization solutions. We have successfully applied this technology to heart and lung, other groups have applied our technology to lung and liver. Perfusion-decellularization generates acellular ECM scaffolds with intact 3D anatomical structure and patent vasculature conduits, capable of re-endothelialization thereby enabling the regeneration of tissues of clinically relevant thickness. Decellularized heart scaffolds were found to be free of significant DNA content and nuclei, while retaining major ECM proteins (collagen I, III, laminin, fibronectin, and sulfated-glycosaminoglycans). Tensile strength testing of decellularized scaffolds revealed insignificant differences in membrane stiffness and preserved three dimensional mechanic characteristics of cadaveric tissue (fiber direction). In our early studies, decellularized scaffolds were successfully recellularized with aortic endothelial cells and neonatal cardiomyocytes to produce functional tissue (2% of adult heart). These results show that perfusion culture in organ specific ECM matrix scaffolds supports not only cell engraftment, but the formation of functional tissue that can be transplanted *in vivo*. Native ECM signals support cell differentiation, engraftment and the formation of functional tissue; preserved ultrastructure and vascular architecture allow for transplantation and immediate blood supply of newly formed three dimensional tissues.

As a first step towards clinical translation of this approach, we now apply the technology of perfusion decellularization to human hearts that were found unsuitable for clinical transplantation (**Figure 1**). In further experiments we then expose human scaffolds to biomimetic culture conditions, and repopulate them with adult derived human cells to achieve the formation of viable, and ultimately functional tissue (**Figure 2**). In parallel to optimizing scaffold and culture conditions, we try to derive the appropriate progenitor cell populations from induced pluripotent stem cells (iPS) derived from heart failure patients. It is our goal to define the ideal differentiation stage at which cells retain their regenerative potential while maintaining restriction to cardiac lineages.

Rebuilding the Human Heart – Translational Challenges

Perfusion-decellularized native cardiac ECM scaffolds theoretically allow regeneration at a clinically relevant scale by meeting cellular metabolic demands via intact vasculature, and maintaining native ECM-contained cues. Despite the early progress achieved by seeding small animal scaffolds with cardiac cells, and current experiments upscaling this approach to human size, a series of hurdles must be taken to enable translation to the bedside. Most regenerative efforts based on perfusion-decellularized whole organ scaffolds to date have been at the small animal scale, using cells of limited clinical applicability, and, aside of pancreatic tissue, showing only short time *in vivo* function. The first step in generating functional tissue that may be directly transplanted in humans is generation of

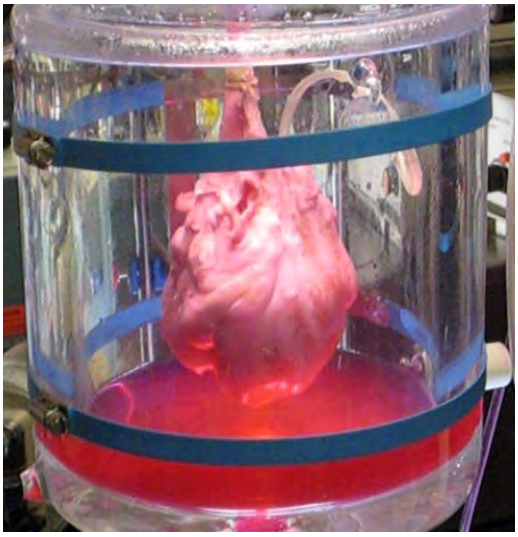


Figure 1. Perfusion Decellularization of a Human Heart. The ascending aorta is canulated, the heart is then perfused with decellularization and wash-ing solutions. Human heart before (left panel) and after (right panel) perfusion decellularization. Figure 2. Whole Organ Culture of Human Heart in a Bioreactor. Decellularized human heart mounted in perfusion bioreactor allowing for biomimetic culture conditions (perfusion, ventricular load, pacing). The left atrium and the ascending aorta are cannulated. The heart is exposed to physiological preload, afterload and intraventricular pressure and is electrically stimulated at 5–20 V.

perfusion-decellularized native ECM scaffolds using optimized protocols with well defined, reproducible endpoints. While we showed that perfusion-decellularization can be applied to porcine, primate, and human heart, lung, pancreas, and kidney, protocols need to be further refined, tailored to organ size, type, species, and donor characteristics (age, ischemia time, body surface area). The resulting scaffolds need to be of reproducible clinical grade, sterile, and preserved for further processing. Immunogenicity of decellularized native scaffolds must be carefully assessed in model systems closer to clinical reality. ECM proteins are among the most conserved proteins. As a result, decellularized ECM scaffolds (like bovine type I collagen) have been widely successful in therapeutic applications. Yet, decellularization may leave residual, or even create new antigenic epitopes. Should the use of porcine derived scaffolds be considered, species specific antigenic epitopes such as Gal have to be targeted. Currently available acellular native ECM grafts such as dermal derived biomeshes have outlined a research and regulatory pathway to successful development of clinically applicable grafts. Human donor tissue used for dermal matrix products and bone allografts are considered relatively safe, given stringent donor screening and graft processing that dramatically reduce risk of disease transmission, or pathogen contamination. The large-scale FDA-approved use of decellularized bone and dermal allografts proves that decellularization protocols can be scaled to clinical use and become available to a large number of patients.

Bringing scaffolds to clinical quality and scale is only one of many steps towards whole organ regeneration. To recapitulate the entire process of embryogenesis from single cell stage to organogenesis in the laboratory setting seems hardly realistic at the current stage of technology. It would require extensive culture periods to generate tissues of clinical size, a variety of tissues to enable cross talk, and lead to obvious ethical dilemmas. Native ECM scaffolds may offer a feasible shortcut from a stage of cell expansion to organ maturation, bypassing initial embryonic structure formation. In our early experiments, we observed that cells of late fetal developmental stages, committed to cardiac or pulmonary phenotypes engrafted onto native ECM scaffolds and formed functional tissue, thereby recapitulating more of a fetal wound healing process than true organogenesis. While ECM, spatial relationships and molecular stimuli shift rapidly in the early stages of embryonic development, the later fetal stages of organ maturation are better understood and easier to replicate. Mimicking this process by providing clinically relevant cell types of corresponding developmental stage and an environment of late organ development including mechanical load and growth stimuli may be a realistic approach. As cell fate is more committed at this stage, the risk of differentiation down a wrong path (e.g. fat vs. cardiac muscle) may be smaller. The ideal, clinically feasible cell source to derive committed progenitor cell populations has yet to be identified. Embryonic stem cells carry ethical and supply issues, and are immunogenic, thus of limited clinical value. Induced-pluripotent stem (iPS) cells are a logical alternative source to regenerate patient-specific tissues, although disease related mutations may have to be corrected. Creating the differentiated cell numbers required for regeneration of human-sized organs exceeds the current progenitor cell technology and poses significant challenges in phenotypic control on a large scale. Clinically relevant cells for organ systems such as the heart may be more readily available than others. We expect that many of the current efforts developing strategies for expansion and stemness (e.g. fibroblasts reprogramming that skip pluripotent progenitor stages and ES cell-derived protein-induced pluripotency) will deliver novel solutions applicable to organ engineering in the foreseeable future.

Conclusion and Outlook

Rebuilding a human heart based on perfusion-decellularized native ECM scaffolds holds great promise for patients suffering heart failure, but remains an ambitious, if not futuristic goal. However, work towards that goal will produce intermediate milestones, and will improve our understanding of stem and progenitor cell fate in cardiac development and disease. *(Ott continued on page 15)*

When the Stars and the Moon Align Claudius Conrad '11

I was honored when asked to write this article for our newspaper. But my initial excitement was soon eclipsed with mild anxiety: what the heck would I write about? We've already read in previous issues about the department's most pressing concerns, such as why they don't make residents as they used to, or why Dr. Warshaw collects chamber pots. What could possibly be left for me to say? Fortunately, the nightly incubation at MGH as the Churchill nightfloat in the sauna-tempered call room (heating hasn't been adjustable for a year now) provided the perfect opportunity to reflect upon my past five years here.

I considered telling you about those moments when Chris Fitzgerald, our revered OR nurse, managed to trump the nearly palpable frustration over the loss of pneumoperitoneum due to the not opened CO_2 tank (perceived 100 per cent of laparosocopy after 8PM) with her untouchable kindness to patients and almost pathological friendliness to us surgeons. I considered telling you why David Hasselhoff is an entertainment amateur compared to Dr. Shellito. But despite the role the aforementioned topics played in shaping my MGH experience, I came to the conclusion that I should write about the most defining aspect of my residency: change. Yes- I indeed mean change. At this moment you are probably wondering- Is this boy really an MGH surgical resident? We are well-familiar with aphorisms such as: "Two guys at MGH meet and one says to the other: *How do you change a light bulb at MGH?* The other one*: Change? What do you mean…*" However, despite our reputation for some inertia, I have observed and been part of surprisingly drastic changes in the Department of Surgery at the MGH. It is this change I would like to discuss.

The post-modern society that typifies the world outside of the hospital seems to be creeping its way in to the MGH. The middle ages were defined by a society driven by uniform religious beliefs. This slowly gave rise to the age of Enlightenment and the Renaissance era, where the belief in mankind and his/her powers set the cultural tone. Industrialism and the dichotomy between the socialist and the capitalist world defined late modernism. Today we live in a post-modern society, its defining feature being that there is nothing defining it. There are no unifying concepts in art or philosophy and every aspect of society is subject to constant challenge.

So you will be surprised and maybe even shocked to learn that what took Western Europe about 1000 years is something I have witnessed in the last 5 years here at the Massachusetts General Hospital. Indeed, the MGH has now fully embraced a post-modernistic philosophy, where every aspect of what seemed to be here to stay (forever) is now constantly questioned, challenged and changed. The list is endless: the super chief, work hours, resident autonomy, women in surgery, fellowships, the educational program and its director, and most recently, the commander in chief. Oh yes, not to mention the sterile linen draping in the OR: For those of you who haven't been here for some time, let me fill you in: we do have paper drapes now. That should make you realize, the culture of surgery has indeed changed at the MGH.

Naturally, the question then becomes: are things worse, are things just different or are we looking at change for the better?

I came to MGH in 2006 from the Department of Surgery at the University of Munich, which hosts its annual departmental bonding experience at Oktoberfest – and believe me when I tell you that people really bond after 4 liters of beer. At first sight it seems that there is no reason to leave. However, even across the Atlantic it is well know that the best surgical training in this solar system can be obtained only at the MGH, so I reluctantly traded my Lederhosen for the light blue pajamas people here at MGH wear to work. In retrospect, however, I will say that the moon and the stars truly aligned for me to receive this blessed opportunity in June of 2006 – when Jason Hall was the super chief and the Churchill Service was still the Churchill Service. I soon discovered that the residents at MGH were strikingly different from those in Germany, and I was immediately impressed by their confidence and technical skills as well as how highly valued their opinions were by MGH staff.

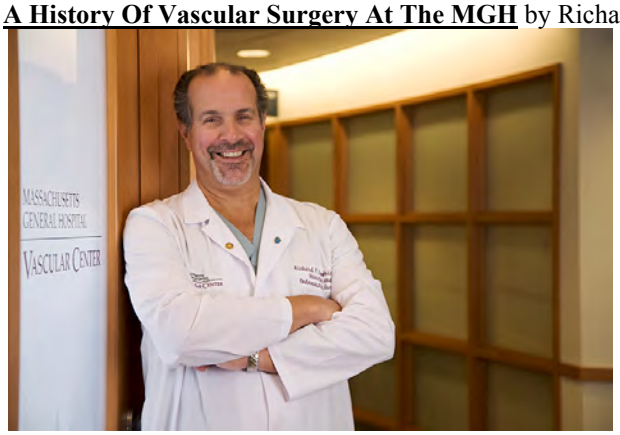
A year later there wasn't a super chief anymore and the Churchill Service commenced on its transition to becoming an acute care surgery service, focused on teaching and delivering high level, evidence based trauma and emergency surgery. Some feel that this process, compounded by the litigious environment of modern-day healthcare, has eroded the autonomy that is a prerequisite for the independent surgeon's training. It has been said that growing into autonomy as a surgeon has shifted from residency into fellowship.

Although I can now acknowledge that one can't get a 120h-work-week-experience in an 80h work-week, I realize that the complexity of surgical knowledge and technique required today has furthered the necessity of subspecialty training. The fact that all graduating residents seek fellowship training aptly reflects this reality of surgical practice today. Therefore, during my third year here at MGH the department added some new fellowships to our repertoire, including having the surgical oncology fellow not only train at the other fairly large hospital of the Partners System (aka "The Women's Hospital"), but also at the MGH. During my fifth year (5 years of checking amylase and lipase levels postoperatively), I found this surgical oncology fellow scheduled to do a couple of Whipples with Dr. Fernandez during my time on the pancreas service. I am glad I resisted my initial inclination to booby trap Dr. Mullen's and Dr. Tanabe's cars for making me share those Whipples. On the cusp of beginning my own oncology fellowship here, I cherish the opportunity to learn surgical oncology from our world-renowned surgical staff, the hard working residents, the competent and caring nurses, and the inquisitive medical students.

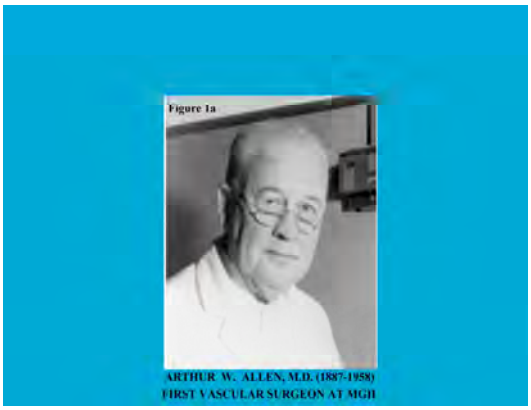
What I learned from my platoon leader during my draft in the German military holds true for the MGH: Adapt or Die. Compared to the 200 years that this hospital has been alive and strong, I have spent very little time at MGH; but even in these few years I have experienced drastic changes to the educational program, the departmental structure and the gender demography of the staff under the prescient leadership of Dr. Warshaw that have prepared us well for the future. Meanwhile, what hasn't changed is the belief in excellence in patient care, creativity in research and training leaders in surgery. Sticking to these values has served the MGH community well over the past 200 years and will be paramount to winning the future.

Our new Department Chair, Dr. Lillemoe, has arrived with a well-earned reputation as an expert pancreas surgeon and researcher, approachable department chair and tireless resident advocate. He has a difficult job ahead as the industry knows how difficult it is to improve a process from an efficiency level of 90-95%. In order to face the challenges in healthcare reimbursement, surgical education, national and international research competition, and transparency in surgical effectiveness, we need to continue to adapt, improve, refine and optimize, while sticking to those values that have made us the best hospital in this solar *(Conrad continued on page 15)*

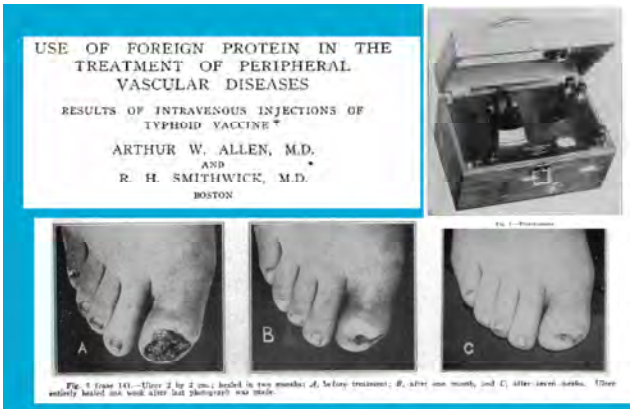
A History Of Vascular Surgery At The MGH by Richard P. Cambria '84



The history of Vascular Surgery at the MGH begins with the vision of the first modern chiefs of surgery, namely, Edward P. Richardson and immediately thereafter, Edward D. Churchill, to establish a department where surgical science and innovation would have an equal footing with expert clinical care. Accordingly, one Arthur W. Allen, having displayed interest, critical observations, and academic contributions to both arterial and venous problems, was appointed by Richardson as chief of the vascular clinic at the Massachusetts General Hospital established in 1928. This was the very first clinic of its kind in the United States because it was run entirely by surgeons. Allen gathered around him a group of bright young surgeons, including Leland McKittrick, James C. White (the first neurosurgery chief at MGH), Reginald Smithwick and Henry H. Faxon. Robert Linton, upon his initial appointment to the surgical staff, joined the clinic in 1931, but it was some time before he would actually have the title chief of the vascular clinic which did not occur until 1946 when Churchill had little alternative other than to appoint this rising star who had by that time a national reputation in the treatment of venous disease.



Arthur Allen or "Jimmy" as he was known to friends, near as I can tell from my review of history, Dr. Rodkey's and Dr. Welch's biosketches, and conversations with people like Dr. Russell who actually worked with him, was a surgeon for all seasons. (Figure 1A). He was born in Kentucky in 1887 and came to the East Coast to matriculate at Johns Hopkins Medical School from whence he graduated in 1913. Claude Welch recounts, in his history of the MGH, that Dr. Allen embodied a Renaissance man sort of persona, being a strict Christian, yet at the same time possessed of a magnificent physique and love of the outdoors and people. He took an internship at the MGH because he decided that patients in Boston Hospitals were "treated by the staff with more human interest than in some other areas". Interestingly, his humanistic background set the stage for a transformation in the perception of the surgeon to both his patients and his trainees. He embodied elements of humanism and kindness when the norm as he came into practice was the surgeon as a Dilettante and aloof prima donna. The men who began vascular surgery at the MGH viz. Arthur Allen and his protégé, Robert Linton, brought intensity, compulsiveness, and absolute demand for excellence to the care of their patients. Arthur Allen was said to tell his trainees that "a surgeon who did not wake up at 2 a.m. and worry for an hour about his patients did not deserve to be a surgeon". Allen was a surgical scientist of the highest order and his interest spanned the spectrum of surgical physiologic problems including peripheral vascular disease. After organizing and leading the vascular clinic at the MGH, he went on to be chief of the east surgical service from 1936 – 1948. His clinical contributions to surgery were many and he wrote of everything from peptic ulcer disease to toe gangrene. Depicted in Figure 1B was his report of 25 patients with advanced arterial insufficiency treated with typhoid vaccine (to engender collateral development) which was reported to the AMA in 1928, i.e. the year the MGH Vascular Clinic was organized. His clinical observations on the frustrations of watching young women expire from postpartum pulmonary embolism began the study of venous disease and thromboembolism. This led to some of the first direct vascular surgery operations at the MGH, mainly interruption of the superficial femoral vein for the prophylaxis of pulmonary embolism, the first such procedure being performed in 1937. Allen credited his fellow Bostonian, John Homans for suggesting the concept in an article published in 1937. Allen summarized the MGH experience with femoral vein ligation in 202 patients in a paper read before the American Surgical Association in 1943. (Figure 2) This again established MGH surgeons as leaders in vascular disease management; approximately, 65 years later, Chris Kwolek of our division would introduce bedside intravascular ultrasound-guided placement of inferior vena cava filters to the MGH!

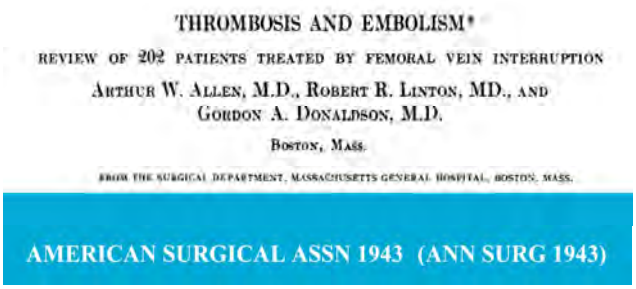

USE OF FOREIGN PROTEIN IN THE TREATMENT OF PERIPHERAL VASCULAR DISEASES

RESULTS OF INTRAVENOUS INJECTIONS OF TYPHOID VACCINE*

ARTHUR W. ALLEN, M.D.
AND
R. H. SMITHWICK, M.D.
BOSTON

Figure 1B: Arthur Allen's 1928 publication on the use of typhoid vaccine to engender healing of ischemic toe ulcerations. Many of the patients had what is known today as Buerger's Disease; note the plate of the potentiometer to follow changes in circulatory status.

THE PROPHYLAXIS OF PULMONARY EMBOLISM


THROMBOSIS AND EMBOLISM*

REVIEW OF 202 PATIENTS TREATED BY FEMORAL VEIN INTERRUPTION

ARTHUR W. ALLEN, M.D., ROBERT R. LINTON, M.D., AND GORDON A. DONALDSON, M.D.

BOSTON, MASS.

FROM THE SURGICAL DEPARTMENT, MASSACHUSETTS GENERAL HOSPITAL, BOSTON, MASS.

AMERICAN SURGICAL ASSN 1943 (ANN SURG 1943)

Given his keen interest in venous thromboembolism and his recognized national position therein, Arthur Allen was amongst a group of several prominent surgeons who held a meeting in December 1945 at the meeting of the Southern Surgical Association in Hot Springs, Virginia. This group included men like Arthur Blake- *(Cambria continued on page 8)*

(Cambria continued from page 7) more, Benjamin Brooks and J. Ross Veale (then a protégé of Alton Ochsner); they agreed to convene an organization meeting the following year to found a surgical society devoted to the management of problems of the circulatory system. The Society for Vascular Surgery was thus founded in July 1946 at the Fairmont Hotel in San Francisco and those in attendance at the founding of the SVS included Michael DeBakey, Alton Ochsner, and one Robert R. Linton. The first annual meeting was scheduled for June 1947 and Dr. Arthur Allen presided over the scientific program of this initial meeting; Robert R. Linton had the distinction of the reading the very first paper at the inaugural meeting (entitled "Postthrombotic states of the lower extremity; treatment by superficial femoral vein interruption and ligation and stripping of long and short saphenous veins). Thus the Massachusetts General Hospital figured prominently in the early days of the Society for Vascular Surgery as did other Bostonians. At the very first meeting, Robert Gross of the Children's Hospital delivered a paper on "Surgical Treatment of Coarctation of the Aorta." Gross would influence the evolution of MGH vascular surgery since he and Linton were close friends. In fact, Linton was initially appointed to the staff in 1931 with a specific charge from Churchill to develop pediatric surgery, which at the time meant pediatric cardiovascular surgery. Following Gross's pioneering work at the Children's Hospital, first with ligation of a patent ductus in 1937 and then direct surgical repair of an aortic coarctation in 1945, Linton performed the first blue baby operations at the Massachusetts General Hospital in the mid 1940's. In 1948 Arthur Allen, as the second president of the SVS, delivered his presidential address on "present evaluation of the prophylaxis and treatment of venous thrombosis and pulmonary embolism." At the time his title was Chief, East Surgical Service. Thirty-seven years later I would be pleased to be called Chief Resident of the East Surgical Service. After retirement from active clinical work around 1950, Arthur Allen held numerous position of honor in surgery including Chairman of the Board of Regents of the ACS. He died at the Phillips House in 1958.

There is general acknowledgment that it was the massive presence of Bob Linton that established the MGH as a leading center in the emerging specialty of Vascular Surgery. By the time Linton would deliver the ninth presidential address before the Society for Vascular Surgery as its president in 1955, the dawn of modern arterial reconstructive surgery had begun. Dr. Linton's interest in vascular surgery was piqued when, as a third year college student, he observed a varicose vein operation performed in Scotland and commented that he found it rather crudely executed. Born in Scotland of a physician father in 1900, Linton grew up in the Puget Sound area of Washington State, graduating from the University of Washington and matriculating at Harvard Medical School in 1926. His interest in surgical physiology began during his medical school days working in the HMS physiology laboratory of Walther B. Cannon. Linton began his internship at the Massachusetts general Hospital in 1927 and came under the influence of E.P. Richardson whom he adored. His exact words were "it was of utmost value to assist the chief of the surgical services, Dr. E.P. Richardson from whom I learnt a great deal of surgical technique and how to be a surgeon under stress." Just as Richardson invited him to join his practice, EP was disabled by a devastating stroke; but Churchill, recognizing the talents of the young man, offered Linton a position on the staff to develop pediatric surgery and perhaps was surprised when Dr. Linton accepted his offer. The year was 1931 and Arthur Allen had already established the vascular clinic immediately inviting Linton to join. This was an era of intense competition for surgical cases and Linton looked for an area to establish a reputation that was of no interest to others. Given what he witnessed at age 19 in the form of a rather shabbily performed varicose vein operation, Linton knew that he could do better. Given the poor surgical results at the time, the primary treatment of varicose veins was injection sclerotherapy because fears of streptococcal wound infection had curtailed a direct surgical approach for venous problems. Dr. Linton swung the pendulum back in the other direction and because of meticulous aseptic technique was able to establish surgical stripping of the veins as the preferred treatment. Thus began his interest and research in lower extremity venous disease, chronic venous insufficiency, the postthrombotic syndrome, and the development of the Linton flap operation. His landmark publication in 1938 in the Annals of Surgery, describing successful results of 50 operations laid the foundation for our understanding of venous physiology in the lower extremity. (Figure 3). Although the Linton flap operation is no longer performed, interruption of incompetent perforating veins remains a surgical standard irrespective of the technical means by which it is performed. Accordingly, Dr. Linton's reputation as a vascular surgeon was already established by the 1940's and the coming of World War II presented an opportunity for academic advancement. Linton's asthma exempted him from military service and Arthur Allen had become ill with lymphoma. Consequently, Leland McKittrick assumed the chief of the peripheral vascular clinic in 1940, but McKittrick subsequently took his practice across town (to the Deaconess Hospital) and Linton was appointed chief of the vascular clinic in 1946. The same year, Linton took on one, Irad B. Hardy as an "apprentice" for specialized training in vascular surgery and near as I can tell this was the very first vascular fellow ever trained in the U.S. Linton was convinced of the value of postgraduate training and said "if a surgeon wishes to specialize in vascular surgery, he should take additional training in this field after he has had basic training in general surgery. I find that many major vascular reconstructive procedures are difficult and time consuming to perform, but how much more difficult they become when some poorly trained surgeon has attempted the procedure sometimes even two or three times and failed." After a sometimes contentious posture over the past 25 years there now exists a join statement from the SVS and the American Board of Surgery that approved fellowship training is required for the practice of vascular surgery.

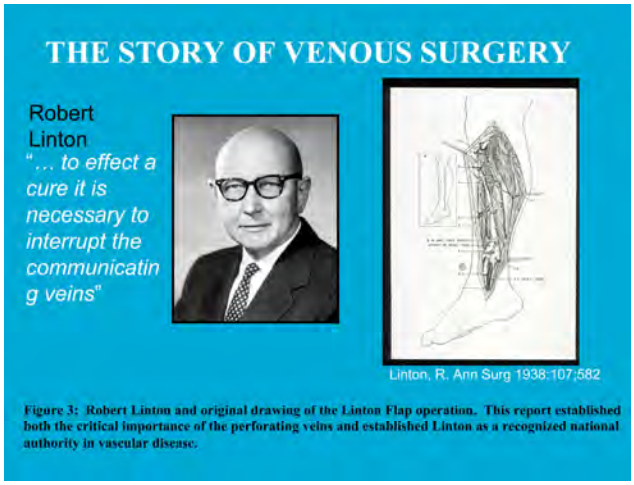


Figure 3: Robert Linton and original drawing of the Linton Flap operation. This report established both the critical importance of the perforating veins and established Linton as a recognized national authority in vascular disease.

So as the golden age of direct arterial reconstruction began around 1950, Linton's presidential address to the SVS in 1955 was actually the first of the prior eight presidents to deal with direct arterial reconstruction. Linton began *(Cambria continued on page 9)*

(Cambria continued from page 8) direct repair of aortic aneurysm at the Massachusetts General Hospital in the mid 1950s. Prior to this, the technique of intrasaccular wiring of aneurysms in an attempt to induce thrombosis was the only mechanical way to treat such lesions. The very first regional report of a successful series of direct repair of aortic aneurysms was reported by Linton in the New England Journal of Medicine in 1960. The operative mortality rate of nearly 10% would fall substantially over the next decade; successful treatment of aortic aneurysm was now a reality. A little less than 40 years later, aneurysm surgery would once again experience an epiphany with Juan Parodi's initial report (1991) of endovascular repair of abdominal aortic aneurysm (EVAR). This approach was considered so radical at the time that then stogy editor of the Journal of Vascular Surgery – D. Emerick Szilagyi – refused to permit its publication in the Journal of Vascular Surgery and thus it appeared in a second tier journal. A few years later, Dr. David Brewster would perform the first EVAR in New England at the Massachusetts General Hospital in 1994.This technology has matured to the point that today, 80% of abdominal aortic aneurysm repairs at the MGH are carried out with the EVAR method, and again the MGH was the regional leader in the march to EVAR; Dr. Brewster summarized the first decade of our experience in nearly a thousand patients in a paper presented before the American Surgical Association in 2006.

Linton performed the first MGH vein autograft to reconstruct lower extremity arterial circulation after resection of a popliteal aneurysm in 1950. Multiple sources verify the fact that a visiting English surgeon by the name of Frank Cockett at vascular rounds suggested to Dr. Linton that John Kunlin's technique of end to side anastomosis was the preferred arterial reconstructive technique. Linton then adopted the saphenous vein femoral popliteal bypass (vs. long segment endarterectomy) as the preferred reconstructive technique for lower extremity arterial occlusive disease and was the first American vascular surgeon to champion this approach. Subsequent presentation and publication of his results in nearly 300 patients, as presented to the Society for Vascular Surgery in 1967, established a standard of successful and durable arterial reconstruction that has been surgical dogma for the ensuing 50 years.

While he was not the first to perform a portosystemic shunt for the treatment of esophageal variceal bleeding, Linton's splenorenal shunt operation (first performed in 1946) along with his modifications of the Sengstaken-Blakemore tube were important advancements and became standard therapy for 30 years in the management of variceal bleeding surgery.

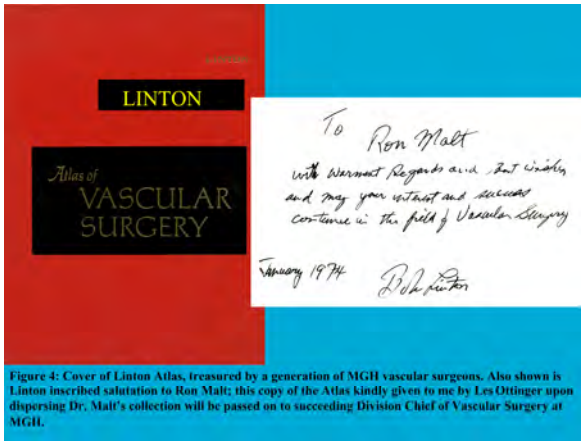
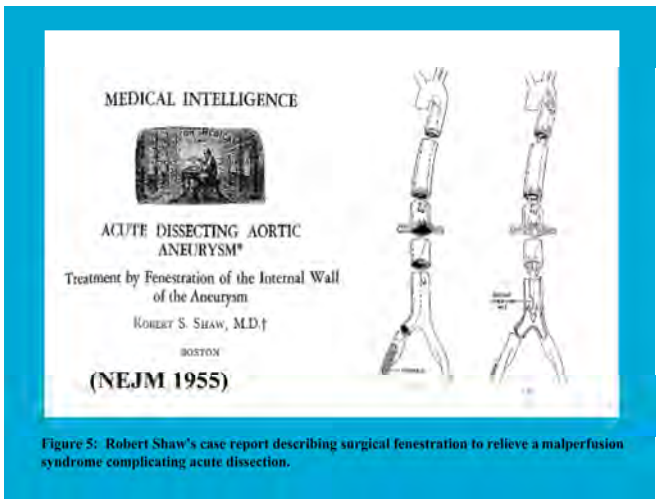


Figure 4: Cover of Linton Atlas, treasured by a generation of MGH vascular surgeons. Also shown is Linton inscribed salutation to Ron Malt; this copy of the Atlas kindly given to me by Les Ottinger upon dispersing Dr. Malt's collection will be passed on to succeeding Division Chief of Vascular Surgery at MGH.

A decade in the making, Dr. Linton published his monumental Atlas in 1973, the year I graduated from college. A generation of MGH vascular surgeons would treasure their inscribed copies (Figure 4). In the same year 1973, now 42 years into surgical practice and yet a vibrant surgeon, the Lintons were in a serious car accident returning to Boston from Isle au Haut in Maine. Dr. Linton, who suffered serious injuries, would never recover, and died in 1977, the year I began and remains the secret of success in Vascular Surgery; the reader is referred to Bruce Cutler's wonderful recounting of the legacy of Robert R. Linton's history and contributions, delivered as Dr. Cutler's 20th Presidential Address before the New England Society for Vascular Surgery (J Vasc Surg 1994;19:951-63)

The sleeper in this story is Robert S. Shaw who I have referred to as "the forgotten genius of Vascular Surgery at the MGH." Shaw was a contemporary of Dr. Linton. He established a homograft bank at the Massachusetts General Hospital in 1953 and in the early days of arterial reconstructive surgery, this conduit was the one used for replacement of the aorta and more distal vessels. Eventually, surgeons would learn that homografts were subject to rapid aneurismal degeneration and thrombosis; however, with cryopreservation and the like, they have a role in both central and peripheral arterial reconstruction even today. Shaw was a man of varied interest and keen surgical abilities. I first discovered his contributions in the course of study of acute aortic dissection and in the debate about different surgical approaches for abdominal aortic reconstructive surgery. In 1955, Shaw published a case report in the New England Journal of Medicine, describing the surgical fenestration operation to relieve malperfusion syndrome in a patient with acute type A dissection. (Figure 5). Although the patient did not survive, an important surgical principle was established; in some of our subsequent clinical series of aortic dissection, the role of first surgical and then endovascular fenestration is recognized as an important treatment adjunct. Massachusetts General Hospital surgeons have been the dominant voice in aortic dissection in the world of vascular surgery. I should like to think that this tradition in the study and treatment of aortic dissection carries on today; Dr. Mark Conrad and I have authored the chapter on aortic dissection in the just published seventh edition of the Rutherford Textbook of Vascular Surgery. In addition our division has led national clinical trials in the use of TEVAR for complicated Type B dissections. Jerry Austen described the double-felt sandwich technique for aortic anastomoses in acute dissection (1967); our paper on the importance of aortic branch compromise in acute dissection (1988) has been cited among the 100 most important works in the history of vascular surgery.


MEDICAL INTELLIGENCE

ACUTE DISSECTING AORTIC ANEURYSM*

Treatment by Fenestration of the Internal Wall of the Aneurysm

ROBERT S. SHAW, M.D.†

BOSTON

(NEJM 1955)

Figure 5: Robert Shaw's case report describing surgical fenestration to relieve a malperfusion syndrome complicating acute dissection.

Shaw was the first to describe surgical treatment of both embolic and occlusive disease of the superior mesenteric artery (1958). He described the oburator foramen bypass (1962) which is in our surgical armamentarium even today when *(Cambria continued on page 10)*

(Cambria continued from page 9) infection about the groin prohibits anatomic reconstruction of the lower extremity. He was the first MGH surgeon to champion the retroperitoneal approach for aortic reconstruction and his paper on this method, published in 1961, was important to us when we designed a randomized, prospective study of the surgical approaches for abdominal aortic reconstruction. Across the country and the world today, a left flank retroperitoneal approach is one of the main stays of open aortic surgery. Shaw's other important contributions included early work on the cardiopulmonary bypass pump with Jerry Austen; he was the "vascular man" on the team that Ron Malt led in the celebrated 1962 world's first arm re-implant. Despite these innovative vascular surgical advances, Shaw's career was sadly curtailed by polio and other illnesses in the mid 1960's such that he never achieved regional or national standing or a position of leadership in vascular surgery.

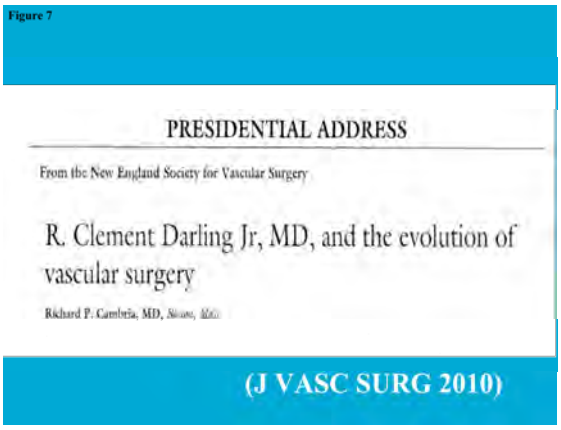
Figure 6

R. CLEMENT DARLING, JR., M.D. (1927-1999)

Clem Darling was my first teacher of vascular surgery, and my professional grandfather. (Figure 6). His contributions to vascular surgery and his stewardship of his pupils created the foundation for the favorable evolution of our specialty and our practice that flourishes today. While Linton began Vascular Surgery in New England at the MGH, it remained for Dr. Darling to both perfect this new specialty of arterial reconstructive surgery and demonstrate and document the safety, efficacy and long-term results thereof. Furthermore, his contributions transformed Vascular Surgery from a series of technical procedures to correct specific problems, to a specialty with comprehensive cognitive, diagnostic and therapeutic mastery of vascular disease. This was an enabling force for the evolution of our specialty when transforming ideas like endovascular therapy subsequently appeared.

My career at the MGH began as a sub-intern on vascular surgery in September of 1976. When I joined Dr. Darling's service, I discovered the specialty that seemed to suit me so well, as the vascular surgeon was the expert in the diagnosis, clinical decision making, and execution of the surgical treatment of the patient afflicted with vascular disease. As I began internship I was committed to a career in Vascular Surgery. Dr. Darling gave me an autographed copy of the "Haimovici's Textbook of Vascular Surgery" and wrote to me after my sub-internship that he had "reported on my good behavior to those who matter around here, (Austen and Ottinger)." Thus, my matriculation on the surgical house staff at the MGH, I attribute to Dr. Darling. Clem Darling was a complex individual. He brought the same intensity, perhaps even reckless abandon, to his career in surgery as he did to his service in the Marine Corps. He would be working on academic projects at 4 AM because it would be the only time to avoid interruption. This same intensity worked to the benefit of his patients and sometimes to the suffering of his colleagues and trainees. He did not suffer fools, and he care little for what we would refer to today as "political correctness." His advice on risk stratification to his patients was sometimes delivered harshly, refusing to consider operation until the patient lost 40 lbs or admonishing a patient that obesity doesn't come from breathing the air; or the occasion when making rounds and using a half-full urinal to douse a patient's lit cigarette! Imagine my trepidation as a 4th year medical student in walking into the operating room of this lofty Bostonian with the more-lofty sounding name of R. Clement Darling Jr. I was, of course, delighted to find Dr. Darling anything but aloof. He was irascible, irreverent and he had a genuine penchant for the politically incorrect. Accordingly, I was immediately attracted to him.

Figure 7

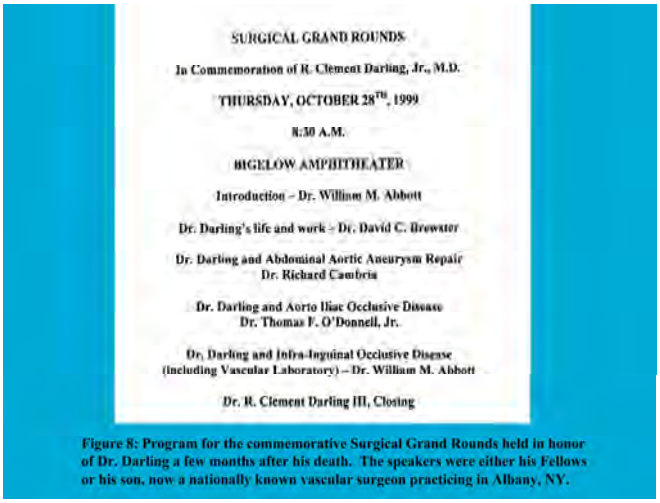


Recently I had the opportunity to recount the contributions of Dr. Darling in the form of a presidential address before the New England Society for Vascular Surgery (Figure 7). Dr. Darling taught the mastery of the total disease process afflicting the vascular surgery patient and the absolute insistence that a practicing vascular surgeon should be totally familiar with the pathology, the disease process of atherosclerosis, pathophysiology, all of its clinical manifestations, and yes, complications. This tradition enabled the appropriate evolution of our Division and our specialty to that of "Vascular and Endovascular Surgery." Linton and Darling were, in fact, innovators in endovascular as well as traditional open vascular surgery, in that they established diagnostic arteriography. It was not until the early 1970's that they relinquished same to radiologists.

Clem Darling was born in California, but spent most of his formative years in Southeastern Massachusetts. As a young boy, he grew up on the Laneway Farm in Taunton, Massachusetts, owned by a Dr. Gamble, who was a Harvard Chemistry Professor; the farm was managed by Clem's father. His was a boyhood of hard knocks and hard work, and despite the Harvard connection at the farm, or perhaps because of it, by age 18, Clem had joined the US Marine Corps in the waning days of World War II. He served in the Far East, one time being hospitalized with malaria in China. He wrote to Clem Hiebert, who would subsequently introduce him for his Presidential Address before the NESVS, that his experiences in a military hospital surrounded by maimed, war-wounded soldiers was the thing that piqued his interest in medicine and surgery. He was only 18 at the time, and the impact was profound. His own words were "particularly to see how mutilated one can be and live, and yet at the same time to see how well one can look and yet die." He was decorated for his work in the Far East and was honorably discharged as a First Lieutenant in the Marine Corps; this facet of his life was both a source of great pride for Dr. Darling *(Cambria continued on page 11)*

(Cambria continued from page 10) and offered a perspective of life, I can perhaps simplify, that as a no-nonsense, get the job done approach that would forever influence his professional career. He was no academic star during his undergraduate years at Boston University, and he relates that he was finally accepted at the Boston University Medical School only the day before classes started! However, in 1953, he would graduate first in his medical School class and become the first Boston University Graduate to ever be accepted as an intern at the MGH. His initial introduction to cardiovascular disease was during a stint working in pathology with Dr. Robert Gross at the Children's Hospital. Indeed, the very first paper on Clem's CV was a study of 17 cases of total anomalous pulmonary venous drainage published in 1957 with Dr. Gross, as he finished residency. More than 20 years later, at the time of Dr. Darling's NESVS Presidency, Dr. Robert Gross would acknowledge Clem's appointment making him an honorary member of the New England Society for Vascular Surgery.

In 1958, appointment to the Super Chief Resident was the aspiration of all MGH surgical residents. However, Dr. Churchill, "with a wink in his eye," said Dr. Darling was "too good technically to be the Chief Resident," and appointed George Zuidema to this position. This was, in fact, fortuitous, since Churchill called one Michael DeBakey, facilitating the appointment of Dr. Darling as Chief Resident in Thoracic and Cardiovascular Surgery under DeBakey in Houston from 1958 – 1960. This, of course, was the proverbial "golden opportunity" as Darling worked directly with DeBakey, Cooley and E. Stanley Crawford who had recently joined Dr. DeBakey's faculty after completing the Chief Residency at the MGH in 1955. The era was apocryphal, being the virtual origin of direct arterial reconstruction, in particular, for aortic disease. Thereafter, Dr. Darling joined Linton in practice in 1960 and the rest, as they say, is history.


SURGICAL GRAND ROUNDS

In Commemoration of R. Clement Darling, Jr., M.D.

THURSDAY, OCTOBER 28TH, 1999

8:30 A.M.

BIGELOW AMPHITHEATER

Introduction – Dr. William M. Abbott

Dr. Darling's life and work – Dr. David C. Brewster

Dr. Darling and Abdominal Aortic Aneurysm Repair
Dr. Richard Cambria

Dr. Darling and Aorto Iliac Occlusive Disease
Dr. Thomas F. O'Donnell, Jr.

Dr. Darling and Infra-Inguinal Occlusive Disease
(Including Vascular Laboratory) – Dr. William M. Abbott

Dr. R. Clement Darling III, Closing

Figure 8: Program for the commemorative Surgical Grand Rounds held in honor of Dr. Darling a few months after his death. The speakers were either his Fellows or his son, now a nationally known vascular surgeon practicing in Albany, NY.

To detail Clem Darling's contributions to and advances in the world of vascular surgery would require a full-day symposium. Perhaps a useful outline to detail Dr. Darling's important contributions can be found in the announcement of the Commemorative Surgical Grand Rounds that was held in his honor at the MGH a few months after his death. (Figure 8). Important contributions, and landmark publications, were produced by Dr. Darling in aortic aneurysm disease, lower extremity occlusive disease, noninvasive diagnosis, arterial embolism, renovascular surgery and the long-term results after vascular surgical procedures. By 1961, Linton had reported in no less a prestigious forum than the New England Journal of Medicine, a series of 150 elective abdominal aortic aneurysm repairs with a 10% mortality. It remained for Darling, to detail the next two decades of aneurysm surgery at the MGH in the context of his own prodigious experience. Darling treated over 500 elective patients for aortic aneurysm in the 1970's, with an operative mortality of 1.7%. There were no Persantine thallium scans, there were no PA lines, every patient got a tube-gastrostomy with intermittent clamping beginning on the fifth postoperative day, and no one cared too much about length of stay! The secret to these superb results was Darling's rigid adherence to Linton's simple, yet quintessential principle of vascular surgery, "it must be done right." His advocacy of an interrupted suture technique for the proximal aortic anastomosis, is a lesson we continue to teach our fellows today. While Linton began aortic surgery at the MGH, Darling perfected it, enabling his pupils with a practice perspective to subsequently mature both EVAR and complicated central aortic surgery.

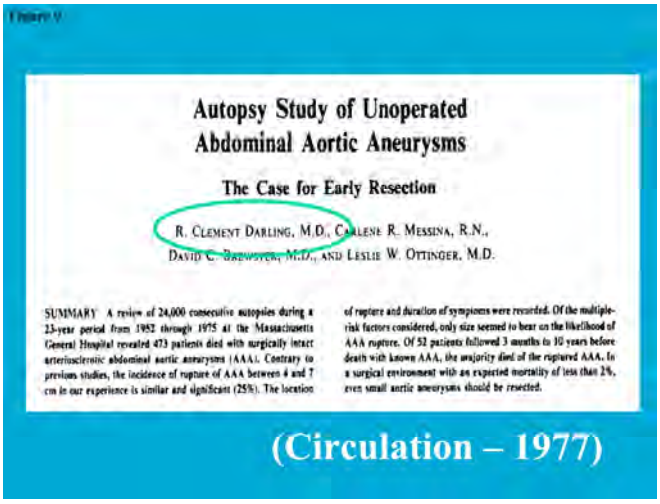


Figure V

Autopsy Study of Unoperated
Abdominal Aortic Aneurysms

The Case for Early Resection

R. Clement Darling, M.D., Carlene R. Messina, R.N.,
David C. Brewster, M.D., and Leslie W. Ottinger, M.D.

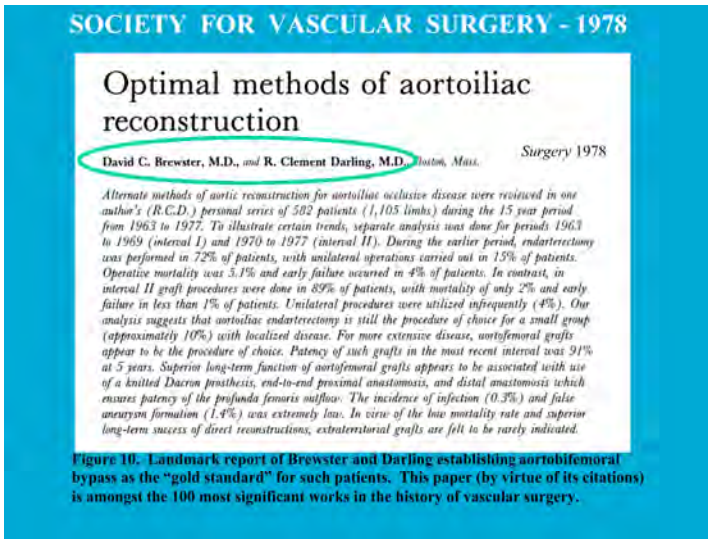
SUMMARY A review of 24,000 consecutive autopsies during a 23-year period from 1952 through 1975 at the Massachusetts General Hospital revealed 473 patients died with surgically intact arteriosclerotic abdominal aortic aneurysms (AAAA. Contrary to previous studies, the incidence of rupture of AAA between 4 and 7 cm in our experience is similar and significant (25%). The location of rupture and duration of symptoms were recorded. Of the multiple risk factors considered, only size seemed to bear on the likelihood of AAA rupture. Of 52 patients followed 3 months to 10 years before death with known AAA, the majority died of the ruptured AAA. In a surgical environment with an expected mortality of less than 2%, even small aortic aneurysms should be resected.

(Circulation – 1977)

Published in Circulation in 1977, (Figure 9) was one of Dr. Darling's most famous and widely quoted contributions to aortic aneurysm disease. In this autopsy study of nearly 500 patients who died with unrepaired abdominal aortic aneurysms, 25% died of rupture. The provocative finding from this study was the finding of rupture in something other than truly large aneurysms. In addition the anatomy of rupture and survival after symptom onset was carefully detailed. Thus, the preponderance of retroperitoneal rupture (being some 80%) and its obvious implications for both the potential of surgical salvage and certain technical considerations (e.g. venous injury) were clearly established. This paper was cited for some 20 years as the definitive work demonstrating that small AAA can and do rupture; I believe I once heard Clem Darling quip that no one seemed overly concerned that his autopsy measurements were made on depressurized aortae!

While his was not the first study to suggest familial and genetic factors in certain AAA patients, Dr. Darling's was the largest series systematically analyzed in this regard. In a paper published 20 years ago in JVS and with his son, Clem, as first author, Dr. Darling presented prospectively-gathered data on over 500 AAA resections; he established the incidence (15%) of familial aneurysm, the fact that anatomic extent was no different vs. non-familial lesions and, most importantly, the greatly increased rupture risk for familial aneurysms, especially in females. The hypothesis of this important paper emphasizing the morbid history of aortic aneurysm in women afflicted with familial aneurysm, has now been verified in large population studies for both thoracic and abdominal aortic aneurysm. *(Cambria continued on page 12)*

(Cambria continued from page 11) In the realm of lower extremity arterial occlusive disease, it remained for Dr. Darling to carry on and mature the experience that Linton began. By 1961, Linton and Darling were reporting clinical series of lower extremity bypass operations to the SVS. The initial direct surgical repairs of both aortoiliac and femoropopliteal occlusive disease were long segment endarterectomies, often closed with a venous or Linton patch. Careful and scrupulous follow up end results after such procedures eventually indicated that endarterectomy would yield to bypass grafting both for aortoiliac inflow disease, and superficial femoral artery disease. A variety of Dr. Darling's landmark publications would profoundly influence the practice of vascular surgery for next several decades in occlusive disease management. Presented to the New England Surgical Society in 1971 and focusing on the superiority of venous autograft bypass versus endarterectomy for femoropopliteal occlusive disease, Dr. Darling first applied the life-table method to report outcomes after a large series of femoropopliteal reconstructions. Similarly, Dr. Darling's personal experience with aortoiliac reconstruction established the superiority of aortofemoral prosthetic BP grafting- as opposed to endarterectomy – for inflow disease. The landmark paper depicted in Figure 10 and reported to the SVS in 1978 detailed nearly 600 patients treated by Dr. Darling for aortoiliac disease from 1963-77. Superior procedural morbidity and durability (with the now-often quoted 91% 5-year patency) was established for aorto-bifemoral BPG, and remains the "gold standard" more than 30 years later. Other surgical nuances such as discerning different patterns of aorto-iliac occlusive disease, the importance of profunda femoris reconstruction and the preference for end-to-end proximal anastomosis have been surgical dogma in aortoiliac reconstruction for more than 30 years and explains why Dr. Brewster, the paper's first author would be called up on to author all the important textbook chapters on direct surgical reconstruction for AIOD over the ensuing 30 years!


SOCIETY FOR VASCULAR SURGERY - 1978

Optimal methods of aortoiliac reconstruction

David C. Brewster, M.D., and R. Clement Darling, M.D., Boston, Mass. *Surgery* 1978

Alternate methods of aortic reconstruction for aortoiliac occlusive disease were reviewed in one author's (R.C.D.) personal series of 502 patients (1,105 limbs) during the 15 year period from 1963 to 1977. To illustrate certain trends, separate analysis was done for periods 1963 to 1969 (interval I) and 1970 to 1977 (interval II). During the earlier period, endarterectomy was performed in 72% of patients, with unilateral operations carried out in 15% of patients. Operative mortality was 5.1% and early failure occurred in 4% of patients. In contrast, in interval II graft procedures were done in 89% of patients, with mortality of only 2% and early failure in less than 1% of patients. Unilateral procedures were utilized infrequently (4%). Our analysis suggests that aortoiliac endarterectomy is still the procedure of choice for a small group (approximately 10%) with localized disease. For more extensive disease, aortofemoral grafts appear to be the procedure of choice. Patency of such grafts in the most recent interval was 91% at 5 years. Superior long-term function of aortofemoral grafts appears to be associated with use of a knitted Dacron prosthesis, end-to-end proximal anastomosis, and distal anastomosis which ensures patency of the profunda femoris outflow. The incidence of infection (0.3%) and false aneurysm formation (1.4%) was extremely low. In view of the low mortality rate and superior long-term success of direct reconstructions, extraanatomic grafts are felt to be rarely indicated.

Figure 10. Landmark report of Brewster and Darling establishing aortobifemoral bypass as the "gold standard" for such patients. This paper (by virtue of its citations) is amongst the 100 most significant works in the history of vascular surgery.

Perhaps less well known, but arguably of greater overall impact in the world of vascular disease management, were Dr. Darling's contributions and that of other MGH surgeons in the realm of noninvasive diagnosis for peripheral arterial occlusive disease. Linton charged one Fiorindo Simeone, M.D., the 16th President of SVS, with the establishment of a laboratory dedicated to the study of peripheral vascular disease in 1946; history would record this as the very first noninvasive vascular laboratory in the country. The initial focus was the effect of alteration of the sympathetic nervous system in a constant-temperature room, and the laboratory was subsequently run by John Cranley for two years, prior to his departure to Cincinnati in 1952, whereupon the laboratory gradually petered out. Cranley would go on to make sentinel contributions in the realm of carotid bifurcation non-invasive diagnosis. In the late 60's, a chance meeting between Dr. Darling and Jeffrey K. Raines, then a Doctoral Candidate in Engineering at MIT, resulted in many hours of basic laboratory research to perfect what we know today as the pulse volume recorder. Results with this technique in some 1,000 observations were presented to the Society for Vascular Surgery in 1971, and the fundamental concept of segmental pressure, and pulse volume recordings was born as the cornerstone of peripheral vascular noninvasive diagnosis. This method for diagnosis of PVD would become and remains standard practice. Dr. Darling subsequently submitted a proposal to Gerald Austen, then Chief of Surgical Services, to establish a clinical vascular laboratory, which was initially housed in our current fellows sleep room adjacent to the Bigelow Amphitheater. With amusement, Darling related that the laboratory was "started with a budget of about $12,000, much of which was spent on removing a toilet and two wash basins." Today the MGH noninvasive vascular laboratory administered by our Division is a multidisciplinary practice with Michael Jaff, D.O. of Vascular Medicine as Medical Director and Karen Furie, M.D. of stroke-neurology as associate director for cerebrovascular diagnosis. The laboratory has some 17 full time employees and performs some 14 thousand examinations annually!

The establishment of specific training in vascular surgery, or the Vascular Fellowship, was something very dear to Clem Darling's heart. Dr. Darling subsequently trained some 30 vascular fellows, at least 11 of whom went on to run vascular divisions of their own. Dr. Darling was no genteel teacher; rather, he was a demanding, intense surgeon accepting only of perfection. He might admonish a trainee with "I don't care if you do it slow and meticulous, or fast and sloppy, but do you have to do it slow and sloppy!" Doubtless, many would say I have continued the "old school" approach to the training of vascular fellows! Yet fact is, the MGH Vascular Fellowship is among the country's tops, as testified by the fact that our ranks include two MGH general surgery residents. Within a year we will offer the 0-5 integrated vascular residency owing to the hard work of Chris Kwolek, our program director, and the visionary support of Keith Lillemoe.

Finally, Dr. Darling's interest in the physiology of aortic crossclamp application, eventually led to his collaboration with a young cardiologist by the name of Charles Boucher, M.D., and the opening of the entire field of cardiac risk stratification in vascular surgery. Norman Hertzer of the Cleveland Clinic had, in 1984, published his important paper on consecutive coronary arteriography in 1,000 vascular surgery patients. It remained for Boucher and Dr. Darling to demonstrate the efficacy of physiologic non-invasive coronary assessment with the first report of the use of the persantine-thallium scan in vascular surgery patients which was published in the New England Journal of Medicine in 1985. This landmark study established the evident negative predictive value of physiologic testing with respect to postoperative cardiac complications and offered a logical alternative to rampant coronary angiography. In the subsequent 25 years, literally thousands of studies would be published on this topic. *(Cambria continued on page 13)*

(Cambria continued from page 12) Clem Darling was an integral and founding member of the New England Society for Vascular Surgery, the nation's first regional vascular society. It was at Darling's cajoling that Linton and Ralph Deterling sought to promote the influence of the SVS – founded in 1947 – to the regional level in order to promote specific training and credentialing in vascular surgery. An organizational meeting for a proposed regional vascular society, in the context of an informal dinner meeting was held at the St. Botolph Club on Commonwealth Avenue in Boston. Those attending included, Allan Callow, Clem Darling, John Davis, Ralph Deterling, Edward Edwards, Robert Linton, and John Mannick. The date was September the 6th, 1973, and the minutes closed with a typical example of Clem Darling's humor – "after some dickering about the bill, the meeting was adjourned with an agreement to have several other organization meetings held over the next several months." The first meeting of the newly launched Society with Bob Linton as its first President and Clem Darling as the Secretary/Treasurer was held in 1973, and Clem Darling would serve as the Society's secretary and prime mover for its first eight years, until he assumed the Presidency in 1980. Many have acknowledged his stewardship during these days as vital to the success of the NESVS and no more gratifying moment, I am sure for Clem, occurred than at the Gala 25th Anniversary Annual Meeting when then President Jack Cronenwett acknowledged Dr. Darling's stewardship of the NESVS in its formative years.

But what then of the evolution of vascular surgery? What perhaps is less well known is how Linton and Darling began endovascular surgery at the MGH; endovascular work, of course, in its early days, meant diagnostic arteriography. Aortography was carried out by the translumbar route, and run-off arteriography was accomplished by the single-needle femoral puncture technique. Dr. Darling did not initiate diagnostic arteriography at the MGH, but he was the first to critically evaluate both the results and complications of diagnostic arterial catheterization. In 1976 at the American College of Surgeons Clinical Congress, he presented a careful analysis of both puncture site and systemic complications of arteriograms in over 8,000 patients. To my knowledge, this was the initial critical evaluation by vascular surgeons of their own endovascular procedures. Gradually, surgeons acquiesced the performance of diagnostic arteriography to their Radiology colleagues beginning in the early 1970's. Only a few years later, Dr. Darling would refer a patient for the initial endovascular therapeutic procedure performed at the MGH.

Transluminal Treatment of Arteriosclerotic Obstruction

Description of a New Technic and a Preliminary Report of Its Application

By Charles T. Dotter, M.D., and Melvin P. Judkins, M.D.

DESPITE the frequency and importance of arteriosclerotic obstruction, current methods of therapy leave much to be desired. Nonsurgical measures, however helpful they may be, provide the patient little more than an opportunity to live with his disease. Consistent success in the use of surgical technics such as endarterectomy, angioplasty, and grafting has largely been confined to highly specialized vascular surgeons of whom there are far too few to cope realistically with literally millions of patients suffering the painful, disabling, or lethal consequences of the disease. Moreover, for practical purposes

Method

Procedure

Prior angiographic survey of the abdominal aorta, its iliac branches, and the leg arteries, including those beyond the suspected primary block, is best done by retrograde catheterization of the opposite femoral artery, thus insuring a hematoma-free femoral region on the side to be treated. If an attempt appears indicated, the procedure, including its present experimental status, is fully discussed with the patient and specific permission is obtained. Oral anticoagulant agents are discontinued and barbiturate sedation is given at an appropriate time. Local anesthesia was used in all but two patients who received low spinal block.

(Circulation 1964)

Figure 11. Charles Dotter's original description of an endovascular therapeutic technique.

Even as Darling's prodigious practice was flourishing and the fundamentals of arterial reconstructive surgery were seemingly well-established, an almost obscure event would change forever the evolution of vascular surgery. Charles Dotter was born in Boston in 1920, took his training in Radiology at Cornell and spent the bulk of his professional career at the University of Oregon where he chaired the Department of Radiology for some 20 years. Dotter, in a 1964 report of 11 cases published in Circulation (Figure 11) described his technique of graduated Teflon dilator expansion of even totally occlusive superficial femoral artery lesions. Although the technology was crude, the concept of endoluminal therapy was born. Dotter stated in his sentinel publication "It seems reasonable to expect that the transluminal technic (sic) for recanalization will extend the scope of treatment beyond the limits of present day surgery. Thus, however primitive its present state of development, and though its application has largely been confined to surgical "cast-offs," transluminal recanalization has proved to be an effective alternative to surgical reconstruction". Again, the year was 1964 (I was in grammar school). Perhaps related to crude instrumentation and/or Dotter's seemingly antagonistic relations to his surgical colleague, the concept lay dormant for nearly a decade until Andreas Grűntzig both resurrected the concept of endoluminal therapy and added the important advance of performing the dilatation hydrostatically with a balloon catheter. Grűntzig rapidly gained notoriety for Percutaneous Transluminal Angioplasty (PTA) of coronary lesions first reported in the Lancet in 1978; however, he applied and perfected the concept initially in the superficial femoral artery. By 1976 a young MGH radiologist by the name of Arthur Waltman had visited Grűntzig twice in Switzerland, and subsequently performed the first iliac PTA at the MGH in 1976 on a patient referred by Dr. Darling! Arthur Waltman, still one of our vascular Radiologists, presented the very first report of this technique to the New England Society for Vascular Surgery at its annual meeting in Waterville Valley in 1979. At Dr. Darling's Presidential Address at the annual meeting in 1981, this series had matured, detailing three year follow-up of the PTA technique with Clem Darling as one of its senior authors. Now I don't mean to imply that Dr. Darling was an early enthusiast with respect to peripheral angioplasty. Indeed, I can certainly recall the sarcastic humor with which Clem described balloon-angioplasty, characterizing it as "percutaneous intimal disruption or PID." The analogy with a certain infectious gynecologic malady was, of course, entirely intentional. Yet, Clem Darling and then David Brewster began a tradition of referral to our interventional radiologists to treat selected patients' occlusive disease with balloon angioplasty. Some 20 years later, at the Annual Meeting of the NESVS in 2003, Dr. Jim Black, then one of our Vascular Fellows, presented results of an aggressive posture with percutaneous endovascular therapy for infrainguinal occlusive disease. This occurred in the context of our newly created comprehensive program of vascular surgeons performing all their own endovascular procedures. The unit at the MGH was renamed "The Division of Vascular and Endovascular Surgery" as of 2002. The discussion of the paper was lively; our suggestion that a paradigm shift had occurred in the management of infrainguinal occlusive disease was guffawed a bit, and the Journal of Vascular Surgery insisted that the words "paradigm shift" be deleted from the manuscript title. A mere 8 years later, all would acknowledge that endoluminal therapies have supplanted a substantial measure of conventional open vascular surgery. *(Cambria continued on page 14)*

(Cambria continued from page 13) Although Linton and his protégé/partner Darling would focus on Vascular Surgery and its academic, societal and specialty training advancement, other MGH surgeons would make significant contributions in the context of a more general surgical practice. Names like Malt, Wirthlin, Ottinger and Moncure, each in turn with training under Linton, would add to the total "vascular production" at the MGH. Ron Malt (who as residents we referred to as "the IGP" [Intergalatic Professor]) made important contributions in portosystemic decompression; Ottinger's papers on early failures after Femoral Popliteal Bypass Grafts (FPBPG) and the anatomy of Superior Mesenteric Artery (SMA) embolization remain classics. Ashby Moncure was an early advocate and published the MGH's initial clinical series of extraanatomic renovascular reconstructions.

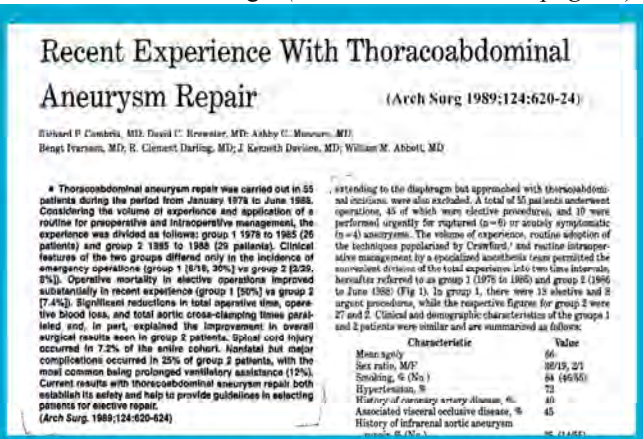
An important consideration in the more contemporary evolution of vascular surgery at the MGH was the vision of Dr. Austen in pushing the department into specialty units in 1978. Originally known as the Vascular Surgery Unit, this consolidation of faculty and focus positioned the MGH Vascular Unit to achieve national prominence. Bill Abbott, M.D. was the initial vascular division chief, a position he held for some 24 years. His tenure witnessed a number of important divisional "maturation points" including a) the consolidation (with the Neurology Stroke Service) of the clinical non-invasive laboratory, b) official ACGME accreditation of the vascular fellowship program, and c) the establishment of vascular surgery research laboratory. With respect to the latter, Bill Abbott was, for the majority of his career, NIH-ROI funded for his work in the biomechanical properties of vascular grafts and anastomoses. Bill also resurrected the MGH vascular chief as SVS President, serving in this capacity in 1995 – a 40 year hiatus since Linton held this prestigious position. We have continued emphasis on fundamental research, and today Dr. Mike Watkins directs the basic research laboratory, being one of perhaps a dozen vascular surgeons nationwide to hold NIH funding.

The final chapter in our history is the current standing of the Division of Vascular and Endovascular Surgery. Our name reflects the single dominant facet in the specialty over the past 15 years, viz the inexorable march to minimally invasive and/or endoluminal therapies. Ours was the first group in the region to have a critical mass of "endovascular competent" vascular surgeons, although mid-career retraining and political navigation were required to solidify the favorable position vascular surgery holds, both at the MGH and nationally. The data in this regard are stunning; 80% of AAA are repaired with EVAR, fully 30% of everything we do is totally percutaneous, and venous surgery has evolved to the endoluminal route in the vast majority of cases. Indeed our faculty arrangement is unique with a defined venous surgery program staffed by Julianne Stoughton, Nancy Cantelmo and Sherry Scovell. Perhaps the most evident and tangible symbol of our endovascular evolution is the space-age wonder of the new Lunder Building Operating Room Endovascular Suites, these being a gratifying step-up from the initial OR Endovascular Suite which opened in February of 2003.

A special, even unique component of our Division has been the evolution of the central aortic practice, initially borne of contributions in extensive open surgery, but now extending to/with TEVAR for a spectrum of Thoracic Aortic Pathologies. Based on this experience I was pleased to join Alan Hilgenberg and Eric Isselbacher (cardiology) in the formation of the MGH Thoracic Aortic Center founded in 1999. Al's untimely death was a pain felt deeply by many in this department; yet the work proceeds and Tom MacGillivray has ably and superbly filled the cardiac surgeon corner of the TAC triangle. We looked to continued joint efforts with Thor Sundt, M.D. now at the helm of cardiac surgery. The origins of the thoracic aortic practice can be traced to Dr. Darling's acknowledgment that the history of extensive thoracoabdominal aneurysm surgery was one that had yet to be perfected at the MGH in the early 1980's. He nurtured, supported, and provided the patients for our initial forays into the successful surgical management of these extensive lesions. Linton had begun thoracoabdominal surgery at the MGH as far back as 1956. (Figure 12a) Yet, the fact of the matter was that in the years prior to 1985, elective resection of these extensive aneurysms was accompanied by mortality as high as 50%! Dr. Darling speculated to me that we needed a different approach, and together we studied the work of Dr. E. Stanley Crawford who made successful surgical treatment of these lesions a reality. At that time, many patients from the Boston area were flying to Houston for successful management of their thoracoabdominal aortic aneurysms. The modern-era in the treatment of these lesions is best described in the initial paper, (Figure 12b) which Dr. Darling and I wrote, detailing the simple fact that a better operation, with shorter cross clamp times, and less blood turnover, minimal anticoagulation and a relative departure from the classic Lintonian teachings was necessary for the successful surgical management of these patients. Translational research, focusing better methods for spinal cord protection, attracted patients from throughout New England to the MGH; both clinical and basic research investiga- *(Cambria continued on page 15)*

LINTON BEGINS CENTRAL AORTIC SURGERY - 1956

Figure 12a. The first thoracoabdominal aortic replacement at MGH (1956) – 2 years after Ethridge first described successful treatment of such lesions. The patient had a variant of abdominal aortic coarctation and Linton replaced the visceral aortic segment with a homograft; 12 years later, angiographic follow-up demonstrated a sustained good result.



Recent Experience With Thoracoabdominal Aneurysm Repair

(Arch Surg 1989;124:620-24)

Richard P. Cambria, MD; David C. Brewster, MD; Ashby C. Moncure, MD;
Bengt Pearsson, MD; R. Clement Darling, MD; J. Kenneth Davison, MD; William M. Abbott, MD

• Thoracoabdominal aneurysm repair was carried out in 55 patients during the period from January 1978 to June 1988. Considering the volume of experience and application of a routine for preoperative and intraoperative management, the experience was divided as follows: group 1 1978 to 1985 (26 patients) and group 2 1985 to 1988 (29 patients). Clinical features of the two groups differed only in the incidence of emergency operations (group 1 [6/16, 38%] vs group 2 [2/29, 5%]). Operative mortality in elective operations improved substantially in recent experience (group 1 [3/3%] vs group 2 [7.4%]). Significant reductions in total operative time, operative blood loss, and total aortic cross-clamping times paralleled and, in part, explained the improvement in overall surgical results seen in group 2 patients. Spinal cord injury occurred in 7.2% of the entire cohort. Nonfatal but major complications occurred in 25% of group 2 patients, with the most common being prolonged ventilatory assistance (12%). Current results with thoracoabdominal aneurysm repair both establish its safety and help to provide guidelines in selecting patients for elective repair.
(Arch Surg. 1989;124:620-624)

extending to the diaphragm but approached with thoracoabdominal incisions were also excluded. A total of 55 patients underwent operations, 45 of which were elective procedures, and 10 were performed urgently for ruptured (n=6) or acutely symptomatic (n=4) aneurysms. The volume of experience, routine adoption of the techniques popularized by Crawford,[1] and routine intraoperative management by a specialized anesthesia team permitted the convenient division of the total experience into two time intervals, hereafter referred to as group 1 (1978 to 1985) and group 2 (1986 to June 1988) (Fig 1). In group 1, there were 13 elective and 3 urgent procedures, while the respective figures for group 2 were 27 and 2. Clinical and demographic characteristics of the groups 1 and 2 patients were similar and are summarized as follows:

Characteristic	Value
Mean age(y)	66
Sex ratio, M/F	39/19, 2/1
Smoking, % (No.)	64 (46/55)
Hypertension, %	73
History of coronary artery disease, %	40
Associated visceral occlusive disease, %	45
History of infrarenal aortic aneurysm	

Figure 12b. First of many publications from MGH dealing with thoracoabdominal aortic replacement. Presented before the NESSS in 1988, this began regular referral of these challenging lesions to the MGH.

(Cambria continued from page 14) tions continue in this arena. Today, Allen, Linton and Darling would be very pleased with the evolution of their Vascular Surgery Unit at the MGH; the complete mastery of all cognitive and technical components for treating the vascular patient, and most importantly, careful analyses and publication of outcomes…taught to the present generation by these giants was/is the enabling element in the wonderful evolution of Vascular Surgery. I can only hope that my stewardship of the Division of Linton and Darling continues the tradition not only of superb clinical care, but also of innovation, academic productivity and the critical evaluation of everything we do. Currently the Vascular Division at MGH, with its 10 faculty members (Figure 13) is thriving; our clinical and research activities position us as the regions leader. Our training programs, soon to include the new integrated 0-5 residency, are avidly subscribed. No better stamp of completion on the "endovascular revolution" is the move to the futuristic Endovascular operating suites in the Lunder Building. The Presidency of the Society for Vascular Surgery is once again held by an MGH surgeon, and soon we will witness the inauguration of the Robert R. Linton Professorship in Vascular and Endovascular Surgery, a gratifying and appropriate testimony to nearly a century of progress in Vascular Surgery at the MGH. *(Editor's note: Richard Cambria is presently a Visiting Surgeon and the Chief of Vascular and Endovascular Surgery at the MGH, a Professor of Surgery at HMS, and the President of the Society for Vascular Surgery. A native of New Jersey, he graduated from the College of the Holy Cross and the College of Physicians & Surgeons, Columbia University. His training in general and vascular surgery was at the MGH where he was the Resident on the East Surgical Service in 1984. He and his wife, Christine, live in Milton and have five children.)* ♦

Figure 13. Current Faculty, Division of Vascular and Endovascular Surgery. The occasion was the 2009 Presidency of the New England Society for Vascular and Endovascular Surgery. Note that the Presidential plaque proudly displays a gavel fashioned from an oar of Dr. Linton's sloop, "Antiquary".

(Ott continued from page 5) Since their debut, iPS cells have generated disease-specific models for Parkinson's Disease, Huntington's Disease, Type I Diabetes, and Down's Syndrome amongst others based on 2D cell culture. Perfusion-decellularized acellular cardiac scaffolds provide more physiologic 3D disease models for cardiac stem cells, and an opportunity for drug testing and therapeutic development. Cardiac-specific matrices may further serve as a mediator for stem and progenitor cell differentiation and phenotypic control by providing organ and site specific cues. Similar to the early clinical application of regenerated tracheal grafts, components of whole heart grafts such as valves, blood vessels, and patches may lead clinical translation. Research leading us to generate patient-specific whole organs will build collaborations among multi-disciplinary groups including but not limited to developmental and stem cell biologists, molecular biologists, transplant immunologists, bioengineers, cardiologists and surgeons. In the pursuit of rebuilding patient-specific whole hearts, such multi-disciplinary collaborative efforts will, most significantly, catalyze the evolution of our understanding of stem cell biology, disease pathophysiology, and physiologic regeneration vs. repair. *Editor's note: Harald Ott was born in Innsbruck, Austria. He received his MD degree, combined with a doctoral thesis in stem cell research, from the University of Innsbruck in 2000. Harald immigrated to the US and the University of Minnesota to pursue cardiac cell therapy, where he was a research fellow in Cell Biology; he then was appointed Assistant Professor in the Department of Physiology at Minnesota, where he was Scientific Director of the Center for Cardiovascular Repair. Harald came to the MGH in 2006, and completed his residency in surgery at the MGH this past June. He is currently a resident in Cardiothoracic Surgery at the MGH. Working closely with Dr. Jay Vacanti in regenerative medicine, Harald has established his own laboratory at the MGH to study whole organ regeneration with stem cell seeding of an acellular matrix. He has received numerous awards and honors for his research, and most recently received an NIH grant, given to support uniquely promising young investigators.)*♦

(Conrad continued from page 2) solar system. *Change* has become *the process* of effectively facing these surprisingly fluid dynamics of today's academic surgery. The stars and the moon have aligned for me again that I will be at the MGH for the next years to come to witness these dynamic changes. *(Editor's note: Claudius Conrad was born in Landsberg, Germany. He attended and received his MD, PhD combined degree from University of Munich in 2003. He pursued surgical residency in Munich, while simultaneously completing requirements for a second PhD in Music Philosophy. Having immigrated to the US, Claudius completed his residency in surgery at the MGH this past June. Currently, he is director of Music in Medicine in the Department of Surgery and the Benson-Henry Institute For mind Body Medicine at the MGH. An Instructor in Surgery at HMS, Claudius is now in a two year Fellowship in Surgical Oncology at the MGH. He has authored 40 articles in peer reviewed journals covering stem cell research, anti-angiogenesis and the relation between music and surgery.)* ♦

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In Memoriam

Dr. John F. Burke '57

Dr. Edwin W. Salzman '61


BOSTON
John Woodson, MD