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# Minimally Invasive Gastric Surgery

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• Stomach neoplasm • Laparoscopy • Gastrectomy • Robot-assisted surgery

**Key points**

- Laparoscopic assisted distal gastrectomy has been shown to be safe and may offer an advantage when compared to open gastrectomy in some perioperative outcomes.
- Laparoscopic gastrectomies in early and advanced gastric cancer may be associated with decreased morbidity which in turn can affect patient ability to receive systemic therapy.
- Robotic platforms are increasingly being used for gastrectomy for gastric cancer with a safety profile that is similar to laparoscopic only gastrectomy.

## INTRODUCTION

Since Kitano and colleagues [1] described their initial report of laparoscopic distal gastrectomy, the indications and uses of minimally invasive gastrectomy have expanded and now include early and advanced gastric cancer as well as subtotal and total gastrectomies. The incorporation of new technologies, such as high-definition video systems, a wide range of stapling devices, and the evolution of energy devices and vessel sealers have allowed minimally invasive gastrectomy to expand its indications as well as to use this approach for more complex cases. In addition, the development of robotic platforms, with instruments with expanded range of motion and, importantly, the possibility to include functional imaging, have opened a new article in the minimally invasive treatment of gastric cancer.

More importantly, there has been an increasing trend in the incidence of gastric cancer and gastroesophageal junction (GEJ) tumors [2], and many

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surgeons will likely have to treat more cases of gastric cancer. A thorough knowledge of the advantages of minimally invasive gastrectomy as well as adequate patient selection for this technique will lead to better outcomes for these patients. The purpose of this review was to present relevant available literature regarding the use of minimally invasive surgery for gastric cancer.

## LAPAROSCOPIC-ASSISTED DISTAL GASTRECTOMY FOR EARLY GASTRIC CANCER

### Retrospective series

Initial case series for laparoscopic-assisted distal gastrectomy (LADG) were reported in the mid-1990s [3–5]. Ohgami and colleagues [5] and Shiraishi and colleagues [6] reported initial experiences with no mortalities. Adachi and colleagues [7] reported in 2000 a retrospective study in which 49 patients were compared with 53 patients with open gastrectomy, finding decreased analgesic use, decreased time to first flatus (3.9 vs 4.5 days), with no difference in proximal margin (6.2 vs 6.0 cm) and number of lymph nodes harvested (18.0 vs 22.1). Additional series reported in the early 2000s [8,9] showed that LADG could lead to deceased time to flatus and length of stay. Kim and colleagues [10] reported 71 patients who underwent LADG compared with 147 patients who underwent open distal gastrectomy (ODG). No significant differences in the number of lymph nodes retrieved was found between the groups, with LADG favoring length of stay and similar complication rates.

Mochiki and colleagues [11] reported their 5-year experience including 89 patients who underwent LADG and 60 with ODG. Complication rate was 9% versus 18% and duration of epidural was 2 versus 4 days favoring LADG. Lee and colleagues [12] evaluated 136 patients with LADG and 120 ODG. Mean operative time was 156 versus 159 minutes ($P = .666$). Lymph node harvesting was smaller, with 31.3 versus 40.0 nodes retrieved and a shorter hospital stay. Kawamura and colleagues [13] also reported similar pathologic stage as well as similar number of lymph nodes harvested (44.8 and 49.2). Kiyama and colleagues [14] reported 101 cases treated with LADG compared with 49 with ODG. Blood loss was higher in the ODG group (139 vs 460 mL), fewer lymph nodes were harvested in the LADG group (27 vs 34), and hospital stay was longer in the ODG group. Lee and colleagues [15] matched 106 patients with LADG and 105 ODG. Postoperative complications in the LADG group was 4.7% versus 13.3% in the ODG group ($P = .046$). In a large retrospective study, Lee and colleagues [16] evaluated 629 patients with ODG and 1002 patients with LADG. Postoperative complications were less frequent in the LADG group (25.3% vs 40.1%, $P<.001$), as well as decreased major complications (2.1% vs 5.4%, $P<.001$).

### Randomized controlled trials for early gastric cancer

A series of randomized control trials have evaluated the role of LADG in early gastric cancer. Kitano and colleagues [17] published the first randomized trial in 2002. In this study, 14 patients were randomized to LADG and 14 to ODG.