Journal of Surgical Oncology 2007;95:267–269

HOW I DO IT

Local Excision of Duodenal Gastrointestinal Stromal Tumor

KATHRYN LANUKE, MD,[1] OLIVER F. BATHE, MD, FRCSC FACS,[2] AND LLOYD A. MACK, MD, FRCSC[2]*
[1]Department of Surgery, University of Calgary, Calgary, Alberta, Canada
[2]Department of Surgery and Oncology, University of Calgary, Calgary, Alberta, Canada

KEY WORDS: Gastrointestinal stromal tumor; local excision; duodenum

INTRODUCTION

Unlike carcinomas, gastrointestinal stromal tumors (GIST) do not widely infiltrate at the microscopic level and they rarely metastasize to lymph nodes. Therefore, when technically feasible, a local excision is appropriate. Duodenal tumors represent a special situation because of the anatomical constraints imposed by neighboring structures. This is particularly true in tumors of the second and third parts of the duodenum. A case is described which illustrates the factors which contribute to operative decisions on the extent of resection.

GISTs are mesenchymal tumors of the gastrointestinal tract which typically express CD34 and c-kit proteins [1,2]. The interstitial cells of Cajal (ICC) also stain positive for c-kit while CD34 immunopositivity has been found in fibroblast-like cells near the ICC [1,2]. It is thought that GIST cells originate from the ICC [3,4].

Despite the availability of new systemic therapies for GISTs, surgery remains the primary treatment modality. While less than 5% of GISTs are found in the duodenum, these tumors represent a special technical challenge because of the potential involvement of adjacent organs, particularly when they are found in the second and third parts of the duodenum. For carcinomas in this region, pancreaticodudenectomy is frequently performed [5]. However, this can be associated with substantial post-operative morbidity [2]. Since GISTs tend to demonstrate local growth rather than lymphatic spread [6], less extensive procedures should be considered. We herein present an example of such a case, illustrating the operative decision-making that is entailed.

CASE/TECHNIQUE

A 36-year-old female presented with irregular menses leading to an abdominal ultrasound which incidentally demonstrated a solid mass inferior to the head of the pancreas and medial to the right kidney. Computed tomography (CT) scan illustrated a 3.3×4.1 cm soft tissue mass with well circumscribed borders at the second part of the duodenum (Fig. 1). No metastatic disease was identified. After pheochromocytoma or functional paraganglioma was ruled out with normal 24-h urinary metanephrines, a CT guided core biopsy was conducted. The tumor cells stained positive for c-kit and vimentin, and negative for desmin, S100, and CD 34. These findings were consistent with a GIST.

At laparotomy, no metastases were identified. The 5 cm tumor was located on the posterolateral aspect of the junction of the second and third parts of the duodenum; it did not appear fixed to the IVC. The hepatic flexure and right colon were mobilized followed by full kocherization of the duodenum. A small Fogerty catheter was passed through the cystic duct into the common bile duct and was guided through the ampulla into the duodenum. The balloon was inflated and pulled back to the sphincter. The tumor margin appeared clear of the ampulla on palpation. The duodenum was opened proximally on the anterior wall and a gross tumor margin at the ampulla was reconfirmed (Fig. 2). The entire third portion of the duodenum circumferentially and the lateral wall of the second portion (including tumor) was resected. Frozen sections of the remaining duodenum were sent, which confirmed clear margins.

Because jejunum was easily brought up to the duodenum, no Roux limb was constructed. Rather, an

*Correspondence to: Lloyd A. Mack, MD, FRCSC, Tom Baker Cancer Centre, Division of Surgical Oncology, 1331—29th St. NW, Calgary, AB, Canada T2N 4N2. Fax: 403-283-1651.
E-mail: lloydmac@cancerboard.ab.ca

Received 29 May 2006; Accepted 5 June 2006
DOI 10.1002/jso.20618
Published online in Wiley InterScience (www.interscience.wiley.com).

Fig. 1. Computed Tomography (CT) image of the GIST arising from the posterior wall of the second part of the duodenum with very well-circumscribed borders.

end-to-side duodenojejunostomy was constructed. The biliary Fogerty was kept in place throughout the construction of the anastomosis, as it served as a reference to the position of the ampulla. A cholecystectomy was performed after the anastomosis was completed, and the catheter was removed from the common bile duct. The patient tolerated the procedure well and blood loss was approximately 400 ml. The post-operative course was uneventful and the patient was discharged on the ninth post-operative day.

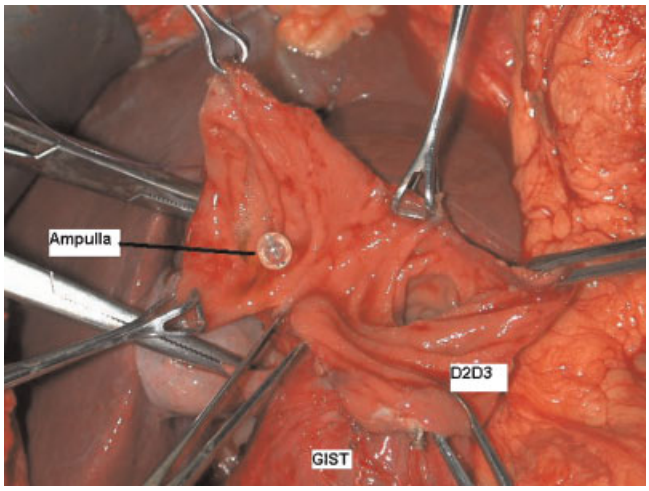

Fig. 2. Relation of the GIST to the ampulla and second and third parts of the duodenum (D2D3). The duodenum has been opened proximally on the anterior wall with electrocautery. A Fogarty catheter is shown at the entrance of the ampulla. [Color figure can be viewed in the online issue, available at www.interscience.wiley.com.]

Final histopathology confirmed a GIST measuring $6.0 \times 4.0 \times 3.5$ cm with a mitotic index of less than 5 per 50 HPF. The tumor stained positive for c-kit, actin, and vimentin. The tumor was negative for keratin and had a low Ki67 index. The margins of the specimen were free of tumor. The patient remains radiographically disease-free 15 months post-resection. Due to the size of her tumor, the patient was presented with the option of participating in the adjuvant imatinib trial (ACOSOG Z9001) but declined for personal reasons.

DISCUSSION

Gastrointestinal tumors are mesenchymal tumors which are distinct from leiomyomas and leiomysosarcomas. They are found most commonly in the stomach, small intestine, and rectum [7], but can be found anywhere in the gastrointestinal tract. GISTs exhibit a wide spectrum of biological behavior, from small indolent tumors to aggressive malignancies [2,6,8]. Several prognostic factors including tumor size, mitotic rate, proliferation index, presence of necrosis, and invasion of mucosa or adjacent structures have been used in an attempt to distinguish GISTs of low and high malignant potential [2,6,8]. Regardless of these distinguishing clinicopathologic features, GISTs generally behave very differently from carcinomas, as they do not typically infiltrate beyond their capsule and they rarely metastasize to lymph nodes [9]. For this reason, in most situations, local excision would be expected to be associated with similar outcomes as more radical surgery.

GISTs should be removed en bloc with an adjacent margin of normal tissue. However, the optimum width of tumor-free margin has not been defined [2]. The recurrence of GISTs appears to occur predominantly intra-abdominally; recurrences typically involve the original tumor site, the peritoneum, and the liver [6]. There is little rationale for a routine pancreaticoduodenectomy in all duodenal GISTs, and a less aggressive approach may be appropriate in some circumstances. Because of the infrequent involvement of regional lymph nodes, lymphatic dissection is not necessary. Pancreas need only be removed if the medial wall of the second or third part of the duodenum is involved or if the ampulla of Vater is involved. The latter can be defined by threading a small catheter into the cystic duct and through the ampulla. Following such a general approach, post-operative recurrence or metastasis is seen in 40%–90% of all cases and 5-year survival is 50%–65% [10]. Mutations in the c-kit oncogene result in the constitutive activation of the c-kit receptor tyrosine kinase leading to tumor formation; the protein represents a target for systemic therapy [2].

Imatinib effectively inhibits c-kit tyrosine kinase and therefore inhibits GIST progression and improves survival in the setting of metastatic disease [6]. Its role as an adjunct to surgery remains to be defined, and results of its use in a neoadjuvant or adjuvant setting are pending. It is quite probable that neoadjuvant imitinab may extend the surgeon's capability to perform more limited procedures, although this must be proven.

In conclusion, in some circumstances, GISTs can be locally excised and oncologic outcomes can be expected to conform with those seen following a more radical approach such as pancreaticodudenectomy. The criteria for a pancreas preserving approach in which the diagnosis of GIST has been established are: no involvement of the medial wall of the duodenum or the pancreas when the tumor lies in the second and third portions; no involvement of the ampulla; tumors of the first and fourth parts of the duodenum; and availability of good reconstructive options.

REFERENCES

1. Kindblom LG, Remotto HE, Aldenberg F, et al.: Gastrointestinal pacemaker cell tumor (GIPACT): Gastrointestinal stromal tumours show phenotypic characteristics of the interstitial cells of Cajal. Am J Pathol 1998;152:1259–1269.
2. Joensuu H, Fletcher C, Dimitrijevic S, et al.: Management of malignant gastrointestinal stromal tumours. Lancet 2002;3:655–661.
3. Sakurai S, Fukasawa T, Chong JM, et al.: Embryonic form of smooth muscle myosin heavy chain (SMemb/MHC-B) in gastrointestinal stromal tumour and interstitial cell cells of Cajal. Am J Pathol 1999;154:23–28.
4. Nishida T, Hirota S. Biological and clinical review of stromal tumours in the gastrointestinal tract. Histol Histopathol 2000;15:1293–1301.
5. Kaklamanos IG, Bathe OF, Franceschi D, et al.: Extent of resection in the management of duodenal adenocarcinoma. Am J Surg 2000;179:37–41.
6. DeMatteo RP, Lewis JJ, Leung D, et al.: Two hundred gastrointestinal stromal tumours: Recurrence patterns and prognostic factors for survival. Ann Surg 2000;231:51–58.
7. Miettinen M, Kopczynski J, Hal RM, et al.: Gastrointestinal stromal tumours, intramural leiomyomas, and leiomyosarcomasin the duodenum. Am J Surg Pathol 2003;27:625–641.
8. Verweij J, Casali PG, Zalcberg J, et al.: Progression-free survival in gastrointestinal stromal tumours with high-dose imatinib: Randomized trial. Lancet 2004;364:1127–1134.
9. Bucher P, Taylor S, Villiger P, et al.: Are there any prognostic factors for small intestinal stromal tumours? Am J Surg 2003;187:761–766.
10. Eisenberg BL, Judson I. Surgery and imatinib in the management of GIST: Emerging approaches to adjuvant and neoadjuvant therapy. Ann Surg Onc 2004;11:465–575.