Minimally invasive colorectal surgery—the sky is the limit

The first report of minimally invasive colorectal surgery was published more than 30 years ago. It has been a long journey to the current state with a few setbacks. The initial laparoscopic approach to colorectal cancer resulted in a concerning high rates of port site metastasis. It was felt that laparoscopy and, more specifically, the presence of pneumoperitoneum would facilitate the implantation of cancer cells at the port site. Instead, it was a part of the learning curve of the few pioneers in this field who tackled a complex disease like colorectal cancer. The subsequent improvements in the technique and technology have made minimally invasive surgery safe for colorectal diseases.

The next step was to validate in colorectal surgery the known postoperative benefits of minimally invasive surgery shown in other surgical procedures. While that was critical in supporting the growth of a minimally invasive field in colorectal surgery, showing equipoise regarding oncologic outcomes when dealing with colorectal cancer was mandatory. The Clinical Outcomes of Surgical Therapy (COST) study facilitated the adoption of laparoscopy for colon cancer. It was designed as a non-inferiority study and included 872 colon cancer patients undergoing open or laparoscopically assisted colectomy performed by credentialed surgeons. The primary endpoint was time to tumor recurrence. There was no difference in recurrence rates after laparoscopically assisted and open colectomy, confirming that in experienced hands laparoscopy is an acceptable alternative to open surgery for colon cancer. Rectal cancer surgery presents additional complexity and difficulty, and we quickly understood that translating the COST data to rectal cancer was inappropriate. The CLASSIC European trial showed that after anterior resection the circumferential resection margins (CRM) positivity was higher in laparoscopy, 12% *vs.* 6%, but without reaching statistical significance (P=0.19). In the long-term follow-up study, there was no difference in oncologic outcomes. The colorectal scientific community started working on evaluating this next step in the evolution of minimally invasive surgery. Three randomized trials were conducted in the US, Australia, New Zealand, and South Korea comparing open to laparoscopic surgery for rectal cancer. The American College of Surgeon Oncology Group ACOSOG Z6051 looked at disease-free survival and locoregional and distant recurrence for stage II/III rectal cancer in 462 patients. There was no significant difference in 2-year disease-free survival (79.5% *vs.* 83.2%), locoregional recurrence (4.6% *vs.* 4.5%) or distant recurrence (14.6% *vs.* 16.7%). The ALaCaRT trial aimed to show the non-inferiority of laparoscopy proctectomy and included 475 patients assigned to each treatment modality.

In this study, the primary endpoint of non-inferiority was not achieved. The open surgery group achieved better complete total mesorectal excision, and CRM (P=0.06) with similar rates of distal clear margin (P=0.67). The COREAN trial looked at laparoscopic and open surgery in patients with mid- or low-rectal cancer after neoadjuvant chemoradiotherapy and included 340 patients in each treatment arm. There were no differences in terms of the quality of the total mesorectal excision (P=0.414), involvement of the CRM (P=0.770), and number of harvested lymph nodes (P=0.085). Despite these mixed results, minimally invasive surgery has also become widely utilized in rectal cancer. Minimally invasive surgery should also be considered inclusive of robotic surgery in the hands of trained and experienced surgeons delivering the same oncologic outcomes as laparoscopy. The key is proper patient selection, skilled surgeon, and appropriate timing of surgery given the wider armamentarium of options patients with rectal cancer have in this day and age. Lastly, we are exploring extended lymphadenectomy following the concept of total and complete mesocolic excision, transanal approaches, including transanal total mesorectal excision, and nonoperative management for rectal cancer. This field is continuously evolving, and it is a great time to be a colon and rectal surgeon with training and expertise in minimally invasive surgery. I believe that in the future, with new robotic platforms and new adjuvant and neoadjuvant protocols for colorectal cancer, what we are doing today in 2023 will be completely obsolete in a few years.

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