# Minimally Invasive Surgical Approaches to Gastric Resection

Sepideh Gholami, MD[a,*], Michael R. Cassidy, MD[a], Vivian E. Strong, MD[b]

**KEYWORDS**

• Gastric cancer • Laparoscopic gastrectomy • Robotic gastrectomy
• Minimally invasive gastrectomy • Techniques in gastric resection

**KEY POINTS**

- Minimally invasive gastric resections carry several advantages, including less intraoperative blood loss, faster recovery time, reduced pain, and decreased hospital length of stay and quicker return to work.
- Numerous trials have proved that laparoscopic and robotic-assisted gastrectomy provides equivalent surgical and oncologic outcomes to open approaches.
- As with any minimally invasive approach, advanced minimally invasive training and good judgment by a surgeon are paramount in selecting patients in whom a minimally invasive approach is feasible.
- With increasing research in patient populations with more advanced disease, the indications are likely to continue to expand.

## INTRODUCTION

Gastric cancer is an important contributor of cancer deaths and is associated with worse survival in the West compared with countries in Asia.[1] An estimated 951,600 new diagnoses of gastric cancer and 723,100 deaths were reported worldwide in 2012.[2] Recent reports have also shown that the incidence of gastroesophageal junction and gastric cardia tumors is increasing in the United States. Perhaps even more alarming is the 70% increase in the incidence of noncardia distal gastric cancer among 25 to 39 year olds in the United States over the past few years.[3] Because gastric cancer may manifest in a variety of histologic, anatomic, and genetic patterns, a customized and multimodality treatment plan for each patient leads to the best outcomes. Gastrectomy with curative intent remains the only strategy offering hope for

[a] Department of Surgery, Memorial Sloan Kettering Cancer Center, 1275 York Avenue, C-1272, New York, NY 10065, USA; [b] Gastric and Mixed Tumor Service, Department of Surgery, Memorial Sloan Kettering Cancer Center, 1275 York Avenue, H-1217, New York, NY 10065, USA
* Corresponding author.
*E-mail address:* gholamis@mskcc.org

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long-term survival and cure in gastric cancer patients. Recent advances in minimally invasive techniques have enhanced the surgical armamentarium for accomplishing both complete gastric cancer staging and curative resection. More importantly, randomized trials comparing laparoscopic with open gastrectomy have not only proved oncologic equivalency of the 2 approaches but also demonstrated favorable outcomes in postoperative recovery with minimally invasive approaches.[4–8] As a result, minimally invasive surgery is emerging as a preferred option in the treatment of gastric cancer. This article discusses the technical aspects of both laparoscopic and robot-assisted approaches to gastric cancer management.

## LEARNING CURVE FOR LAPAROSCOPIC AND ROBOTIC GASTRECTOMY

Several factors influence the learning curve for laparoscopic and robotic gastrectomy. Part of the technical complexity arises from the different types of gastric resection and the range of technical skills required (as an example, an esophagojejunostomy after total gastrectomy is more challenging to perform than a stapled gastrojejunostomy after distal gastrectomy). Although technical factors of the operations influence the acquisition of skill, the training of the surgeon, experience with both open gastrectomy and minimally invasive techniques in general, and case volume also play a role.

There is a dearth of literature to address the question of learning curve in a systematic way for laparoscopic and robotic gastrectomy. Additionally, much of the knowledge about the learning curve has been generated in Eastern countries, where gastric cancer is far more common than in the United States. For laparoscopic gastrectomy, 1 study reports the outcomes of a series of laparoscopic distal gastrectomies performed during the learning curve of a single surgeon in South Korea.[9] The surgeon had prior extensive experience with open gastrectomy; 102 laparoscopic gastrectomies, divided into early (n = 50) and late (n = 51) groups, were compared with a series of 71 open gastrectomies. All the operations were for early gastric cancer. In the late laparoscopic group, the mean lymph node retrieval was greater and operative time was shorter compared with the early laparoscopic group. The open group, however, had the fastest operative times and greatest lymph node retrieval.

In another study, a series of 100 laparoscopic gastrectomies were divided into 5 groups based on the level of the surgeon's experience.[10] If the surgeon had performed more than 60 laparoscopic gastrectomies, there were no conversions to open and the operative time for the laparoscopic approach was similar to that of the open gastrectomy comparison group. Blood loss decreased after 20 laparoscopic gastrectomies, and hospital length of stay was shorter after 60 laparoscopic gastrectomies.

Other small studies of learning curve in laparoscopic gastrectomy similarly suggest a case volume of approximately 50 to 60 cases to achieve proficiency.[11] Most series, however, report only on the experience with early gastric cancer in highly selected patients. The learning curve for more advanced disease may be more difficult to overcome, particularly where extended lymphadenectomy is required[12] (**Fig. 1**).

There is some evidence that the learning curve for robotic gastrectomy may require fewer cases to achieve proficiency. For example, 1 study reported the experience of a single surgeon, dividing cases into early-experience laparoscopic, late-experience laparoscopic, and early-experience robotic gastrectomy.[13] Early-experience robotic gastrectomies showed nearly equivalent outcomes to late-experience laparoscopic gastrectomies. Robotic gastrectomies had less blood loss, shorter hospital length of stay, faster diet initiation, and better lymph node retrieval than early-experience laparoscopic gastrectomies. Most experience with robotic gastrectomy is reported for surgeons already proficient in laparoscopic gastrectomy, which enhances the