

# Application of an individualized operative strategy for wedge resection of gastric gastrointestinal stromal tumors: Effectiveness for tumors in difficult locations



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**Background.** There is some concern that wedge resection of gastric gastrointestinal stromal tumors is not feasible in certain anatomic locations, such as the cardia or antrum. We sought to review our experience with treatment of gastric gastrointestinal stromal tumors with a particular focus on nonanatomic wedge resections in these challenging locations.

**Methods.** Patients undergoing resection of gastrointestinal stromal tumors from 2000–2014 at the Montreal General Hospital were identified from a prospectively collected database, and outcomes were tabulated. An individualized operative strategy was used to guide resection based on tumor location, size, and characteristics. Disease-free survival and overall survival analyzed using the Kaplan-Meier method. Data are presented as median (range).

**Results.** We identified 59 patients who underwent operative resection for gastric gastrointestinal stromal tumors. Tumor location was fundus/body/greater curvature in 35 (59%) patients, lesser curvature in 8 (14%) patients, antrum in 8 (14%) patients, and cardia in 8 (14%) patients. Median tumor size was 4.5 cm (1.4–25 cm). The majority of cardia and antral lesions were removed with wedge resections (14/16, 87%). For cardial and antral tumors, on-table gastroscopy was used to guide the operative approach and prevent narrowing of the Gastroesophageal junction or pylorus in all patients undergoing wedge resection. Negative pathologic margins were achieved in all patients. The 5-year disease-free survival was 91% and 5-year overall survival was 95%.

**Conclusion.** When selected appropriately, and under the guidance of on-table gastroscopy, laparoscopic nonanatomic wedge resection can be performed successfully in the majority of cases, even for gastrointestinal stromal tumors near the GEJ or pylorus, with excellent oncologic outcomes. (Surgery 2016;160:1038-48.)

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GASTROINTESTINAL STROMAL TUMORS (GISTs) are the most common mesenchymal tumors of the gastrointestinal tract, arising from the interstitial cells of Cajal, the so-called “pacemaker cells” of the gut.<sup>1</sup> They are most common in the stomach and occur with an annual worldwide incidence of 1.5–2 cases per 100,000

people.<sup>2-4</sup> The median age of onset is in the mid-60s, and there is no sex preponderance.<sup>5</sup> All GISTs are considered to have malignant potential, although their behavior varies considerably. They typically metastasize by local invasion, direct peritoneal implantation, or hematogenous spread to distant sites, commonly the liver.<sup>6</sup> Recognized risk factors for recurrence include invasion into adjacent organs, large tumor size, high mitotic count, and incomplete surgical resection.<sup>7-10</sup> Patients at high risk of recurrence benefit from adjuvant treatment with the tyrosine kinase inhibitor imatinib.<sup>11,12</sup> However, in more than half of all cases,<sup>13</sup> operative resection alone is sufficient to prevent disease progression or recurrence, highlighting the importance of complete and oncologic surgical treatment of these tumors.

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Operative resection principles for gastric GISTs include complete en bloc tumor excision with microscopically negative mucosal margins and careful tumor handling to avoid intraperitoneal rupture. Lymphadenectomy is not required routinely as lymphatic spread is very rare.<sup>6</sup> As a result of several recent trials showing oncologic equivalency and superior clinical outcomes, the laparoscopic approach has supplanted open resection whenever technically possible,<sup>14</sup> although larger tumors, which require delicate handling and a large extraction incision, as well as those requiring multivisceral resection, continue to be approached preferentially by laparotomy.<sup>10</sup> Wedge resection is preferred to anatomic resection wherever possible due to the reduction in physiologic derangement and lower risk of anastomotic leak. However, there remains some concern that wedge resection is not feasible or appropriate in certain anatomic locations, such as the cardia or antrum.<sup>9,15-18</sup>

The purpose of this study was to review our experience with wedge resection for gastric GISTs, with a focus on resection techniques used for difficult anatomic locations, such as the antrum and cardia.

## METHODS

**Patient selection.** All patients undergoing resection of gastric GISTs from 2000–2014 at the Montreal General Hospital of the McGill University Health Centre were identified from a prospectively collected database. These were then cross-referenced against the operative booking database of all gastric resections performed during the study period. Pathology records of these patients were reviewed to identify all patients who had pathology-proven gastric resection for GIST. In total, 59 patients met inclusion criteria across the hospital system. Patients incidentally found to have a GIST in the pathology specimens of gastric sleeve resections for bariatrics or for gastroesophageal resection for another reason, such as adenocarcinoma, were excluded, as they did not undergo deliberate operative resection for the submucosal tumor but were operated for another indication. Because this review sought to describe our operative approach and techniques, it was thought inclusion of these patients would confound the results.

**Preoperative investigations.** Preoperative workup of all patients with suspected gastric GIST included upper endoscopy, endoscopic ultrasound for mass characterization, and endoscopic ultrasound-guided fine-needle aspiration for tissue diagnosis when possible. All patients

also had preoperative computed tomographic scans of the abdomen and pelvis to delineate tumor location and size and to rule out distant metastatic disease or local organ invasion. Patients with large, locally invasive tumors in whom upfront operative resection was thought to be impossible or highly morbid were referred for neoadjuvant treatment with imatinib and offered operative interventions when follow-up imaging showed tumor shrinkage had reached a plateau.

**Operative technique.** We utilized an individualized approach to plan operative resection of gastric GISTs, considering both tumor size and location. Larger tumors, which were deemed preoperatively to be difficult to handle laparoscopically, have an elevated risk of rupture, and/or require a large extraction incision, were approached most commonly via laparotomy. Based on experience, size of >10 cm is used as a guide to suggest the case is best approached in an open fashion. Wedge resection was performed preferentially to anatomic resection whenever possible. Tumors invading resectable surrounding organs (spleen, tail of pancreas, left lobe of liver, etc) were resected en bloc. All resection margins were confirmed to be negative by inspection of the specimen and/or consultation with a pathologist before leaving the operating room.

Tumors <10 cm were preferentially approached laparoscopically. In this technique, the patient is positioned supine, split leg, with the operating surgeon standing between the legs. An open Hassan technique is used to gain abdominal access at the umbilicus, 2 operator ports are placed in the left and right mid-clavicular lines along the gastric greater curvature, and an assistant port is placed laterally in the left upper quadrant. A liver retractor is used selectively. The stomach is then mobilized according to tumor location, requiring selective division of the short gastric vessels, the gastro-colic ligament or the gastro-hepatic ligament. Wedge resection is performed preferentially to anatomic resection whenever possible. For tumors deep along the posterior wall, a trans-gastric approach is used to access the tumor and an endoloop used to snare the tumor atraumatically at its base and exteriorize it through the gastrotomy. A laparoscopic stapler is then used to divide the stomach beneath the tumor, and the gastrotomy is then closed with sutures or stapling.

For all tumors, but particularly when they are near the pyloric channel, GEJ or incisura, on-table gastroscopy has been found to be invaluable in ensuring patency of these areas after closure of the

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