THE JOURNAL OF
THORACIC AND
CARDIOVASCULAR
SURGERY

Vol. 135, No. 5, May 2008

Who we are – Who we will be

Bruce W. Lytle, MD

Video clip is available online.

From The Cleveland Clinic, Cleveland, Ohio.

Read at the Eighty-seventh Annual Meeting of The American Association for Thoracic Surgery, Washington, DC, May 5–9, 2007.

Received for publication Feb 21, 2008; accepted for publication Feb 22, 2008.

Address for reprints: Bruce W. Lytle, MD, Chairman, Heart and Vascular Institute, Cleveland Clinic, 9500 Euclid Ave/F24, Cleveland, OH 44195 (E-mail: lytleb@ccf.org).

J Thorac Cardiovasc Surg 2008;135:965-75

0022-5223/$34.00

doi:10.1016/j.jtcvs.2008.02.032

It is a privilege for me to be a cardiothoracic surgeon and it is an honor to speak to you today. During this time I would like to think about our future, some of the changes we will witness in the future, and some of the things we will need to become. Also, I would like to think about the foundations of what we are, our core values and skills. One of the core values of cardiothoracic surgery has been mentorship. None of us has made this journey alone. In my life and career I have had great mentors, and I have needed them. My father, Francis Lytle, was a physician in Fargo, North Dakota, who taught me the responsibilities of being a physician. In this photograph he is with his young son on a prairie trail (Figure 1). His death at far too early an age from cardiovascular disease gave me a mission for my life. This is a picture of some of friends that I grew up with, along with our prize possessions—guns and pickup trucks (Figure 2). These guys ended up being everything from cops to astronauts. They are my friends and mentors today. They keep me real, and on a few occasions where I think that I may have at least some of the answers to some of the questions, they remind me of the time I drove the pickup into the slough.

After college and medical school, I was fortunate enough to be accepted into the general surgical training program at the Massachusetts General Hospital, headed by W. Gerald Austin. This was a wonderful place and I am grateful to many of the faculty who did the best they could with me. I am also very grateful to my fellow residents and the tremendous impact that they had on me and my career (Figure 3). Terry McEnany, Willis Williams, Cary Akins, Al Hilgenberg, Robert Guyton, Jim Kirklin, Gus Vlahakes, and Doug Mathisen, all members of The American Association for Thoracic Surgery (AATS), and many more residents, were people from whom I learned a great deal and from whom I am still learning today. The faculty during my cardiothoracic training included Hermes Grillo, Earl Wilkins, Gordon Scannell, Ashby Moncure, and Willard Daggett. They very generously shared with me great patience and insight. For most of us, however, there is someone who brings everything together, and for me that person was Mortimer J. Buckley, our 76th president (Figure 4). Dr Buckley is correctly known as one of the great educators of our time, and I am particularly appreciative because I needed more education than most. Although many of the techniques that I was taught have changed with time, the lessons about a steadfastness of purpose and the totality of commitment remain, and time has not diminished my gratitude to Dr Buckley.

I was recruited to The Cleveland Clinic during the tenure of Dr Floyd Loop as chairman of the Department of Cardiothoracic Surgery (Figure 5). He made it absolutely clear that he had an expectation that I was going to write. It was very important for this young surgeon to be given that clear direction. Dr Loop also taught me to use the interrupted silk technique for coronary surgery, and I have really never forgiven him for that.

Dr Toby Cosgrove (Figure 6) was my colleague as a resident, preceded me to The Cleveland Clinic, and was one of the reasons that I ended up there. He has been a colleague and friend for more than 35 years. This long interaction has been entirely to my

Figure 1. Francis T. Lytle and Bruce W. Lytle on a North Dakota country road.

benefit, and my life and career have been greatly enhanced by this collaboration and friendship.

One of the great joys of my life is that I work with a wonderful group of surgeons at The Cleveland Clinic (Figure 7). There are a lot of them, you know them all, and you will know them even better in the future. They are committed, intelligent, collegial people and they make my life a joy. I learn something from them everyday. We also have a group of long-term employees, nurses, surgical assistants, and secretaries who really are the heart of our organization.

Finally, it is possible for me to have my career because of my wife, Suzanne. She has been incredibly supportive from the day we were married, and even for a few days before that. The home that she created for our children, for me, and for our dogs was real magic. It sort of went along its own serene way regardless of me and my very irregular appearances, but it allowed me to be what I am. Here we are last Christmas with our children, Ted and his wife, Sara, our grandson Hudson, my daughter Medora and my son-in-law, Kevin, and our dogs (Figure 8). The dogs are in their normal position, very close to the food. I have a friend who tells me often that if there is such a thing as reincarnation he wants to return as one of Suzanne's dogs. So do I.

My friends and colleagues, cardiothoracic surgery is a specialty that is small in numbers but that has had a huge impact on the treatment of cardiovascular and thoracic disease and

Figure 2. I am pictured, at left, with friends in a Dakota winter.

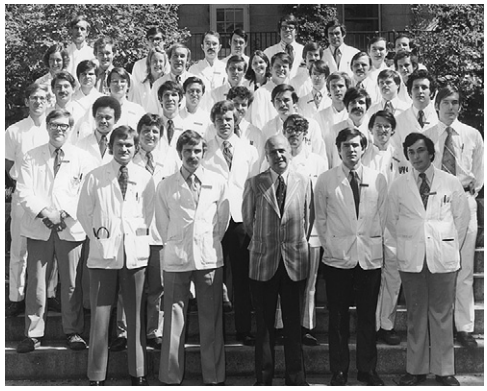

Figure 3. Resident staff with W. Gerald Austin, MD, Massachusetts General Hospital, 1977.

on medicine in general. Many decades ago cardiac surgery led medicine into an era of technology-based health care. The idea that a person's circulation and oxygenation could be maintained by a machine while a complicated surgical operation is performed inside the heart was stunning in the late 1950s, and it broke down a lot of psychological barriers to the application of technology in all areas of medicine.

Cardiothoracic surgery has contributed to some very profound economic and social changes. The development of coronary surgery meant there was an effective anatomic treatment for coronary artery disease, which, at that time, was the single most common cause of premature death in America. The passage of the Medicare/Medicaid Act in 1965 meant that doctors and hospitals could be compensated for doing it. As we look back over the past 30 years, we should recognize that a huge expansion of the medical infrastructure in

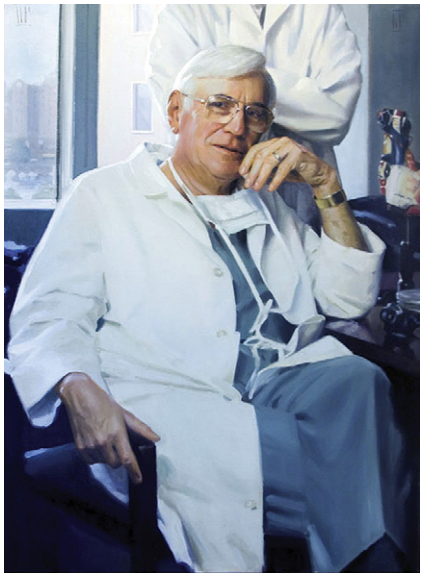

Figure 4. Mortimer J. Buckley, MD, 76th president of the AATS and my surgical mentor.

Figure 5. Floyd D. Loop, MD, 78th president of the AATS, former chairman of the Department of Cardiovascular and Thoracic Surgery, and chief executive officer of The Cleveland Clinic Foundation. Dr Loop understood academic pursuit to be part of the surgeons' mission.

America has occurred. All over the country, in cities large and small, medical facilities have grown dramatically in size and in social and economic importance. Often, cardiac surgery was the economic engine that fueled that growth.

Today, however, we are at an inflection point. Things are changing. Some of those changes involve the treatment of cardiovascular disease, and some involve the environment in which medicine is practiced, taught, and learned. Among the trends that we currently recognize are a diminishing number of bypass operations, declining reimbursement, a diffusion of technology from academic to community hospitals, a stream of new technologies with potentially strong impact on the treatment of cardiovascular diseases, changes in the motivation of medical students and young physicians, and declining interest of those graduates in our specialty.

Figure 6. Delos M. Cosgrove, MD, 80th president of the AATS, chairman of the Department of Cardiovascular and Thoracic Surgery, and chief executive officer of The Cleveland Clinic Foundation. Colleague, friend, and mentor for over 35 years.

Figure 7. Department of Cardiovascular and Thoracic Surgery, The Cleveland Clinic Foundation surgical staff, 2006.

But the issue that directly affects our professional lives on the most basic level is that today cardiothoracic surgeons are not the only physicians engaged in the anatomic treatment of cardiothoracic disease. Many other specialties use some kind of anatomic treatment for cardiothoracic disease, most often catheter based. These alternative strategies are usually described by their proponents as less invasive, less morbid, and less inconvenient than the open surgical operations that are the core of our expertise. In some cases, they are at least partially correct. Those of us in this room respond by pointing out the proven and excellent long-term outcomes of open surgery. However, a fact we must reckon with is that young physicians are less and less interested in our specialty. This trend has multiple causes, some of which we may understand and some of which we may not, but the one cause that we need to understand is the perception by young physicians that the importance and value of cardiothoracic surgery is declining.

Figure 8. My family, Christmas 2006.

Ultimately, medical and surgical specialties flourish to the extent that the physicians in that specialty provide effective patient care. The value and importance of cardiothoracic surgeons, of our professional societies, our scientific sessions, and our opinions derive from the benefit that patients experience from our work. In the past, that benefit has been great. In the future, our value and importance will be related to the extent that we can employ both old and new technologies for patient benefit.

Part of what I would like to talk about today is future technology and our role in it. But I would also like to think about some things that are fundamental to who we are and what we are, the core values and skills of cardiothoracic surgery. What makes us different from cardiologists or radiologists? We are different, you and I, from other physicians. Whether those differences are due to our heritage or to our training or to the types of people that become cardiac surgeons or some combination of these things, I do not know. But I think that they are real and, in a world of change, I believe they are of enduring importance. Most of this discussion will relate to adult cardiac surgery, partially because that is where I have been most involved and partially because it is the area of most immediate concern. However, many of the same issues apply to congenital heart surgery and to general thoracic surgery.

Of all the characteristics of cardiac surgery, the most salient is that it is a serious business and the people who do it successfully are serious people. That sounds trite, but I do not think that it is. Some of that seriousness may be related to the fact that survival is the issue at stake, and some of that seriousness may be related to the assumption of personal responsibility by the cardiac surgeon, another defining characteristic. Cardiac surgeons are personally and identifiably responsible for outcomes. The position of the cardiac surgeon has been and will continue to be that of the patient's last chance. In the end there is no one else to whom we can pass the ball.

Another important characteristic of cardiac surgeons is the demand for technical excellence and a belief that technical excellence matters. Traditionally, residents choosing a career in cardiac surgery have been among the most technically gifted and focused, and they train for a long time to become skillful at the varied and complex reconstructions that make up cardiac surgery. There is a wonderful and terrible reality associated with cardiac surgery. No matter what someone says can be done, the surgeon must actually go and do it and make it work. If it does not work, you usually find out about it sooner rather than later. Cardiac surgery is not generic and you cannot fake it.

Leadership, and in particular leadership of the cardiac surgical team, has been extremely important. Cardiac surgical operations involve complex interactions among a large number of people with different skill sets, including nurses, perfusionists, operative assistants, anesthesiologists, and the surgeon. The development of the operating room team, the coordination of their efforts, and the continued strong and stable leadership have been important characteristics of successful cardiac surgeons and have enabled highly reproducible outcomes to be achieved. The team approach to surgery has been an important contribution and also has extended to postoperative care. Cardiac surgeons have maintained a persistent involvement with postoperative care and understand that the effectiveness of critical care is reflected in the overall outcomes.

The careful and persistent study of patient outcomes and the factors affecting those outcomes is an important part of what we are today and what we must continue to be in the future. Early in the history of cardiac surgery, follow-up studies of patients after valve replacement set a standard for longitudinal observational studies. The randomized trials of coronary bypass surgery versus medical management were landmarks in the evaluation of invasive therapies and were the first studies that documented the benefits of a surgical procedure relative to medical treatment. These trials were heavily criticized at the time, but in the end they did show that bypass surgery prolonged the life expectancy of some definable patient populations and relieved angina for most patients. Today, these studies are still great assets and provide some of the basis of the indications for bypass surgery. Similarly, the trials of bypass surgery versus percutaneous treatments have been criticized but, again, in retrospect, have provided a strong body of evidence for the safety, stability, and superiority of surgical treatment. Observational data from state registries and single institution registries, often laboriously maintained by cardiac surgeons, have confirmed and extended the data regarding the benefits of bypass surgery. Today, it seems that sometimes there is an overwhelming demand for information and a whole lot less appreciation for the truth. It can be frustrating to all of us to witness data being ignored and practice patterns deviating from those that evidence seems to dictate. However, we cannot be discouraged. We must continue to be engaged in the study of outcomes. The truth is our greatest ally. Every cardiac surgeon must be an academic surgeon, must be able to understand and to credibly discuss data that relate to the treatment of cardiovascular disease. This is important on every level, from a national meeting to an individual discussion in the hospital hallway.

The study of outcomes has helped us to achieve better outcomes. Process improvement based on data is another area in which cardiac surgery has been a model for all of medicine. Contributions in this area have been made by many surgeons, but particularly noteworthy was the work done by Drs John Kirklin and Eugene Blackstone, whose development of the initial guidelines for coronary bypass surgery for the American College of Cardiology/American Heart Association helped to set standards in this area. More recently, The Society of Thoracic Surgeons (STS) Database has evolved into a valuable resource for the study and improvement of the processes of care for cardiac surgical patients.

The high level of intellectual credibility that has been characteristic of these efforts in the past will continue to be

important in the future. Everyone in the health care arena, particularly the patient, is bombarded with information. We will not be able to be the source of the largest amount of information, but we must be the source of the best information. In the past, there has been justifiable criticism of some of our scientific sessions: they lack "buzz" and they do not have the excitement of interventionally based meetings. Some of those criticisms are correct. Every advance in medicine is at some point just a good idea. I think we now understand that in our national meetings there needs to be room for the unproven great idea and for the exploration of possibilities as well as known outcomes. However, we also need to be able to distinguish between them. Trivialization of our academic processes will not make us more innovative.

The core values of cardiac surgery have been seriousness, personal responsibility, technical excellence, intellectual credibility, leadership, and mentoring. Our core skills have been complex cardiac reconstructions, including aortic and mitral valve replacement and repair, coronary revascularization, and thoracic aortic surgery, with these procedures often supported by cardiopulmonary bypass. These operations have provided great benefit to thousands of patients, and we love to do them. However, we now realize that they will not be the only valuable anatomic treatments for cardiovascular disease in the future.

For example, endovascular procedures will be a major part of the future of aortic surgery. An elderly patient with multiple comorbidities was maintained at home on supplemental oxygen (see Video 1) with an extensive aneurysm (Figure 9, *A*). This patient was treated with a stent graft of the entire thoracoabdominal aorta, which included multiple visceral branches (Figure 9, *B*). He was in the hospital for 4 days and is well more than a year after the operation. A 350-pound man with a previous aortic dissection and a contained rupture in the area of the isthmus was treated on an emergency basis by my colleague, Dr Eric Roselli. First, through a median sternotomy incision, a debranching operation revascularized the upper extremity and cerebral vessels (Figure 10, *A*). Dr Roselli then stented the arch and descending aorta down to the celiac artery (Figure 10, *B*), ending up with the result shown in Figure 10, *C*. Dr Roselli was trained for a year in endografting by our vascular surgical colleagues and in coronary angiography and is now carrying out these procedures within a center that includes cardiac and vascular surgery. These operations are not easy to perform and the devices have to get better, but the potential for endografting to decrease the procedure-related risks of these major operations is striking.

For many cardiac surgeons, the treatment of aortic disease other than the ascending aorta is not a huge issue. The treatment of valvular heart disease is a huge issue for everybody. Today, there are a myriad of catheter-borne devices designed for the treatment of valvular heart disease. Most of them are in some form of developmental stage, but both a mitral repair device and a catheter-borne aortic valve prosthesis are currently in pivotal randomized trials in the United States. In Europe there are many more such devices.

Video 1 shows a Cleveland Clinic patient undergoing implantation of a catheter-borne aortic valve. This procedure was done via an iliac artery exposure because of the presence of severe peripheral vascular disease (Figure 11, *A*). The

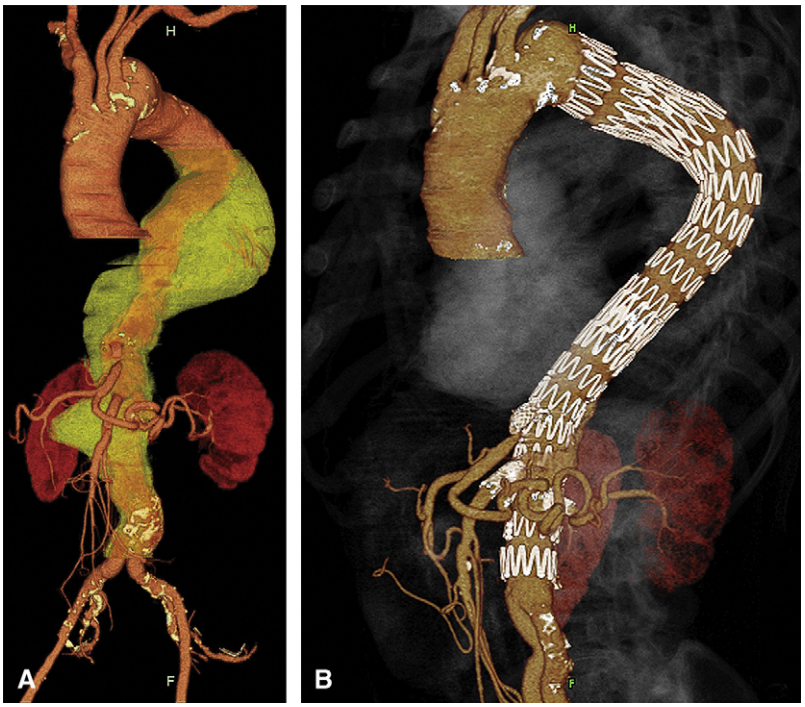

Figure 9. Chronic thoracoabdominal aneurysm (A) treated with 1-stage endografting including branch grafts (B).

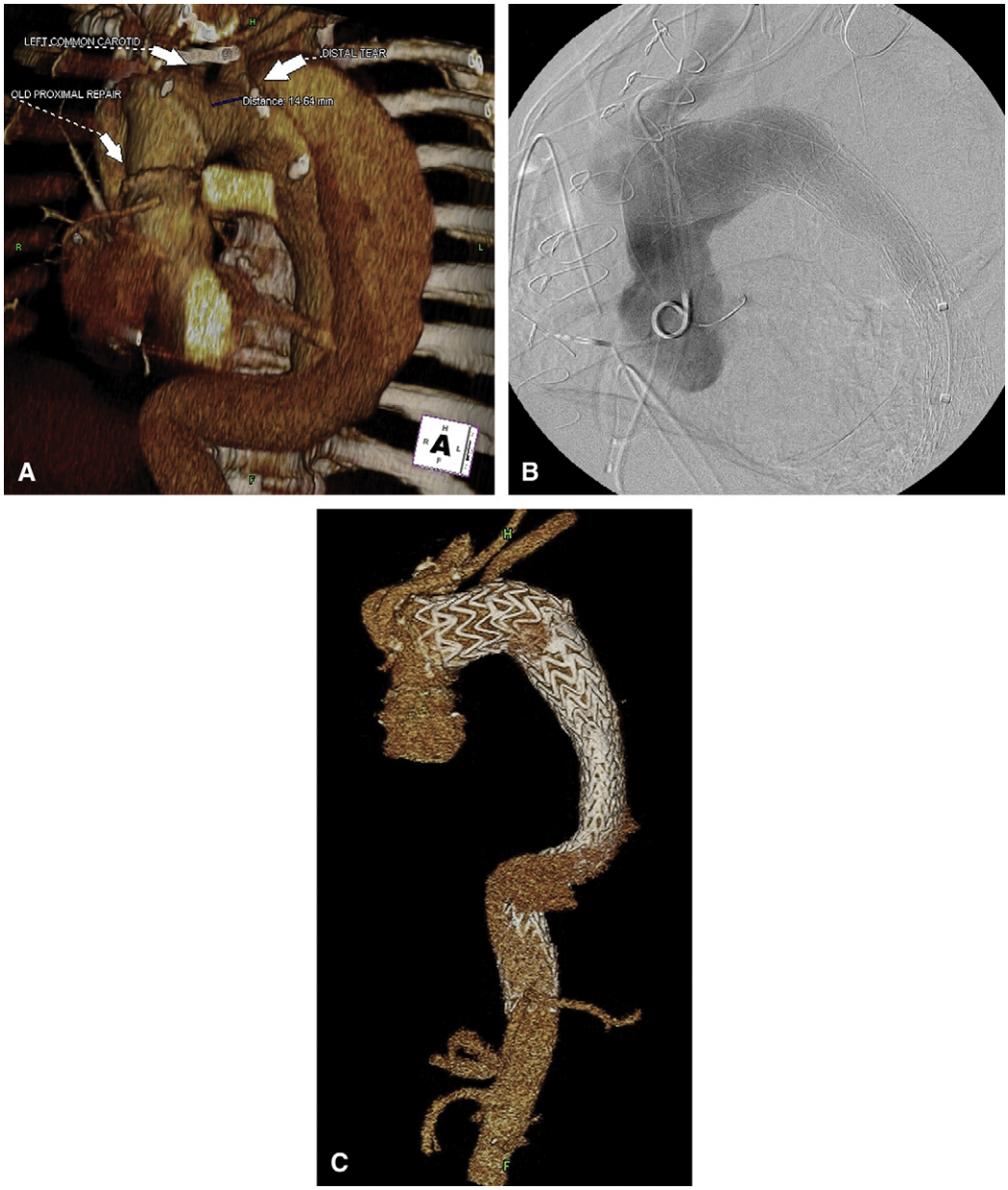

Figure 10. Chronic dissection after repair of type A acute dissection (A).This patient was treated with "debranching" of the cerebral vessels (B) and stenting of the arch and thoracoabdominal aorta (C).

balloon was inflated to fix the valve into the annulus, and with that maneuver the left main coronary artery became occluded by the calcified left coronary cusp (Figure 11, *B*). Not surprisingly, hypotension ensued and was first treated with resuscitation and placement of a left ventricular assist device. Subsequently, a guide wire was passed into the left main coronary artery (Figure 11, *C*) and a bifurcating stent was placed to keep the left main coronary artery open (Figure 11, *D*). This patient left the hospital a few days later with a well functioning aortic valve and is fine, but the implantation team and patient were a short step away from disaster. A vascular surgeon, a cardiac surgeon, an interventional cardiologist, and an echocardiographer were all involved in this case, and the skills of each of them were essential for a safe outcome.

The following sequence shows a transapical aortic valve being placed by my colleague, Dr Lars Svensson, with the assistance of a cardiothoracic anesthesiologist doing transesophageal echocardiography and a cardiologist helping with fluoroscopy (Figure 12, *A* to *C*). There are many theoretical advantages of transapical access to the aortic valve. It avoids having to place a catheter through a long, circuitous route through an atherosclerotic aorta, and it should allow

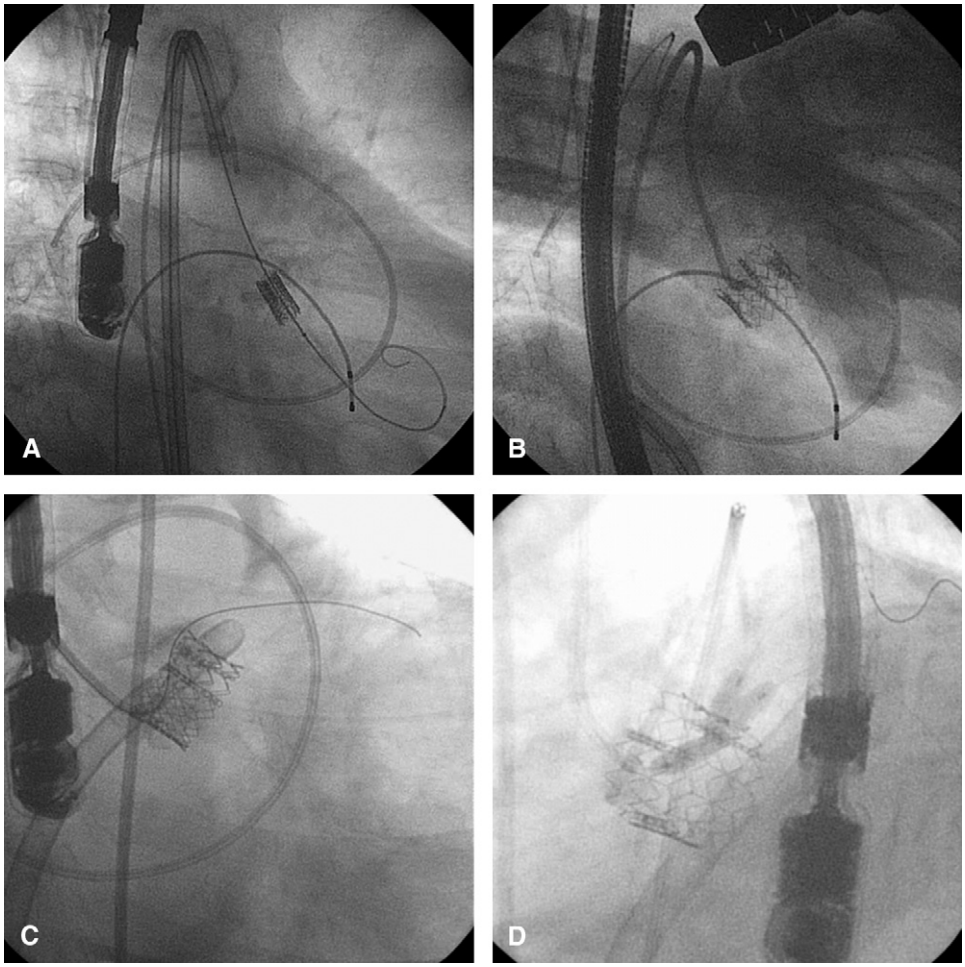

Figure 11. Patient with calcific aortic stenosis treated with a catheter-borne aortic valve prosthesis (A), resulting in left main coronary artery occlusion (B). After a guide wire was placed in the left main coronary artery (C), a bifurcated stent was placed re-establishing flow to the left main, left anterior descending, and circumflex coronary arteries (D). Multiple skill sets are needed to optimize safety during these complex procedures.

more accurate control of the catheter and device placement. In Figure 12, *B,* the valve is fixed in place as Dr Svensson inflates the balloon. The postprocedure angiogram shows only slight aortic insufficiency (Figure 12, *C*).

The apex is not the only place at which cardiac surgeons can access the beating heart. In theory, this should be able to be done through the right atrium or left atrium with catheter-borne devices that can accomplish mitral annuloplasties and possibly close septal defects or periprosthetic leaks with the heart beating (Figure 13). It is reasonably easy to imagine types of operations that might be accomplished with the aid of minimally invasive robot-assisted strategies, and I think this type of approach is a fruitful area of investigation. Robotic technology has made strong progress. With the development of parallel anastomotic technologies and possibly in combination with catheter-borne devices, there is a great future in this area. Robotics is not dead. Combinations of these technologies offer the possibility of providing cardiac surgeons with a complex platform that will allow access to all cardiac chambers and the performance of multiple intracardiac procedures. The transvascular route is not the only way to get catheter-borne devices into the heart to treat structural heart disease.

The catheter-borne valve devices available today are first-generation efforts and our experience is limited, but lessons have already been learned. First, some of these procedures produce good outcomes even today for individual patients over the short term. Second, device improvement is likely to be very rapid. Third, vascular complications are a substantial source of risk. Fourth, accurate imaging is critical for consistent success, and multiple imaging modalities can be very helpful. For example, Figure 14 is a 4-dimensional computed tomographic image of a bicuspid aortic valve. Today, this technique cannot be used in an operating room in real time, but I believe that will come and that this type of imaging

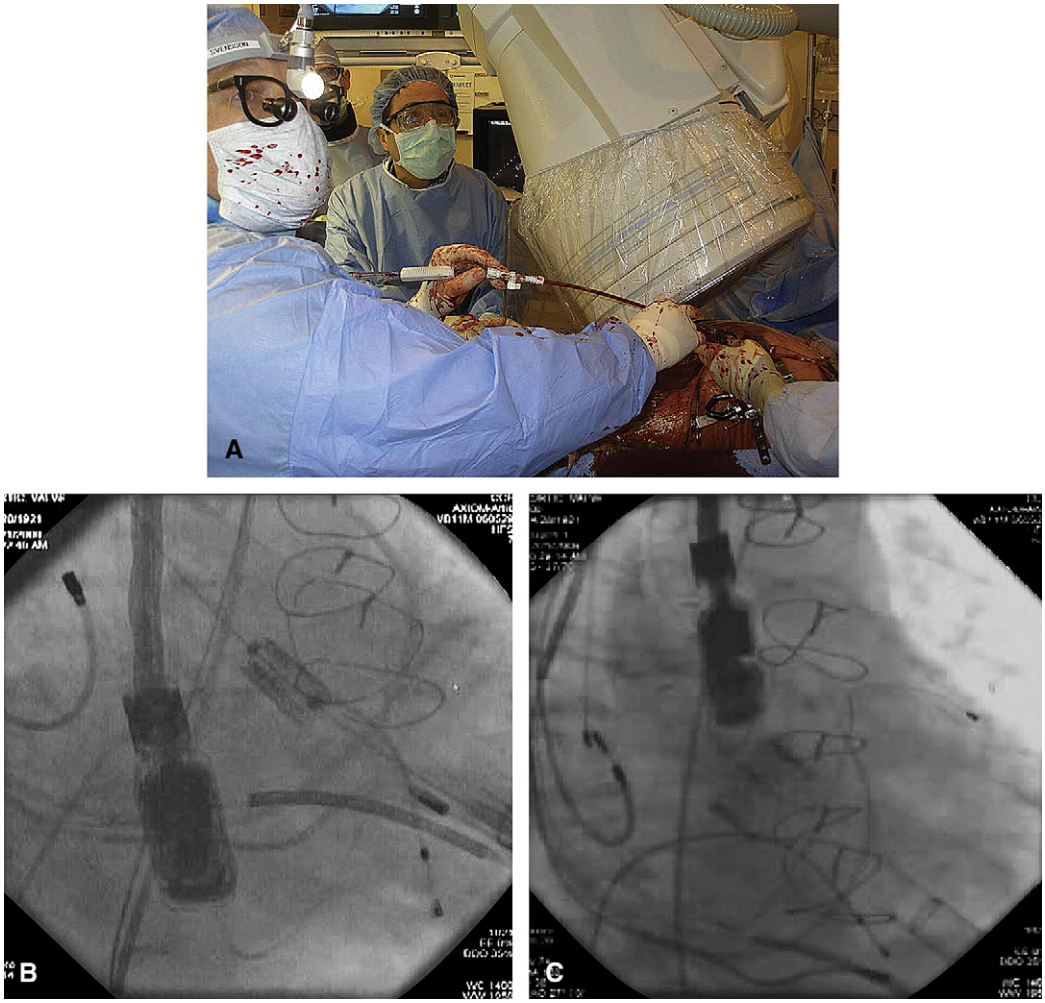

Figure 12. Dr Lars Svensson, cardiothoracic surgeon, and Dr Murat Tuzcu, interventional cardiologist (A), collaborate in placing a catheter-borne aortic valve at The Cleveland Clinic Foundation. After placement of the aortic valve prosthesis (B), postoperative angiography shows little evidence of a periprosthetic leak (C).

not only will allow us to understand better which patients are most appropriate for the placement of catheter-borne devices, but eventually will help us place these devices. Fifth, the operating room is the ideal location for combining multiple imaging capabilities with multiple therapeutic strategies and devices. Sixth, a variety of skill sets and experience is needed to carry out these procedures with the highest degree of accuracy and safety.

Catheter-borne valve devices are going to work. They work today. They are not going to replace open surgery in the near future, but they will have an impact. Some of the questions that we have to answer now are as follows: What does this have to do with us? Do we want to and do we think we can perform these procedures? Shouldn't we leave these to physicians who have only catheter skills? What is it that we can add?

I believe that it is in the interest both of patients and of progress in the treatment of structural heart disease for cardiac surgeons to be personally involved in performing these procedures. First of all, our skills and experience in perfusion, myocardial protection, cerebral protection, robotics, and open surgery will allow the maximal use of these technologies and will allow them to be taken to their highest level. The operating room is the safest location for the use of these devices so long as that operating room has imaging capabilities that are state of the art. Cardiac surgeons have the most to add when new technologies are applied to complex problems. We are not going to displace either cardiologists from coronary stenting or vascular surgeons from iliac or carotid stenting. There are not enough of us to do these procedures even if we wanted to, and we do not add much to relatively straightforward catheterization laboratory type procedures. Sometimes it is possible to achieve good outcomes with a simple catheterization laboratory approach, but not always. The operating room does add safety, and it also allows the possibility for

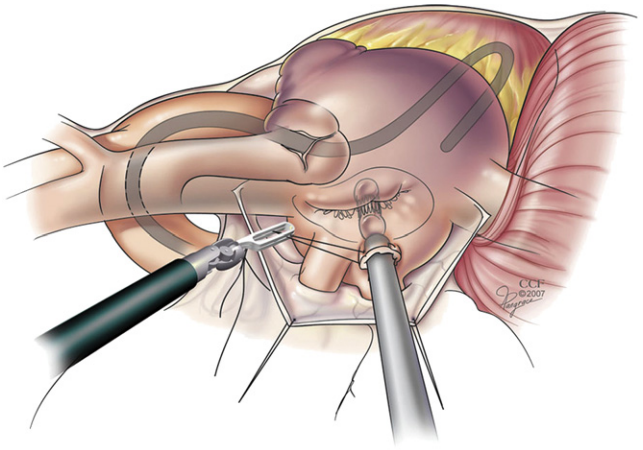

Figure 13. The transvascular route is not the only access to cardiac chambers for the delivery of catheter-borne devices.

multiple interventional technologies and interventional procedures combined with open surgery to be used in combination.

Second, if our opinions are going to carry any weight regarding the use of these devices, we are going to have to be able to use them ourselves. The posture of one group of physicians telling another group of physicians when to use or not use a technology has not worked well in the past and is unlikely to work well in the future. Decision-making is rarely ideal, acrimony is inevitable, and patient care suffers. To allow the best choice of procedure, it helps to be able to perform all procedures, if not by an individual, then at least by a unified group.

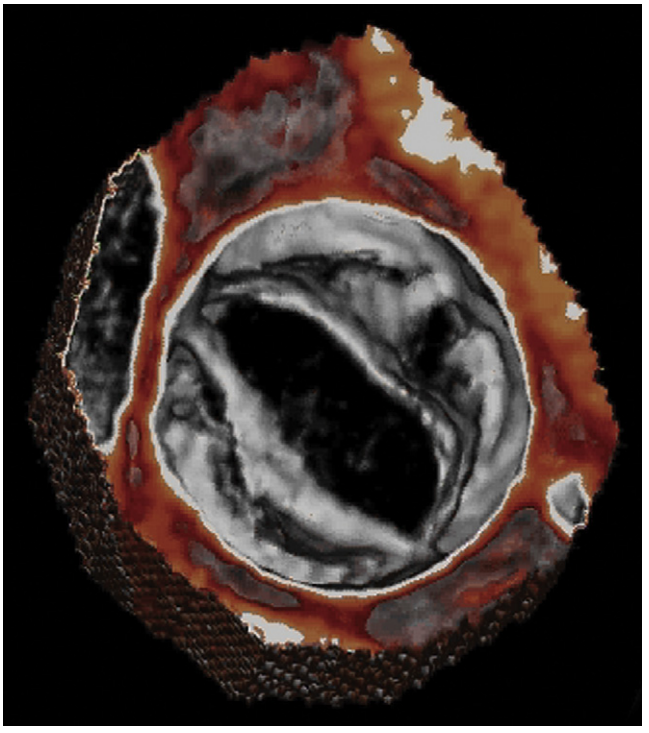

Figure 14. Accurate imaging is critical for successful minimally invasive and catheter-borne operations, particularly if they involve the beating heart. This 4-dimensional computed tomographic image allows very accurate localization of the calcium on a bicuspid aortic valve.

Now, let's shift gears for a second. An important point for us to consider is that increasing our scope of practice cannot just mean using a bunch of new technologies. We need to think about altering our model of practice to allow more interaction with patients before procedures and during follow-up and to achieve more total disease management, to use a current phrase. If we look back at the early years of cardiac surgery, what we might term the research and development years, surgeons were the dominant breed of cardiovascular physiologists and often played a significant role in preoperative management, even performing diagnostic catheterizations. Realistically, part of the reason for that was that cardiology was a fairly undeveloped specialty at that time. With the onset of coronary surgery, cardiac surgeons became extremely operating room centered and totally uninvolved in coronary angiography, the only form of imaging at that time. That was a very efficient way to do things when there were limited choices of technologies. We are, after all, surgeons and we like to work in the operating room. But that meant that the choice of treatment, at that time surgical versus medical management, evolved largely into the hands of cardiologists. As we now know, that situation was to have tremendous impact once there were cardiologist-driven, catheter-borne therapeutic alternatives.

In other areas of cardiovascular disease, that sequence did not play out. For example, in the management of thoracic aortic disease, cardiothoracic surgeons have long been involved in total disease management, including diagnosis, follow-up, and sometimes eventual surgery. This model can be extended to valvular heart disease. Now the question arises, isn't that what cardiologists do? Well, not necessarily. In many practice settings, the emphasis of cardiology is very much away from disease management and very much toward intervention. Today, relatively few cardiology fellows are interested in going into clinical cardiology, only 16% in an American College of Cardiology survey, whereas programs offering training in interventional cardiology or in electrophysiology are oversubscribed. It is also important to appreciate the substantial progress that has been made in non–catheter-based imaging, including computed tomographic scanning, magnetic resonance imaging, echocardiography, and positron emission tomography, alone and in combination. These imaging strategies will greatly aid surgeons in the preoperative assessment and postoperative follow-up of patients with valvular heart disease. The model of disease management will have consistency and longevity in a world of multiple and changing interventional technologies.

Our own steps toward our adoption of paradigm-shifting invasive technologies will not be easy, but we must take those steps. Damon Runyon was a great American author and the source of considerable wisdom. To quote Damon Runyon, "Son, don't play 'em unless you got 'em." And, right now, we ain't got 'em. Or at least we ain't got enough of 'em. For us to get to where we need to get will take dedicated individuals who will commit themselves to a new career direction, spend significant amounts of time to be able to use new technologies at a high level, and develop practices. Everything else stems from that. When it is possible, we need to learn from physicians who currently have these skills, regardless of their specialty. It will be difficult to be alone in educating ourselves, and I do not think we have to be. At The Cleveland Clinic we are very fortunate to work with cardiologists and vascular surgeons who have a vision of a collaborative effort and can see the unique capabilities that cardiac surgeons add to the team and add to the technology. I certainly realize that those relationships do not exist every place, but the principle of enlisting and collaborating with skilled physicians who are not cardiothoracic surgeons is not wise to abandon. For our part, we also need to be collegial, to help these other specialties understand that we are not trying to develop competitive practices in isolated coronary interventions or peripheral vascular disease, but that we are trying to expand the use of these technologies to treat complex heart and vascular disease.

It is not only the surgeons learning these techniques who will need to be committed, but there must be support from their colleagues and the organizations employing them. That support must be both financial and programmatic. These technologies involve different skill sets, will need a lot of concentration, and will continue a trend toward the subspecialization of cardiothoracic surgery. Our skill level in using all devices will need to be very high. We will not be able to contribute if we are second rate users of new technologies, and the exact role cardiac surgeons will play in using them will depend on how good we get at it. Increasing the scope of practice of the specialty will at times mean a decrease in the scope of the practice of the individual, but it must be so.

This increasing subspecialization is also likely to point toward more practice consolidation and toward regionalization. Even with the relatively standard cardiac surgical procedures that are done today, there are multiple studies that show that outcomes are volume-dependent. The same will be true of these procedures, perhaps more so.

Our professional organizations, the AATS and the STS, need to contribute to our move into the future and, in fact, they have been contributing. One of the most rewarding things about my involvement with both our professional organizations has been to interact with the many fine surgeons who spend such an enormous amount of time to better this specialty and improve patient care. These are volunteers and they all have day jobs and they make enormous commitments. The collegiality of Fred Grover and John Mayer, the two STS presidents during my tenure at the AATS, has been tremendous, as it has been from the entire group of the STS leadership—and we had better continue to be collegial, because we have a lot that we need to accomplish together. Both organizations have made initial efforts in the very important area of establishing training sessions and educational programs to help practicing surgeons become familiar with new horizons and new technologies. These programs are not going to substitute for long-term institution-based training, but they are useful today and they will be even more so as the issues in the future relate to the familiarity with a multiplicity of devices. Some of our partners in industry have stepped up with the development and the funding of new teaching technologies, such as simulators, and have constructed programs to help surgeons make progress with these catheter-borne technologies. This is great, but it is also expensive. This is an area in which it makes sense for the AATS and the STS to combine their efforts and conjointly develop sessions to make this training more efficient for surgeons and more efficient and less costly for our partners in industry.

Another area in which we need to be on the same page is in the development of our future relationships with our vascular surgical colleagues. The interface between vascular surgery and cardiac surgery is extremely variable and sometimes contentious. If we were designing a system of practice and training from scratch, I doubt that today we would separate cardiothoracic surgery and vascular surgery. Some places never have, to their great benefit. There are vascular surgeons who have skills and experience that can be of great benefit to us as we attempt to design and apply new treatments for cardiovascular disease, including new treatments for heart disease. The AATS is an association for thoracic surgery, not of thoracic surgeons. Our founders were wise to make that distinction, and we will advance the care of patients faster if we take advantage of the talents of physicians dedicating themselves to the treatment of cardiovascular disease, regardless of which Board examination they have passed. Cardiothoracic surgery and vascular surgery are not going to meld together over night, but it is in all of our interest for the AATS and the STS together to develop a common plan for evaluating this possibility.

One of the most perplexing issues we have been forced to deal with has been the recent lack of interest in our specialty by young surgeons. To many of us, including me, this is mystifying. More objective observers than I am have pointed out that today's young physicians may be put off by the long training commitment, the demanding lifestyle of cardiac surgeons, combined with the lack of a defined vision for the future of a specialty, and the fear of a poor job market at the end of their training. This is certainly logical thinking. On the other hand, most of us did not become cardiac surgeons because of logic. We did it because of a passion; we found that we loved it.

When I was a young general surgery resident, one of my senior residents asked me what I was interested in. When I told him cardiac surgery, he replied "Well, I can understand that but, don't worry, you'll grow out of it." But, I never did. As the years have passed, I think it has become apparent to many of us that you do cardiac surgery somewhat with your brain and you do it somewhat with your hands, but mostly you do cardiac surgery with your heart.

There are things about cardiac surgery that we can change to make it more appealing to medical students and residents. The length, difficulty, and inefficiency of our training have been cited as issues, and we can make training more efficient. We now can re-engineer residency programs. The potential models for cardiothoracic training programs extend from what is standard today: a lot of general surgery, followed by 2 or 3 years of cardiothoracic surgery, to a total, straight out of medical school, cardiovascular and thoracic training program lasting at least 6 years. At this point, relatively few programs have actually changed, and those that have are in the early stages of enrolling residents. Thus we do not know what model of training will work the best. We need to follow these experiments very carefully to study their effectiveness in attracting and training candidates.

Whatever the exact model, what making our programs more efficient really means is a longer, more fruitful period of involvement with cardiovascular disease. The earlier the exposure to cardiac surgery, the more likely the young physician will fall in love with it. This year, the AATS initiated a scholarship program for medical students to try to expose them to cardiac surgery and cardiovascular disease at an early stage of their career. It is our hope that these students will be able to feel the passion and the joy that we have experienced. So far the response has been overwhelming, but only time will tell whether this is effort is successful.

Regardless of how we shape it, residency training is always going to be a major commitment. If we think about what we have been saying about the scope of teaching and practice, it must include total disease management, critical care, expertise in imaging, open surgery involving adult and congenital cardiac disease, vascular surgery, general thoracic surgery, catheter-borne endografting, catheter-borne valve repair and replacement technologies, coronary angiography, and perfusion. Now, that is a lot. So, although we may be able to make residency training more efficient and more focused on cardiovascular disease, we may not be able to make it easier or overall much shorter.

Sociologists tell us that the millennium generation, those young adults now in their 20s who make up our current generation of trainees, express different career motivations than has been true of past generations. Without going into great depth on the details, it appears that they place a lot of value on a limited career commitment, both in time and intensity, value time spent with their families, and like the possibility of having multiple careers during their lifetime. These characteristics are not a great match for our specialty, which has a long period of training, a long career focus, the need for technical excellence, the assumption of personal responsibility, and the need for continued growth in expertise throughout one's career.

The fundamental problem that we face is that cardiac surgery is hard. Sometimes it is really hard. And, people with a limited commitment usually do not get very good at it. We really cannot change that. Maybe in the future there will be niches for people to fit into using limited technologies on limited problems that require only a limited commitment. However, technology will change, and training surgeons in limited technologies is likely to run out. The field of cardiac surgery will not be advanced by people with a niche focus or a limited commitment.

Even during the most popular years of cardiac surgery, most physicians were not a good match. Theognis, speaking centuries ago, observed, "In a serious business a man's companions are few." It has been that way in the past, it is the same today, and we will not be able to make it otherwise. We are not going to be able to train meadowlarks to be eagles. What we have to do is to find the eagles, and there are eagles out there. Once we find them, we have to show them a vision of what their careers can be should they make the commitment and show them a path that they can look down and see a way to get to their goal. We must be able to show them the future relevance of cardiac surgery to the treatment of heart disease, the relevance of the operations we do today, and the relevance of the operations that we will do in the future. We must be able to show them the relevance of understanding the diseases as well as understanding the technologies.

What we will be in the future is, we will be better. We will make the treatment of heart disease safer, more efficient, less invasive, and more effective. We can do that by improving those skills that are at our core today, complex open surgery, perfusion, critical care, and we can do that by exploring those technologies that have not been our core. Our unique role will not be battling other specialties for the application of these technologies to simple problems, but elevating them to contribute to the solution of the more complex. What our core values will be in the future is what our core values have been in the past—seriousness, personal responsibility, technical excellence, intellectual credibility, leadership, and mentoring. Technologies are going to change, but those values will outlast them.

It has been a great honor for me to speak with you today and to have spent my career with you. We share much that is truly inspiring. Only we know how wonderful it is to be able to go into the operating room, to hold in our hands a damaged heart, to be able to reconstruct it, and to allow someone a longer life and more happiness. Cardiac surgery has provided our lives with a great purpose and with profound meaning. We owe much for this and, God willing, I look forward to an exciting future with you.