Editorial

Computer-Assisted Surgical Systems in Cardiothoracic Surgery: Why Are We Reluctant to Accept the Future?

Kemp H. Kernstine, MD, PhD

Fewer than 5% of cardiothoracic surgeons perform minimally invasive lobectomies, and far fewer perform minimally invasive cardiac procedures. Why? Perhaps the "video game" type of technology is too foreign given that the average age of the cardiothoracic surgeon in the United States and most likely many countries is in the mid-50s. Second, in regard to the only available computer-assisted robotic system, the current intuitive surgical robot, which moves the surgeon from the operating table to an operating console, thereby causing a loss of tactile feedback, may be incongruous with the mantra of cardiothoracic surgery, where proximity to the patient and palpation is integral to much of what we do. Also, perhaps, current robotic technology is too much a team-driven endeavor to which we are unaccustomed. Not only the surgeon, but also the first assistant, the scrub nurse, the circulator, the anesthesiologist, and the pump technologist are required and much more involved in robotic cases than in conventional surgery. Further, the robotic repairman and manufacturer and the hospital administrator are indispensable in this new technology. Lastly, and for some most important, the current US$1.6 million to purchase the machine and the US$600,000 maintenance fee per year are simply too expensive for a medical environment that is already writhe with cost overruns and double-digit-per-annum inflation. But should that dissuade cardiothoracic surgeons from exploring this new technology?

Video-assisted cardiothoracic surgery (VATS) has its origins in the 1920s, but it wasn't until the late 1980s that interest in it experienced a resurgence. To reduce pain and debility in our patients, we were willing, in fact eager, to embrace this "chopstick" and sometimes awkward approach, thus losing the tactile feedback that has been a staple of our surgical culture. Did that prevent us from developing our own approaches to thoracic diseases? No. Early on, we saw the attributes of this approach and so did the patients and referring physicians. In fact, we saw an increase in thoracic procedures, and in some practices having the skill set to perform VATS became a requirement.

For the past 15 years in cardiac and thoracic literature, the minimally invasive approach, smaller incisions, less rib spreading, and less tissue manipulation have been found to reduce the surgically induced inflammatory response. The result appears to reduce the length-of-stay and debility, allowing an earlier return to preoperative function. In malignancy, the reduction in inflammatory response may be related to improved median and disease-free survival and potentially improved response to adjuvant therapy. We all agree that these are positive attributes and deserve further attention. Perhaps the robotic techniques, as an advancement beyond VATS, will further reduce the inflammatory response, allowing us to realize that more advanced thoracic malignancies and cardiac diseases, even diseases that we are not currently being surgically treated, such as small-cell lung cancer, will become targets of our robotic scalpels. Computer-assisted or robotic technology provides not only 3-dimensional visibility with multiple degrees of rotational dexterity, but it will also allow the potential use of smaller, even minute instrumentation and possibly detached surgeon-controlled rovers to detect and treat diseased tissues. Some of the equipment is potentially small enough to travel through blood vessels.

Two current issues should encourage our interest in robotics. First, the improvement in VATS technology has reached a plateau. We are no longer seeing the rapid advancement in optics and instrumentation that we saw in the 1990s and early 2000s. For technical reasons,

From City of Hope Medical Center and Beckman Research Institute, Duarte, USA

Address reprint requests to Kemp H. Kernstine, MD, PhD: City of Hope Medical Center and Beckman Research Institute, 1500 East Duarte Road, Warsaw MOB, Suite 2001, Duarte, California 91010-3000, USA.

further refinement in optics and instrumentation is quite likely impractical, refinements that would be necessary to perform finely detailed work. Second, there is but one robotic company, and the lack of competition stifles ingenuity and creativity. Given the understandable economics, as long as we do not use robotics, there will be no investment of time or resources from the robotic industry in cardiothoracic surgery.

So what can we, as a profession, do to more rapidly introduce robotics into our surgical therapy, realizing that if we don't do something, our professional futures will be whittled away, and rightly so, by competing technologies and other medical professions? We must avoid the debacle seen in coronary artery surgery where stenting and cardiologists virtually replaced the role of bypass surgery and cardiac surgeons, unnecessarily and to the disfavor of the coronary artery disease patient. So all cardiothoracic surgeons, everywhere, should continue to embrace and explore new technologies, such as robotics, but do so in a collective sense. As a first step to achieve this goal, we should join a professional international cardiothoracic society, such as the International Society for Minimally Invasive Cardiothoracic Surgery (ISMICS) (http://www.ismics.org), whose focus is on the potential role of new technologies in cardiothoracic surgery, and it has developed partnerships with other professional groups, engineers, and industry to promote superior clinical results through technology. In regard to robotics, learning this new technology and developing expertise in it will stimulate new equipment/devices and new ways of approaching cardiothoracic diseases. As a result of this fresh interest, the economic drivers will develop new robots and nurture changes in the culture of the current minimally invasive and robotic companies. Encouraging our hospital administrators and government officials to partner and purchase these technologies and to develop the relationships that will advance the science is the next step. Again, if we don't adopt robotics and computer-assisted technologies in our surgical treatments, competing technologies will be adopted in spite of their probable inferior quality, and we will be faced with later recapturing diseases that we had previously treated successfully, such as coronary artery disease. Cardiothoracic surgical treatments have continued to have a major role in chest diseases. To maintain that role, we must embrace the future and become an essential part of it.