

# Open surgery in the era of minimally invasive surgery

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## Abstract

The benefits and popularity of minimally invasive surgery are undeniable around the globe. However, open surgery is necessary and learning open surgery skills is still a necessity. Open surgery allows for better exposure to the surgical field and provides tactile sensation to facilitate the stereo visual assessment to precisely remove the lesion. Open surgery is still the key to surgical training, and the skills learned from open surgeries remain crucial for unforeseen circumstances and certain conditions like emergencies, challenge cases, or patients with compromised status.

**Keywords:** Open surgery; minimally invasive surgery; laparoscopic surgery

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Over the past century, open surgery has been the primary treatment for colorectal cancer (1). China placed first worldwide in the number of new CRC cases and CRC-related deaths because of its comparatively large population (2). Since the first report of laparoscopic colectomy by Jacobs and Fowler in 1991 (3,4), laparoscopic colectomy has gained popularity among surgeons worldwide with the development and widespread application of medical technology over the past 30 years, with minimally invasive surgery (MIS) rates ranging from 6.4% to 68.7% (Table 1) (5-8). Undeniably, the MIS era has arrived (9). Recently, carefully curated videos of MIS have become the mainstream in various academic conferences around the world. In highly regarded medical journals such as *The Journal of the American Medical Association*, *The American Journal of Surgery*, *Annals of Surgery*, *Lancet* and *The New England Journal of Medicine*, more articles have been published on MIS than on open surgery in the past 30 years.

What is MIS? Dr. John Wickham coined this term to describe various procedures requiring only very small or no

incisions to treat diseases that previously required open surgery (10). Patients often regard MIS as a small esthetic incision. Surgeons understand that minimally invasive procedures, such as laparoscopic or robot-assisted laparoscopic surgery, are not performed for esthetic purposes only and a smaller scar does not necessarily equate to less damage to patients. In contrast, open surgery requires making a sufficient incision and allowing surgeons to fully view the organs and structures involved with the unaided vision. Compared with MIS, open surgery usually has larger incisions and scars, incurs more pain in patients, requires longer hospital stays, and may cause more complications. The advantages of MIS are exceedingly evident, and many doctors might question whether there is still a need for open surgery in the era of MIS and whether surgeons still need to learn open surgery skills.

Open surgery is necessary, and learning open surgery skills is a necessity.

Currently, most surgeons' MIS skills are based on their open surgery skills. Anatomy is the foundation of surgery, and since open surgery allows for better exposure of organs

**Table 1** Frequency of laparoscopic surgery for colorectal cancer in various countries

Country	Frequency of laparoscopic surgery	N
China	56.7% (5)	72,650
United Kingdom	40.3%–68.7% (6)	35,304
Germany	6.4%–28.5% (7)	345,913
United States	65.3% (8)	11,031

and structures, it is the cornerstone of learning and mastering surgical techniques. In many countries, acquiring open surgery skills is compulsory for residency training. In the current Surgical Training Requirements in China's "Contents and Standards for Standardized Residency Training", all surgical skills must be mastered during their residency in general surgery, orthopedics, urology, thoracic surgery and neurosurgery, including open surgery skills. Open surgeries require the most participation of residents. In the Surgery Resident Skills Curriculum from the American College of Surgeons and the Association of Program Directors in Surgery (11), most core skills and advanced procedures also focus on training surgical residents in open surgery.

Open surgery is currently key to surgical training and is expected to remain relevant in the foreseeable future. Laparoscopic surgery has not yet replaced open surgery to treat colorectal cancer (Table 1), and some surgeries might be initiated as minimally invasive but are converted to open surgery if time is of the essence. In colorectal cancer, the frequency of conversion to open surgery is approximately 10.0%–16.0% (12–14), which has not improved in some countries and regions for years (6). In addition, patients might opt for open surgery instead of MIS because of complications with their health insurance or finances. As a relatively new technology, whether MIS will bring more benefits to patients than open surgery still needs to be verified by more high-quality studies and high-level evidence. In some diseases, including early-stage cervical cancer, the disease-free survival and overall survival of patients who undergo MIS are lower than those that undergo open surgery (15).

Compared with MIS, open surgery has certain inherent advantages. First, in open surgery, tactility can facilitate visual assessment to precisely remove the lesion (16). Experienced surgeons can estimate the texture, mobility, and invasion status of tumors using the tactile sensation of their fingers. Second, mentorship is invaluable in surgical training; MIS tends to involve fewer people, and usually, only one set of equipment is placed in the patient's body. Additionally, the loss of tactile sensation and stereo vision

during MIS may increase the risk of unintentional harm. Thus, even if the senior doctor is nearby, they may not be able to stop improper movements in time. Many of the current generations of senior laparoscopic surgeons are self-taught; the next generation's challenge is to acquire expertise without the pioneers' catastrophes (17). In colon cancer, open surgery is still the standard treatment; however, laparoscopic surgery is also an option. Surgeons need to strive to make MIS simpler, more replicable, and easier to teach and master (1). Third, the indications for open surgery are broader than those for MIS. In general, open surgery provides better access and higher efficiency than MIS procedures, making it suitable for patients who cannot undergo MIS due to anesthetic challenges, compromised cardiopulmonary status, or abdominal surgery history (18). According to the National Comprehensive Cancer Network guidelines for colon cancer, MIS should be performed by surgeons experienced in laparoscopically assisted colorectal operations and is not indicated for locally advanced cancer, acute bowel obstruction, or perforation from cancer. For high-risk tumors, especially recurrent cases that require reoperation, open surgery should be the first choice (19,20). Additionally, open surgery is still necessary for patients in extreme situations, such as war or disasters.

MIS tends to be used significantly less often in patients with stage II–IV colon cancer and is less often used in older (70+) or male patients with rectal cancer (21). Most surgical videos presented at various international academic conferences are on MIS, which creates an illusion that everyone is performing MIS, that MIS is easy, or that only MIS is worth being presented. In fact, MIS has relatively limited indications and requirements for patient conditions. The surgical cases presented are usually carefully selected and the videos are usually edited. University or tertiary hospitals should not selectively admit patients; higher-level hospitals are responsible for solving patients' problems that lower-level hospitals could not, and senior surgeons have a duty to assist junior surgeons in solving the difficulties they encounter during surgeries. Otherwise, who will perform surgery for patients with complicated or advanced tumors? Who will take care of patients in remote or underdeveloped areas? Who can take charge of the operation to ensure patients' safety when a junior doctor encounters difficulties or emergencies?

Although we have entered the era of MIS, we should realize that the ultimate goal of surgery is to remove the lesion and resolve patients' pain. It is important to select an appropriate surgical method and ensure surgical safety. Despite the popularity of MIS, open surgery is still an indispensable and essential means of accomplishing surgical

goals. Surgery is not a means to parade one's skills, and the primary objective should always be the patients' welfare. Only by putting this objective above all can surgeons live up to their responsibilities.

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## Footnote

*Conflicts of Interest:* The authors have no conflicts of interest to declare.

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