ELSEVIER *Original Article*

Laparoscopic Intragastric Approach for Stromal Tumours Located at the Posterior Gastric Wall

Vicky K.M. Li, Wai-Ka Hung, Chi-Kin Chung, Marcus W.L. Ying, Billy Y.K. Lam, Daisy M.Y. Kan and Miranda C.M. Chan, Department of Surgery, Kwong Wah Hospital, Hong Kong SAR.

Surgical resection is indicated for gastrointestinal stromal tumour (GIST). Laparoscopic resection with clear margins is effective in gastric GIST. However, GIST located in the posterior gastric wall with close proximity to the oesophagogastric junction poses special challenges. Laparoscopic intragastric resection offers a new approach to the management of these tumours. The surgical technique, our experience and a summary of the literature are presented. [*Asian J Surg* 2008;31(1):6–10]

Key Words: gastrointestinal stromal tumour, laparoscopic intragastric resection

Introduction

Stromal tumour accounts for about 1–3% of all gastrectomy specimens.[1] The most common pathology is gastrointestinal stromal tumour (GIST). GIST most commonly occurs in the fundus, followed by the body and antrum.[2] Surgical resection is indicated for complete histological diagnosis and for managing complications like ulceration and bleeding.

A laparoscopic approach offers good postoperative recovery. For GISTs located at the anterior wall, laparoscopic wedge resection is indicated. However, for posterior wall GISTs, extensive mobilization of the stomach or creation of a large anterior gastrostomy is necessary to approach the tumour. Resection is even more difficult for tumours located close to the oesophagogastric junction (OGJ). Laparoscopic intragastric surgery (LIGS) may offer an advantage for GISTs located at these areas.

The laparoscopic intragastric approach was first described by Ohashi[3] in 1995 to treat early gastric cancers. Apart from the benefit of laparoscopic surgery, intragastric ports provide direct visualization and access to the interior of the stomach. Various therapeutic steps like mucosectomy[4] and full-thickness resection are possible under direct vision. For tumours close to the OGJ, resection can be performed under direct vision without damaging the OGJ.

LIGS was performed in three patients with GIST. The tumours were all located at the posterior gastric wall close to the OGJ. The surgical procedures are presented.

Surgical technique

The patients' demographic characteristics are shown in Table 1. All of them presented with upper gastrointestinal bleeding. The mean size of the GIST was 2.8 cm.

Each patient was put on a split-leg table and the operating surgeon stood between the legs (Figure 1). Pneumoperitoneum was achieved after subumbilical incision and insertion of a 10-mm port using the Hasson technique. A 30-degree laparoscope was inserted for diagnostic laparoscopy. The position of the tumour was confirmed with oesophagogastroduodenoscopy (OGD) by another surgeon who stood at the head of the patient. The stomach was adequately distended to facilitate the insertion of three intragastric ports. Gastrostomies were created using diathermy. The first two 5-mm ports with retaining device (Pediport®; AutoSuture Co., Norwalk,

Address correspondence and reprint requests to Dr Wai-Ka Hung, Department of Surgery, Kwong Wah Hospital, 25 Waterloo Road, Kowloon, Hong Kong SAR.
E-mail: hwkhwk@netvigator.com • Date of acceptance: 1 August 2007

Table 1. Patient demographics and gastrointestinal stromal tumour characteristics

Case	Sex/ Age (yr)	Position	Size (cm)	Distance from OGJ (cm)	Previous abdominal surgery	Operation time (min)	Diet resumed on postop day...	Discharged on postop day...	Mitotic count (per 10 high-powered field)
1	F/74	Fundus	2	5	None	240	6	9	<1
2	F/70	Posterior wall of body	4	3	Appendectomy	195	2	6	<1
3	F/87	Fundus	2.5	3	None	140	4	8	0–1

OGJ = oesophagogastric junction; postop = postoperative.

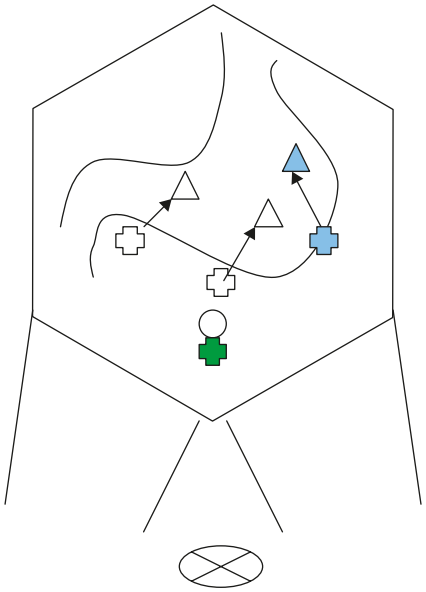

Figure 1. Sites of intragastric port insertion. ✣ = position of abdominal wound; △ = position of intragastric port. Green colour indicates 10 mm for initial laparoscopy and intragastric port insertion; blue colour represents 12 mm for endostapler; white represents 5-mm ports for mobilization and intragastric laparoscope.

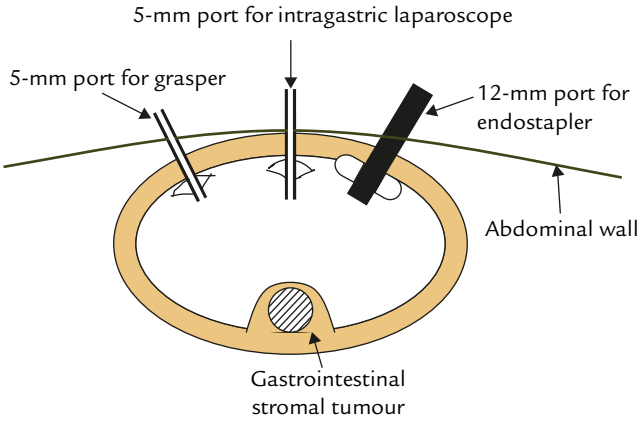

Figure 2. Diagrammatic representation of intragastric ports. Specially designed ports with self-retaining devices were used to maintain the position of the intragastric ports.

CT, USA) were inserted into the right upper quadrant and upper midline respectively. The first port was for "lifting up" of the tumour and the second was for a 5-mm intragastric laparoscope. Intragastric pressure was maintained at 10 mmHg with carbon dioxide insufflation. The third 12-mm balloon-tip intragastric port (Blunt tip trocar®; AutoSuture Co.) was inserted into the left upper quadrant for subsequent endostapler insertion (Figure 2). The position of these three intragastric ports varied according to the position of the tumour. The three ports were at least 6 cm apart.

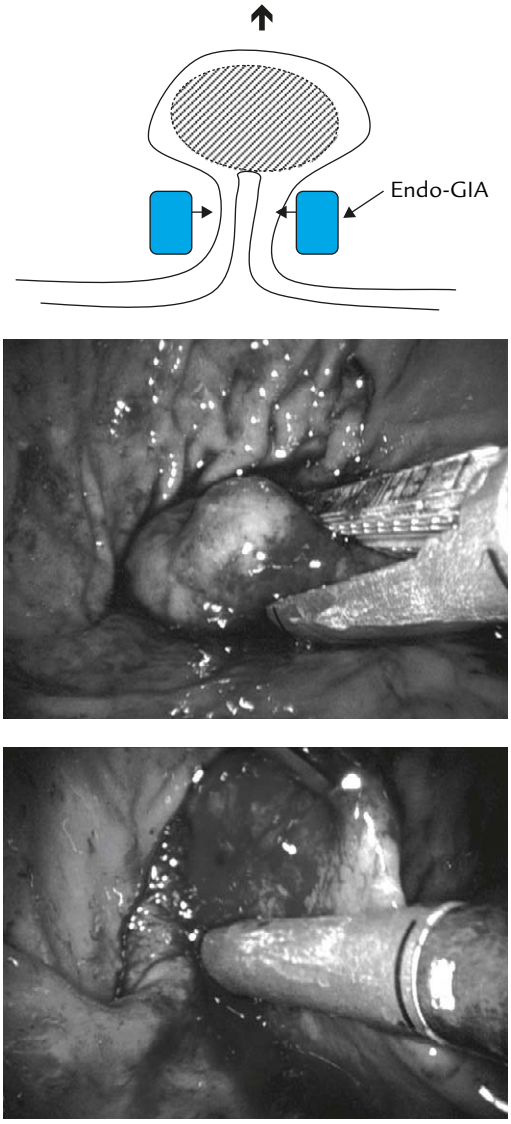

Figure 3. Engagement of the tumour with endostapler for full-thickness resection.

After aspiration of gastric fluid, the GIST was located and particular attention was paid to its proximity to the OGJ. The tumour was lifted up for engagement by an endostapler (Endo-GIA®; Ethicon, Somerville, NJ, USA) and full-thickness resection was performed (Figure 3).

The specimen was retrieved through the extended 12-mm intragastric port site and examined to confirm complete excision with clear macroscopic margins (Figure 4). The gastrostomies were closed with either intracorporeal sutures or extracorporeally through the abdominal incision. A nasogastric tube was inserted at the end of the operation to decompress the stomach.

Intravenous proton-pump inhibitor was given after the operation. All patients recovered uneventfully except for our first case. She had coffee-ground vomiting and required

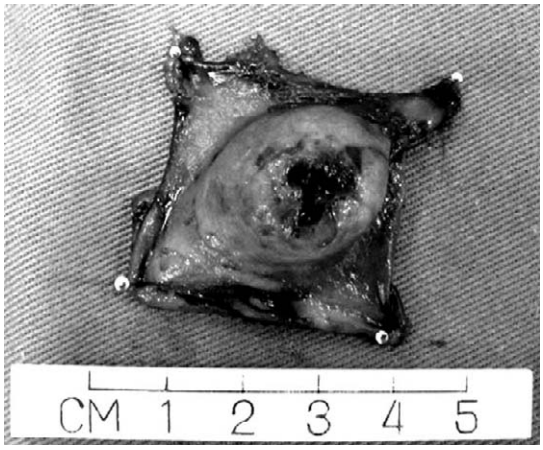

Figure 4. Resected tumour with clear macroscopic margins.

blood transfusion. This was likely to have been due to suture line bleeding, but the bleeding subsided spontaneously and no specific intervention was required. All specimens were confirmed to be benign GIST with clear resection margins. There was no evidence of recurrence on follow-up (follow-up duration ranged from 8 to 57 months).

Discussion

Results from reported series of laparoscopic intragastric resection for GIST are summarized in Table 2.[5–14] There was variation in the techniques used among different authors. Different port sizes ranging from 2 mm to 12 mm were used. Some authors employed OGD to avoid the third port,[6,7,14] and most series employed OGD to extract the specimen transorally. We preferred to deliver the specimen through the extended 12-mm port site because this enabled extracorporeal closure of gastrostomies. Using this technique in the second and third patients, we shortened our operation time compared to the first operation that used intracorporeal suturing. In Heniford et al's report, the three 2-mm ports were not closed at all.[14]

From Table 2, it should be noted that only three groups resected the tumours with an endostapler.[5–7] We preferred to use an endostapler for resection because suturing a gastrostomy in a collapsed stomach is technically demanding. In contrast, closure by stapling is fast and prevents contamination of the lesser sac. Furthermore, we believe that full-thickness resection ensures complete resection of the tumour. None of these reports, however, documented full-thickness resection. It has been demonstrated that complete resection is the most important factor to prevent recurrence of GIST.[15] Even for gastric leiomyosarcoma,[16,17]

Table 2. Reports of laparoscopic intragastric resection of gastrointestinal stromal tumours

Authors	Cases (*n*)	Sites	Size (cm)	Intragastric ports	Use of stapler	Full-thickness resection	Retrieval of specimen	Closure of gastrostomy
Tagaya et al[5]	6	OGJ	1.7–3.2	5 mm × 1–2 12 mm × 1–2	Yes	No	OGD	Both
Sekimoto et al[6]	1	Fundus	2	10–12 mm × 2	Yes	N/A	OGD	Intracorporeal
Ludwig et al[7]	8	Posterior	1.3–3.8	12 mm × 2	Yes	N/A	OGD	Intracorporeal
Taniguchi et al[8]	1	Cardia	5	5 mm × 2 12 mm × 1	No	No	OGD	Extracorporeal*
Uchikoshi et al[9]	7	OGJ	2.7–7.5	5 mm × 2 10 mm × 1	No	No	OGD	N/A
Choi & Oh[10]	9	Posterior	N/A	5 mm × 2 12 mm × 1	No	No	OGD	Intracorporeal
Nguyen et al[11]	1	OGJ	2.8	5 mm × 3	No	N/A	OGD	N/A
Walsh et al[12]	11	OGJ, posterior, fundus	2.4–5.8	2–5 mm × 2–3	No	N/A	OGD	Intracorporeal
Heniford et al[13]	1	OGJ	5	2 mm × 3	No	N/A	OGD	Not closed
Matthews et al[14]	3	OGJ	N/A	2 mm × 2	No	N/A	OGD	Intracorporeal

*Delivery of stomach through abdominal wound for closure. OGJ = oesophagogastric junction; OGD = oesophagogastroduodenoscopy; N/A = not clarified in text.

Table 3. Clinical outcomes of patients who underwent laparoscopic intragastric resection for gastrointestinal stromal tumour*

Authors	Cases (*n*)	Operation time (min)	Resumed diet (d)	Hospital stay (d)	Complications	Recurrence	Follow-up (mo)
Tagaya et al[5]	6	168	N/A	9.8	Nil	Nil	27
Sekimoto et al[6]	1	NA	N/A	N/A	Nil	N/A	N/A
Ludwig et al[7]	8	67.1 (49–102)	4	10.2	1 to open	Nil	(1.5–24)
Uchikoshi et al[9]	7	141.4 (95–200)	4.4 (3–7)	7.6	1 to open	1 in 2 yr	(1.17–8.25 yr)
Choi & Oh[10]	9	(100–140)	2.9	5.9	1 to open	Nil	Up to 42
Nguyen et al[11]	1	180	N/A	3	Nil	Nil	9
Walsh et al[12]	11	186 (120–320)	N/A	3–8	Nil	Nil	16.2 (1–32)

*Data presented as mean (range). N/A = not clarified in text.

full-thickness resection with negative margin is adequate surgical treatment for optimal survival. Since in most of these cases, a definite diagnosis cannot be made preoperatively, full-thickness resection seems to be a reasonable surgical strategy for dealing with these tumours.

For full-thickness resection of GIST by endostapler, it is essential to "lift up" the GIST for engagement by the endostapler (Figure 3). For tumours larger than 5 cm, difficulty may be encountered during stapler engagement because of the small opening of the stapler jaws. Moreover, it is generally believed that lesion size > 5 cm is one of the important features of malignant GIST. Therefore, we believe that LIGS may be most suited for GISTs that measure less than 5 cm.

To avoid gaseous distension of the intestines during intragastric surgery, Tagaya et al[5] introduced a soft bowel clamp through an additional 10-mm port to clamp the jejunum. We used carbon dioxide for gastric insufflation and kept the intragastric pressure below 10 mmHg. Bowel clamping was not performed and we did not encounter over-distension of the intestines.

Table 3 shows the clinical outcomes of patients after LIGS as reported in the literature.[5–7,9–12] All three of our patients recovered from their operations without major morbidity except for one with staple line bleeding that required transfusion. There was no evidence of recurrence. In conclusion, a laparoscopic intragastric approach is feasible and safe for patients with GIST located at the posterior wall of the stomach close to the OGJ.

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