Laparoscopic resection of benign submucosal gastric tumors

A report of 65 cases

Jean-Luc BOUILLOT (1), Laurent BRESLER (2), Pierre Louis FAGNIEZ (3), Guy SAMAMA (4), Gérard CHAMPAULT (5), Yves PARENT (6) et la Société Française de Chirurgie Laparoscopique

(1) Hôtel Dieu, Paris ; (2) Service de Chirurgie, Nancy ; (3) Hôpital Henri Mondor, Créteil ; (4) Hôpital de Caen ; (5) Hôpital de Bondy ; (6) Hôpital de Pau.

SUMMARY

Aim of the study — The aim of this retrospective multicenter study was to evaluate the feasibility and the results of laparoscopic resection of benign submucosal gastric tumors.

Patients and methods — We reviewed the cases of 65 patients (20 centers) who have been operated on laparoscopically for benign submucosal gastric tumors. The tumor was symptomatic in 56 cases, located on the posterior wall in 23 cases. The mean size of the tumor was 3.8 cm (1.5-10).

Results — A laparoscopic wedge resection was performed in 53 cases. In 1 case a laparoscopic-assisted gastrectomy was done. A conversion to laparotomy was mandatory in 11 cases because of difficulties in localization of the tumor (n = 5), in excision (n = 5) or for safety reasons (n = 1). There was no mortality. Two patients required reoperation because of bleeding. During follow-up, one patient developed recurrence requiring a second laparoscopic excision.

Conclusion — Most submucosal benign gastric tumors can be removed by laparoscopy. The location of the tumor (posterior wall or closed to the lesser curvature) or the size of the tumor (large or very small) can make the laparoscopic approach difficult.

RÉSUMÉ

Exérèse laparoscopique des tumeurs sous-muqueuses bénignes de l’estomac. A propos de 65 cas

Jean-Luc BOUILLOT, Laurent BRESLER, Pierre Louis FAGNIEZ, Guy SAMAMA, Gérard CHAMPAULT, Yves PARENT et la Société Française de Chirurgie Laparoscopique

Objectif — Cette étude rétrospective multicentrique avait pour but d’évaluer la faisabilité et les résultats de l’exérèse laparoscopique des tumeurs sous-muqueuses bénignes de l’estomac.

Matériel et méthodes — Les dossiers de 65 malades opérés sous laparoscopie d’une tumeur sous-muqueuse bénigne de l’estomac ont été étudiés (20 centres). Cinquante-six malades étaient symptomatiques ; dans 9 cas la lésion était de découverte fortuite. Vingt-trois tumeurs étaient développées sur la face postérieure de l’estomac. La taille moyenne des tumeurs était de 3,8 cm (extrêmes : 1,5-10).

Résultats — L’intervention a été menée sous laparoscopie exclusive 53 fois avec excision à la demande puis suture manuelle ou mécanique de l’estomac. Elle a nécessité une mini-laparotomie dans 1 cas pour gastrectomie caélo-assistée et a été convertie en laparotomie 11 fois en raison de difficultés de repérage de la lésion (n = 5), de difficultés techniques (n = 5) ou par sécurité (n = 1). Il n’y a eu aucune mortalité postopératoire. Deux malades ont dû être réopérés pour hémorragie sur la tranche de suture gastrique. À distance, un malade a présenté une récidive nécessitant une nouvelle exérèse laparoscopique.

Conclusion — La grande majorité des tumeurs sous-muqueuses bénignes de l’estomac se prête bien à une exérèse gastrique laparoscopique atypique. La localisation de la lésion (face postérieure, petite courbure) ou sa taille (petite ou très grande) peuvent cependant rendre le repérage et/ou l’exérèse difficile par cette voie.

Submucosal gastric tumors which develop in the connective tissue of the stomach wall are by definition deep-seated tumors which generally lie between the muscularis propria and the mucosa. Such tumors are much rarer than epithelial tumors and there has been much discussion on their classification. These tumors develop deep in the gastric wall growing inwardly or outwardly, sometimes leading to bleeding or obstruction. Surgical resection is often necessary. Until recently laparotomy was the standard procedure [1, 2]. Over the last ten years, several teams have published their experience with laparoscopic resection. Most of the reported series have however included a small number of patients [3-7]. The purpose of this multicentric retrospective study of a large number of patients was to assess the feasibility and results of laparoscopic resection of benign submucosal gastric tumors.

Patients and methods

Sixty-five patients seen between January 1993 and December 2000 in 20 centers were included in this retrospective study. The centers had 1 to 9 patients. There were 31 men, and 34 women, mean age 567 years (range: 18-88). The centers recorded the diagnostic circumstances, complementary tests performed, the pre- and post-operative diagnosis and surgical findings in their patients with benign tumors.
Laparoscopic resection of benign submucosal gastric tumors. A report of 65 cases

Table I. – Features of gastric tumors.

<table>
<thead>
<tr>
<th>Localization</th>
<th>Gastric tumors n = 65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size (cm):</td>
<td></td>
</tr>
<tr>
<td>• Mean (SD)</td>
<td>3.7 (2)</td>
</tr>
<tr>
<td>• Range</td>
<td>1.5-10</td>
</tr>
<tr>
<td>• 0-5, n (%)</td>
<td>58 (89)</td>
</tr>
<tr>
<td>• More than 5, n (%)</td>
<td>7 (11)</td>
</tr>
<tr>
<td>Cardia, n (%)</td>
<td></td>
</tr>
<tr>
<td>Fundus, n (%)</td>
<td>10 (15)</td>
</tr>
<tr>
<td>Mid third, n (%)</td>
<td>32 (49)</td>
</tr>
<tr>
<td>Antrum, n (%)</td>
<td>20 (31)</td>
</tr>
</tbody>
</table>

SD: standard deviation.

Results

Fifty-six patients had clinical symptoms. The clinical signs occurring alone or in association, which led to diagnosis were gastrointestinal bleeding (n = 26), anemia (n = 7), epigastric pain (n = 22), dyspepsia (n = 7), other (n = 3). Nine patients were symptom free. In these patients, the tumor was discovered during an upper endoscopic procedure (n = 6), or surgery for another disease (sigmoidectomy for sigmoiditis in one patient, and cholecystectomy in two). The preoperative work-up in 62 patients with a preoperative diagnosis of benign tumor included gastrosopy (n = 62), abdominal ultrasound (n = 12), computed tomography (n = 24, 39%), and endoscopic ultrasound (n = 40, 65%).

The characteristics of tumors are summarized in table I. The surgical procedure began with laparoscopy in all patients. Wedge resection was performed in 62 patients and gastrectomy in 3. The entire procedure was performed laparoscopically in 54 patients (combined with a mini-laparotomy for laparoscopy-assisted gastrectomy in one patient). The different procedures are reported in table II. Transmural resection was achieved in 52 patients: wide tumor resection and coagulation of the gastric wall with a coagulation forceps, followed by manual or mechanical (endo-GIA clips for wedge resection) closure of the gastric wound. Resection was more limited in one patient with a lipoma lying in the anterior wall of the antrum which was enucleated without opening the mucosa. Peroperative endoscopy was used in 20 patients to help localize the lesion, and laparoscopic ultrasonography in one other. Mean operative time was 104 min (range: 40-120). Cholecystectomy was performed during the same operation in 10 patients, an antrectomy in 2, and sigmoidectomy in 2. A second operation was required in one patient to arrest bleeding from an arteriole along the staple line. The conversion rate was 9% for tumors lying in the anterior wall (3/35) and 30% (7/23) for posterior tumors. Mean hospital stay was 8.6 days for these 11 patients.

The pre- and post-operative histology findings are reported in table III. At mean 20 months follow-up, one patient who underwent transmural resection of a leiomyoma with healthy margins developed a recurrent tumor requiring a second laparoscopic resection. No other complications or recurrences were observed.

Discussion

Submucosal gastric tumors are rare accounting for 5% of all gastric tumors [2]. These tumors are termed heterotopic, corresponding to normal endocrine or connective tissue developing in an ectopic localization (generally pancreas tumors). Connective tissue tumors can be further divided into differentiated tumors (benign or malignant) when the primary cell type can be identified and undifferentiated or stromal tumors composed of spindle cells [8], Immunohistochemistry may produce discordant results but generally enables identification of the stromal nature of these tumors (expression of CD34 and CD117 and absence of desmin antibodies) [9]. Recent studies have shown similar immunohistochemical and ultrastructural features in stromal tumors and Cajal cells. The common origin of these cell types is suggested by their common expression of the c-kit gene [10].

Submucosal gastric tumors have variable clinical presentations, depending on the size of the tumor and the presence of intra- or extra-gastric growth. Non-specific symptoms (overt or occult bleeding, abdominal pain, common dyspepsia) are the rule [1, 2, 11]. A large proportion of the patients (15-46% in the literature) are asymptomatic, the tumor being a fortuitous discovery at endoscopy or surgery. This raises the question of the rationale for excision under such circumstances [1, 12].

The diagnosis is based on endoscopy, computed tomography, and especially findings at endoscopic ultrasonography. Endoscopic ultrasonography is the only method which can identify the intramural nature of the tumor, enabling 92% diagnostic precision [13]. The precise localization of the tumor in the different layers may be suggestive of the histological type but the entire tumor must be examined to establish the definite diagnosis.
Complete surgical resection is generally proposed. Surgery is mandatory for symptomatic tumors, but may be discussed for asymptomatic tumors. This is especially true for small-sized asymptomatic tumors or certain tumors perfectly identified by imaging (lipoma, ectopic pancreas). If the nature of the tumor remains doubtful, surgical resection should be performed. The role for per-endoscopic mucosectomy is not well established and can only be proposed for small-sized tumors strictly limited to the submucosa [8].

The most appropriate surgical approach remains to be determined. The objective is to achieve complete transmural resection with healthy margins without rupturing the tumor. Simple enucleation (3 tumors in our series) should be avoided because complete transmural resection can only be achieved for submucosal lipomas, requiring a precise preoperative diagnosis. The advantages of a gastrectomy in comparison with wedge resection and possible lymph node dissection have not been proven [1, 14-15]. The only indication for gastrectomy concerns tumors involving the gastric orifices or tumors with a wide implantation base prohibiting wedge resection. This was the case in 3 of our patients [4, 6%], a percentage lower than that reported by others [12.5% and 23% [2, 3].

Until recently, laparotomy has been the preferred procedure despite significant morbidity [1, 2], but the advent of minimally-invasive surgery has incited several teams to propose laparoscopic resection of submucosal gastric tumors [5, 6, 16-19]. A limited number of cases have been reported in the literature and to date only two series have included more than 30 patients [20-21].

The laparoscopic approach raises several problems. Peroperative localization of the tumor may be difficult. Exophytic tumors are easily identified, both in the anterior and posterior wall, but small intramural tumors or tumors lying close to the pylorus may be difficult to identify. One proposed solution is to tattoo the overlying gastric wall during the peroperative endoscopic procedure, but experience has been anecdotal. Most teams use peroperative endoscopy to locate the tumor in difficult situations, guiding the resection with transillumination. We have used endoscopic guidance in about one-third of our patients. With an endoscope, the quality of the resection and absence of bleeding or stenosis can also be checked at the end of the procedure [22]. Laparoscopic ultrasonography would be an attractive solution [one case in our series] but is not a routine technique [4, 18, 23]. Exploratory gastrotomy may be the only solution in other cases.

Generally, a transmural resection is required. This type of resection can be performed with scissors after opening the stomach or with coagulation forceps, enabling adapted resection. The gastric wound is closed with intracorporeal sutures. More generally, resection is performed without opening the stomach. With this technique, the gastric wall over the site of the tumor is distracted in order to section the portion of the wall involved followed by laparoscopic stapling. Not opening the stomach avoids the risk of contamination (infection, tumor) but has some drawbacks including the cost of the stapling material and the impossibility of checking the quality of the resection. This latter point is particularly important since the size of the resection must be adapted to the size of the tumor (risk of stenosis after an overly large resection near the cardia or the pylorus or insufficiently wide margin after an overly restricted resection) [24]. There is also the risk of bleeding along the staple line (2 cases in our experience) and the need for a second intervention, which can be avoided by carefully choosing the size of the staples.

The localization of some tumors makes resection more difficult. If the tumor lies in or near the fundus, the entire upper portion of the stomach may have to be mobilized, requiring section of short vessels. If the tumor lies posteriorly, a posterior access to the tumor may be required after opening the omental bursa. Otherwise an anterior access may be achieved via anterior gastrotomy. Resection of a posterior wall tumor can then be easily performed with a coagulation forceps or with a mechanical stapler, the anterior gastrotomy being closed with sutures or staples. Tumors lying near the cardia or the pylorus must be removed with as little healthy tissue as possible to avoid stenosis of the gastric lumen. If the tumor is very large, gastrectomy (performed laparoscopically depending on experience) would be preferable.

We do not have any experience with the intragastric surgical procedure proposed by Ohashi [25] for the treatment of intramucosal gastric tumors. This method is used by some teams for the treatment of submucosal tumors of the anterior wall [20, 26]. It does not however allow resection of transmural tumors which should preferentially be removed with an intragastric laparoscopic procedure [17, 23, 27]. This involves introducing the trocars directly into the stomach for a closed-stomach resection which avoids contaminating the peritoneum with the gastric contents. The theoretical advantage is limited and the procedure is more difficult than the open-stomach technique. It can be useful for tumors in a difficult localization (cardia, lesser curvature) [17].

Laparoscopic resection of submucosal gastric tumors is a reliable and safe method as shown by data in the literature [17, 21, 28-29]. Conversion rate has varied from 0 to 22%, similar to

Table III. – Pre and postoperative histologic diagnosis.

<table>
<thead>
<tr>
<th>Preoperative diagnosis (n = 62)</th>
<th>Definitive postoperative diagnosis (n = 65)</th>
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</thead>
<tbody>
<tr>
<td>Stromal tumor</td>
<td>7</td>
</tr>
<tr>
<td>Leiomyoma</td>
<td>16</td>
</tr>
<tr>
<td>Schwannoma</td>
<td>20</td>
</tr>
<tr>
<td>Lipoma</td>
<td>1</td>
</tr>
<tr>
<td>Ectopic pancreas</td>
<td>2</td>
</tr>
<tr>
<td>Extra-gastric tumor</td>
<td>2</td>
</tr>
<tr>
<td>Carcinoïd tumor</td>
<td>1</td>
</tr>
<tr>
<td>Dysembryoplastic tumor</td>
<td>0</td>
</tr>
<tr>
<td>Glomic tumor</td>
<td>0</td>
</tr>
<tr>
<td>Neurinoma</td>
<td>0</td>
</tr>
<tr>
<td>Unspecified benign tumor</td>
<td>13</td>
</tr>
</tbody>
</table>

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Despite the advantages, the question remains as to whether laparoscopic resection is the most appropriate solution. The risk of tumor seeding is a well-known problem after laparoscopic surgery for cancer of the colon. Is there a similar risk of recurrence after laparoscopic resection of connective tissue tumors of the stomach? To date, there has been no report of tumor dissemination after resection of connective tissue tumors, but there has been one reported case of tumor seeding after laparoscopic resection of a borderline connective tissue tumor of the duodenum [30]. The prudent approach would be to limit indications for laparoscopic resection to benign tumors, recognizing that there is no way to achieve formal proof of benignity before resection [13]. Malignant tumors are distinguished from benign tumors by their gross aspect (tumor size > 5 cm, lymph node metastases) and their microscopic properties (tissue density, mitotic index). The hypothetical risk of perioperative tumor dissemination implies performing the laparoscopic procedure in strict compliance with the rules of oncological surgery: avoid repeated exsufflation and tumor manipulation, prefer closed-stomach resection, extraction of the surgical specimen in a bag, wash out the peritoneum and trocar portals at the end of the procedure.

In conclusion, the laparoscopic approach appears to be a safe and reliable technique for the treatment of benign submucosal tumors of the stomach. For teams experienced in laparoscopic surgery, the procedure is easy to perform and enables the same gastric resection as laparotomy. It may however be difficult to localize small-sized tumors or tumors of the posterior wall. Likewise, large tumors or tumors near the cardia or pylorus may be difficult to remove. Based on our experience, laparoscopic surgery can be recommended as the first-line approach for benign submucosal gastric tumors, conversion still being possible in case of difficulty.

REFERENCES


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