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Outcome after laparoscopic versus open wedge resection for suspected gastric gastrointestinal stromal tumors: A matched-pair case–control study☆

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Abstract

Background: Laparoscopic resection of gastric gastrointestinal stromal tumors (GISTs) has been shown by several retrospective studies to be technically feasible and associated with favorable outcomes when compared to the open approach. This study aims to mitigate potential selection bias by performing a case control study of laparoscopic (LWR) versus open wedge resection (OWR) matched by resection type, location and tumor size.

Methods: We retrospectively identified 50 consecutive patients who underwent LWR for a suspected gastric GIST from a prospective database and matched this cohort with 50 patients who underwent OWR.

Results: There was no statistical difference between the key baseline clinicopathological features of patients' who underwent LWR versus OWR. Patients who underwent LWR had longer operating times [150 (range, 65–270) minutes vs 92.5 (25–200) minutes, $P < .001$] but decreased median blood loss [0 (0–300) ml vs 0 (0–1200) ml, $P = .015$], decreased frequency of intraoperative or postoperative blood transfusion [1 (2%) vs 8 (16%), $P = .031$], decreased median time to liquid diet [2 (0–5) vs 3 (1–7) days, $P < .001$], decreased median time to solid diet [3 (1–6) vs 5 (2–11) days, $P < .001$] and decreased postoperative stay [4 (2–10) vs 4.5 (3–17), $P < .001$] compared to OWR. There was no difference in oncological outcomes such as frequency of close margins (≤1 mm) and recurrence-free survival.

Conclusion: This matched case–control study provides supporting evidence that LWR results in superior perioperative outcomes compared to OWR without compromising on oncological outcomes.

Keywords: Gastrointestinal stromal tumor; GIST; Laparoscopy; Minimally invasive surgery; Resection; Gastric; Comparison; Wedge resection

Introduction

Gastrointestinal tumors (GISTs) are the most common mesenchymal tumors of the gastrointestinal tract with the stomach being the most common site of origin.[1–4] Gastric GISTs present on endoscopy or imaging as submucosal tumors and frequently cannot be distinguished preoperatively from other tumors such as leiomyoma, schwannoma or ectopic pancreas.[5,6] Presently, the treatment of choice of localized primary GIST is complete surgical resection with clear margins.[2–4,7] Local resection rather than formal organ resection is frequently the surgical procedure of choice as submucosal and lymphatic spread are rarely associated with GIST.[2,3,7,8] Hence, gastric GISTs are frequently treated via wedge resections (WR) rather than formal gastrectomies when technically feasible.[3–5]

In the past, open wedge resection (OWR) via laparotomy was the standard approach for gastric GISTs. However, in recent years; laparoscopic wedge resection (LWR) has

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been increasingly adopted and its feasibility is now well-established.[4,9] Several recent case series' and systematic reviews have reported that laparoscopic resection was superior to open resection in terms of short-term postoperative outcomes such as decreased blood loss, lower morbidity rate and shorter hospital stay without compromising on the oncologic outcomes.[4,9,10] However, an important limitation of these studies was that the studies included were retrospective in nature and there was an inherent selection bias between the patients in the laparoscopic arm compared to the open arm. In a recent systematic review comparing open versus laparoscopic resection of gastric GISTs,[4] patients who underwent open resection for gastric GIST were statistically more likely to undergo formal gastrectomy, have higher risk tumors and tended to have larger tumors (not statistically significant, $p = .099$) compared to the laparoscopic arm.

Hence, in the absence of a prospective randomized controlled trial it is difficult to determine if the superior perioperative outcomes reported with laparoscopy over the open approach was the result of the selection of 'technically simpler' and less extensive procedures in the laparoscopic arm.[4,5,11] The 2 main factors widely accepted to determine the technical difficulty of LWR for gastric GISTs are tumor size and location.[11,12] These factors have an important influence on perioperative outcomes. In general; larger tumors, tumors in the posterior gastric wall and tumors located in the proximal stomach (cardia and fundus) are associated with a more technically challenging resection.

Matched case–control studies may mitigate some of the biases associated with unmatched case control studies. To our knowledge only 3 matched case–control studies has been performed to date to compare laparoscopic with open resection of gastric GISTs.[11–13] Karakousis et al. performed a matched case control study which only controlled for tumor size but not tumor location.[11] Furthermore, the authors did not control for operation type and 2 patients in the open group underwent a distal gastrectomy compared to none in the laparoscopic group.[11] More recently, Bischof et al. performed a propensity matched-study comparing laparoscopic versus open resection of gastric GISTs.[13] However, only factors such as age, tumor size, sex, neoadjuvant or adjuvant tyrosine kinase inhibitors (TKI), year of surgery and margin status were used in the matching.[13] Important factors such as tumor location and resection type (formal gastrectomy versus WR) were not considered. The study by Lee et al. is the only study to date which controlled for resection type, tumor location and size.[12] They demonstrated that LWR was associated with superior postoperative recovery compared to OWR for gastric submucosal tumors.

The aim of this study was to determine the outcomes and efficacy of LWR versus OWR for suspected gastric GISTs. In this study, we aim to mitigate this selection bias by matching patients who underwent LWR and OWR by operation type, tumor location and size.

Methods

We identified all patients who underwent WR for suspected localized primary gastric GISTs between 1998 and 2013 from a prospectively maintained surgical database. This study was approved by our Institutional Review Board. All data were subsequently obtained retrospectively from the patients' clinical, radiological and pathological records. Only patients with localized tumors less than $\leq$90 mm were included (as the largest tumor in the LWR group was 90 mm). Patients' who had formal gastrectomies, tumors at the cardio-esophageal junction or had concomitant resection of other organs for other indications with the exception of cholecystectomies were excluded. During the time period, 114 patients who met these criteria were identified. Fifty patients underwent attempted LWR and 64 underwent OWR. The matched-pair control patients were selected from the OWR group.

LWR was first performed in our institution in 2002 and was only increasingly adopted as a surgical option in 2006.[6] Our institution has previously reported this initial experience with the first 14 LWR cases and the impact of its adoption on postoperative outcomes.[6] Presently, LWR is offered as the first option in most patients when deemed technically feasible although, the choice of surgical approach remains dependent on various factors including tumor characteristics (size and location), individual surgeons' preference/comfort level with the laparoscopic approach and patients' choice after a thorough discussion on the benefits and limitations of both approaches.

Definitions

In this study, tumors were classified as being located in the proximal 1/3rd or distal 2/3rd of the stomach. Tumors in the gastric cardia and fundus were classified as located in the proximal 1/3rd whereas those in the body, antrum, greater curve and lesser curve were in the distal 2/3rd. Tumors were also stratified as located in the anterior or posterior stomach. For tumors located exactly at the lesser or greater curve (neither anterior nor posterior), these were classified as being located anteriorly. Based on these definitions, the gastric tumors were divided into 4 groups according to location i.e. anterior or posterior proximal 1/3rd and anterior/posterior distal 2/3rds. Tumors could not be matched precisely by their exact location as there was inadequate number of patients who underwent OWR whom were available for matching. Close resection margins were defined as a microscopic resection margin of $\leq$1 mm.

Matching

First, the OWR group was matched with the LWR group for location according to the 4 groups as previously defined. Of the 50 patients who under LWR; 11 were located in the anterior proximal 1/3rd, 3 in the posterior proximal 1/3rd,