REVIEW ARTICLE

MINIMALLY INVASIVE GASTROINTESTINAL SURGERY: CURRENT STATUS AND FUTURE PERSPECTIVE

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ABSTRACT:
Minimally invasive surgery (MIS), or laparoscopic surgery, plays a vital role in residency training in a number of surgical disciplines including general surgery, surgical oncology, colorectal surgery, pediatric surgery, and thoracic surgery. The tremendous patient demand for MIS over the past 2 decades has resulted in surgeons rapidly embracing this technique. Many general surgery residencies cover basic laparoscopy within their residency program; however, the experience with more advanced cases is more variable. This career resource guides the interested medical student and physician to opportunities for fellowship training in MIS. It includes a discussion of the specialty, training requirements, grant funding, research fellowships, and pertinent societies. The history of laparoscopy started as a primitive diagnostic procedure and it took close to a century before it became an effective therapeutic tool in the management of surgical problems. The advent of MIS has not only revolutionized surgical patient care but has also ushered in a new era and focus on surgical training and residency training in particular. Considerations that include surgical simulation, the development of objective measures of surgical performance, and the way in which both will come together in a standard surgical curriculum should leave little doubt of the significant impact MIS has had on surgical residency training.
Key words: Laparoscopy, Minimally invasive surgery, Patient, Surgeons

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INTRODUCTION

The development of minimally invasive surgery (MIS) over the past 30 years is considered a landmark shift in modern surgery. MIS has revolutionized surgery and brought substantial benefits for patients,[1] health systems, and society as a whole. Patients benefit from reduced perioperative morbidity, enhanced postoperative recovery, and better cosmetic outcomes compared with opensurgery.[2] The widespread application and adoption of MIS for benign diseases over the past decade occurred despite the initial absence of level I evidence to support its use.[3] Currently, MIS techniques are considered the standard of care for a wide variety of benign diseases.[4] The history of laparoscopy started as a primitive diagnostic procedure and it took close to a century before it became an effective therapeutic tool in the management of surgical problems. The history of laparoscopy started as a primitive diagnostic procedure and it took close to a century before it became an effective therapeutic tool in the management of surgical problems.

Imagine for a moment a scenario in which there had occurred no MIS revolution and, therefore, no MIS approaches to common surgical disorders existed. In this day of healthcare funding crises and limited hospital bed access, if cholecystectomy potentially still required a 4 to 6 day hospital stay and 4 to 6 week postoperative recuperation and paraesophageal hiatal hernia repairs occasioned a 7 to 10 day hospital stay and 6- to 8-week recovery period, our

current volumes of patients let alone the anticipated infusion of senior citizens could not possibly be accommodated within such a strained system. The advent of MIS has been most fortuitous on many levels. In its most recent incarnation, MIS is only about 20 years old. Despite laparoscopy having been described more than a century ago[5] and practiced to some degree over the intervening years, the introduction of laparoscopic cholecystectomy (LC) by Phillip Mouret in 1987 is largely credited with launching the revolution in MIS with which most readers will be familiar.[6]

Following the wide spread use of laparoscopic techniques for gall bladder removal, the benefits of laparoscopic surgery was established in the management of common gastrointestinal surgical problems.

HISTORY OF LAPAROSCOPY

The history of laparoscopy dates back to the beginning of the last century. The first 3 primitive laparoscopic examinations of the abdomen were performed by George Kelling in 1901, Dimitri Ott in 1901, and Hans Christian Jacobeus in 1910. Initially, Kelling described an examination of the peritoneal cavity of an anesthetized dog. That same year, Ott examined the abdomen of a pregnant woman. Nine years later, Jacobeus performed several laparoscopic examinations of the abdomen in humans and human cadavers.[7,8] However, it took over 80 years for the first video laparoscopic cholecystectomy to be performed by Philippe Mouret in 1987 for several reasons.

The reasons why laparoscopy never improved from a diagnostic modality to therapeutic surgery for this long time were mainly due to the primitive optics, lack of an adequate light source, and poor instrumentation allowing for a very poor image of the peritoneal cavity projected at the end of the laparoscope. The introduction of the rodlens optical system, cold light fiber glass illumination, and computer chip television camera allowed for projection the images on a screen for the entire surgical team to evaluate the abdomen. Projecting the images on a television screen, allowed the assistant to hold the camera, assist in the surgical procedures, and the surgeon had both hands free to manipulate intra-abdominal viscera.[8]

Laparoscopic access to abdomen Safe access to the peritoneal cavity is a key component of any laparoscopic procedure. Avoiding injury to intra-abdominal viscera and vascular structures must be kept in mind when choosing a method of access to the peritoneal cavity. Initially, Hans Christian Jacobeus in 1910 attempted access to the peritoneal cavity in patients with ascitis to minimize the risk of injury to intraabdominal viscera. Currently, three methods of access to the peritoneal cavity are used: closed, open and the hybrid visual method of access. Closed access is done using the spring loaded needle developed by Veress in 1938. This Veress needle is commonly used today and remains essentially unchanged from its initial design. The open access is done using direct cut down to the fascia followed by trocar placement under direct visualization. This technique was developed by Hasson. The hybrid visual access is done using an optical trocar mounted on a zero degree laparoscope with or without pneumoperitoneum to gain access to the abdomen under direct vision. The location chosen for access depends on the method of access chosen. The best place for hybrid visual access is below the costal margin on either side of the abdomen, preferably on the left side, far away from large vessels and abdominal viscera after decompressing the stomach with an orogastric tube. This is our preferred technique of access to the peritoneal cavity unless there is a previous surgical scar at this location.

The body habitus of the patient affects the method of access to the abdomen as well. Closed Veress needle access, the hybrid optical access may be easier than open entry, and even safer in obese patients. Conversely, closed and hybrid optical access may be more dangerous in very thin patients because of the short distance between the posterior fascia and the retroperitoneum.

There is no consensus to the optimal method of entry to the peritoneal cavity(5). In a recent review published in the Cochrane data base regarding randomized controlled trials comparing different laparoscopic entry techniques[9]. The total numbers of patients undergoing laparoscopy evaluated in the meta-analysis were 3040 patients. Overall, there was no advantage in terms of preventing major complications when different ways of entry to the peritoneal cavity are compared. However, the studies evaluated in this meta-analysis were small and could not be used to establish safety of any technique. [9]

MIS FOR COLON CANCER AND OTHER GI MALIGNANCIES

The most studied GI malignancy in laparoscopic surgery is colon cancer. Early attempts at resection showed feasibility, but questions remained concerning oncologic adequacy. 7 In addition to the long-term survival and disease recurrence, there were significant concerns about peritoneal seeding and port-site metastasis.[10] Johnstone et al,[11] in their review article on the subject in 1996, clearly advised against the use of MIS techniques in resection of malignancy until better prospective evidence was made available. These concerns resulted in many MIS pioneers abandoning the use of the technology for GI malignancy at that time. Laparoscopy is associated with better preservation of immune function,[12,13] less inflammatory response reaction, and no increased risk of tumor spread in relation to the pneumoperitoneum compared with open surgery. Several randomized clinical trials were also published and showed that MIS for colon cancer provided at least equivalent oncologic results and better short-term outcomes.[14,15]

For other GI malignancies, the evidence for MIS application has not been as extensive because of lower disease incidence and limited expertise. Laparoscopic resections for gastric adenocarcinoma have been shown in multiple small randomized trials from Japan to result in better short-term results and equivalent long-term oncologic outcomes. Although there are no randomized trials available for MIS application in liver, pancreas, and esophageal malignancies, MIS has been shown to be feasible and safe with good short-term outcomes in multiple retrospective trials in the hands of experts and in high-volume centers.

CONCLUSION

The advent of MIS has not only revolutionized surgical patient care but has also ushered in a new era and focus on surgical training and residency training in particular. Considerations that include surgical simulation, the development of objective measures of surgical performance, and the way in which both will come together in a standard surgical curriculum should leave little doubt of the significant impact MIS has had on surgical residency training.

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