

Minimally Invasive Surgical Procedures

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A minimally invasive surgical procedure should be defined as one that is safe and is associated with a lower postoperative patient morbidity compared with a conventional approach for the same operation. The first procedure, which prevented a previous radical operation, was the use of a cystoscope to look into and treat lesions of the bladder. In 1931, Takagi of Tokyo redesigned the cystoscope and produced an arthroscope 3.5 mm in diameter. Marski Watanable, a pupil of Takagi, tenaciously pursued the development of the arthroscope, and in 1957, based on extensive experience in performing arthroscopy, he published an *Atlas of Arthroscopy*. Thus, the beginning of minimally invasive surgery. Arthroscopy was quickly accepted by the orthopedic surgeons and in a short time became the preferred method to diagnose and treat maladies of the knee. Since then, minimally invasive surgery has been the focal point of new medical technology. It is within reason to predict that greater than 80% of all surgical procedures will be performed by some form of minimal invasiveness and the majority on an outpatient basis.

Physicians and surgeons who champion minimally invasive surgery are enthusiastic to prove its efficacy and are approaching the challenge vigorously. At the seat of success of minimally invasive surgery is the constant upgrading of surgical instruments, which have gone from crude, cumbersome gadgets to sophisticated, robotically controlled instruments. In observing the rapid and successful implementation of these changes, one can only marvel at the accomplishments that lie ahead. Although improved instrumentation makes the procedure easier and more effective for the surgeon, the surgeon must learn to master the new technology. Thus, the procedure involves a learning curve with its risks. We, as physicians and surgeons, must be certain that the rate of acceptance does not jeopardize patient safety.

Minimally invasive surgical techniques can be mild to radical modifications of conventional surgery. Although one can question the semantic accuracy of the term "minimally invasive surgery," it does carry connotations of increased safety. The term minimally invasive surgery has gained widespread acceptance, and indeed it should if there is reduction of operative traumatic insult without compromise of therapeutic benefit. Practically every surgical subspecialty is using some form of minimal invasiveness. However, it appears that for some of those techniques to fulfill their greatest potential, one needs to apply a multidisciplinary approach, forming a coherent team of specialists from various disciplines working in cooperation rather than in separate disciplines. I strongly advocate the need for this unified arrangement. Only by such cooperation can we expect to improve the outcome for the patient.

It has also become apparent that advances are the result of the combined influences of technical advances and the skill of the operator. Unfortunately, those performing the procedure need to develop the dexterity and skills for proper execution. In the final analysis, safe and efficient execution depends on the skill of the surgeon or interventionalist. One must always take into consideration the need to convert an endoscopic surgical procedure into an open surgical procedure, and it will always entail the experience and clinical judgement of those involved.

The Ochsner Clinic has a great heritage, particularly in providing the state of the art in surgical techniques. In the early 1940s at a time when thoracic surgery was in its infancy as a surgical specialty, pulmonary resection was the most dramatic operation performed. At that time, more pulmonary resections were performed at the Ochsner Clinic than any other institution in the world. Subsequently as other operations were developed, the Ochsner Clinic competed in the forefront in technical innovations. A precursor to minimally invasive video-assisted surgery was minimally invasive direct surgery. When I was a young surgeon at the Baylor College of Medicine in the late 1950s, I remember reading of the presentations of Dr. Paul DeCamp, an Ochsner Clinic staff member, who championed thoracoscopy as a minimally invasive surgical technique. He expounded on the values and effectiveness of this technique in pleural and lung biopsies, lysis of pleural adhesions, pleurodesis, etc. Because of the excitement of extracorporeal circulation and open-heart surgery, it was hard for surgeons at that time to be convinced of the value of minimally invasive techniques. However, years later the development of the video camera, the demand for less traumatic procedures, and the need for cost reduction stimulated evolution of minimally invasive surgical techniques.

In general surgery, minimally invasive surgery is synonymous with minimal access via ports for the laparoscope and video assistance. Laparoscopic cholecystectomy revolutionized the surgical approach to the abdomen. Not only did it replace conventional surgery, but it also negated other nonsurgical alternatives such as dissolution therapy and extracorporeal lithotripsy.

With the success of laparoscopic cholecystectomy, minimally invasive technology followed to virtually every area of the gastrointestinal tract. There has been some question of the superiority of laparoscopic colectomy. At this time, it is hard to say whether it is safer, and it does not appear to offer a substantial economic benefit. Only with time and carefully designed studies that address the outcome, safety, and cost will we be able to determine the superiority of laparoscopic over conventional colectomy. However, generally the use of ports and/or small incisions reduces pain and substantially reduces postoperative care and cost.

In cardiac surgery, in contrast to general surgery, the goal should not necessarily be to minimize pain since extracorporeal circulation, not mediastinotomy, is probably the major cause of morbidity. Thus, we might consider minimally invasive cardiac surgery as largely off-pump surgery. This is particularly true when minimally invasive surgery via a small thoracotomy incision may still cause significant pain from spreading the ribs and at the same time produces a more difficult and dangerous means of extracorporeal circulation with limited exposure in a prolonged

operative and anesthetic time. Therefore, in cardiac surgery, we must resolve whether minimally invasive access is synonymous with minimal invasiveness. It is likely that this is the case in some, but not all, minimal access methods.

It does us little good if we attempt to choose a minimally invasive technique that actually takes more time, does not prove to be safer, and may actually cost more than conventional methods. Just because something can be done does not automatically mean that it should be done. We as surgeons must prove that minimally invasive techniques do in fact produce equal, if not better, results and can be done with less trauma and less risk to the patients, with benefits of cost reduction.

I believe the most exciting happening in cardiac surgery is in the field of video assistance. This method offers advantages over direct vision, be it through a large incision or a tiny incision. There has been a limited but growing experience in this endeavor. This is the next challenge for cardiac surgeons and will require acquisition of video dexterity. A voice-activated robotically controlled camera is being used to endoscopically repair or replace cardiac valves. Clearly, robotic manipulation has a place in the new era of cardiac surgery. These systems work on the concept of tele-presence surgery, where the surgeon no longer manipulates tissue directly but through robotic manipulations controlled electronically by the surgeon.

Time has proven many minimally invasive procedures to be effective. Other techniques need more time. There is no doubt that patients will benefit from these new operations, but we must proceed cautiously and question and review our results. ❁