Liposarcoma of the stomach: Report of two cases and review of the literature

Wen-Zhe Kang, Li-Yan Xue, Gui-Qi Wang, Fu-Hai Ma, Xiao-Long Feng, Lei Guo, Yang Li, Wei-Kun Li, Yan-Tao Tian

Department of Pancreatic and Gastric Surgery, National Cancer Center/National Clinical Research Center for Cancer/ Cancer Hospital, Chinese Academy of Medical Sciences and Peking Union Medical College, Beijing 100021, China

Li-Yan Xue, Xiao-Long Feng, Lei Guo, Department of Pathology, National Cancer Center/ National Clinical Research Center for Cancer/Cancer Hospital, Chinese Academy of Medical Sciences and Peking Union Medical College, Beijing 100021, China

Gui-Qi Wang, Department of Endoscope, National Cancer Center/ National Clinical Research Center for Cancer/Cancer Hospital, Chinese Academy of Medical Sciences and Peking Union Medical College, Beijing 100021, China

ORCID number: Wen-Zhe Kang (0000-0001-9965-8109); Li-Yan Xue (0000-0001-5185-0126); Gui-Qi Wang (0000-0001-7767-1564); Fu-Hai Ma (0000-0003-2437-6881); Xiao-Long Feng (0000-0003-4745-9513); Lei Guo (0000-0002-3110-8167); Yang Li (0000-0002-4549-7087); Wei-Kun Li (0000-0002-3883-1497); Yan-Tao Tian (0000-0001-6479-7547).

Author contributions: Tian YT, Xue LY, and Wang GQ designed the report; Ma FH, Guo L, Li Y, and Li WK collected the patient’s clinical data; and Kang WZ and Feng XL analyzed the data and wrote the paper.

Supported by Beijing Municipal Science and Technology Commission, No.Z161100000116045; and National Natural Science Foundation of China, No. 81772642.

Informed consent statement: Consent was obtained from patients for publication of this report and any accompanying images.

Conflict-of-interest statement: The authors declare that they have no conflicts of interest.

CARE Checklist (2013) statement: The authors have read the CARE Checklist (2013), and the manuscript was prepared and revised according to the CARE Checklist (2013).

Open-Access: This article is an open-access article which was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: http://creativecommons.org/licenses/by-nc/4.0/

Manuscript source: Unsolicited manuscript

Correspondence to: Yan-Tao Tian, MD, Professor, Department of Pancreatic and Gastric Surgery, National Cancer Center/ National Clinical Research Center for Cancer/Cancer Hospital, Chinese Academy of Medical Sciences and Peking Union Medical College, No. 17, Panjiayuan Nanli, Beijing 100021, China. tyt67@163.com

Telephone: +86-10-87787120
Fax: +86-10-87787120

Received: April 27, 2018
Peer-review started: April 28, 2018
First decision: May 24, 2018
Revised: May 26, 2018
Accepted: June 9, 2018
Published online: July 7, 2018

Abstract

Liposarcoma of the stomach is extremely rare, and only 37 cases have been reported worldwide. We herein report two cases of liposarcoma of the stomach. The first patient was referred to our hospital with upper abdominal discomfort. The endoscopic examination revealed a tumor mass about 3 cm in diameter. The patient underwent a partial gastrectomy and had an uneventful recovery. The histopathological examination revealed a well-differentiated liposarcoma. The second patient had symptoms of upper abdominal discomfort combined with nausea and anorexia. Several palpable masses were found with endoscopy. Endoscopic submucosal dissection
was the treatment used, and the postoperative course was uneventful. The histopathological diagnosis was a well-differentiated liposarcoma. The two patients did not undergo any adjuvant therapy. They are both currently in good condition without recurrence. Therefore, we believe that the outcome of liposarcoma of the stomach is positive, and surgical resection may be the first choice for treatment at present.

Key words: Pathology; Signs and symptoms; Diagnosis; Liposarcoma; Therapeutics

© The Author(s) 2018. Published by Baishideng Publishing Group Inc. All rights reserved.

Core tip: Liposarcoma of the stomach is extremely rare, and only 37 cases have been reported in the literature. We herein report two cases and review the literature. These cases might contribute to improving our understanding of the etiology, diagnosis, treatment strategies, and outcome of liposarcoma of the stomach. This report can also serve as a reminder to gastroenterologists, surgeons, and pathologists who encounter liposarcoma of the stomach in their clinical practice.

Kang WZ, Xue LY, Wang GQ, Ma FH, Feng XL, Guo L, Li Y, Li WK, Tian YT. Liposarcoma of the stomach: Report of two cases and review of the literature. World J Gastroenterol 2018; 24(25): 2776-2784 Available from: URL: http://www.wjgnet.com/1007-9327/full/v24/i25/2776.htm DOI: http://dx.doi.org/10.3748/wjg.v24.i25.2776

INTRODUCTION

Liposarcoma is one of the most common mesenchymal neoplasms[1], and liposarcomas are classified histologically into five subtypes[2]. However liposarcoma of the stomach is rare, and only 37 cases have been reported in the literature. Liposarcoma of the stomach is mainly located in the antrum, and it is usually of submucosal origin. Definitive diagnosis is reached only by histopathological examination. Because of the low incidence of this tumor, treatment of gastric liposarcoma is still not well-standardized. However, the prognosis may remain satisfactory if the condition is diagnosed early and treated appropriately. Herein, two cases of liposarcoma of the stomach are described, and we also discuss the histopathological types, etiology, diagnosis, and treatment strategies in this report.

CASE REPORT

In the Chinese Academy of Medical Sciences Cancer Hospital we encountered two cases, one in 2009 and one in 2016.

Case 1
The first patient was a 45-year-old woman who presented with the symptom of upper abdominal discomfort, which she had experienced for 6 mo. She complained of abdominal pain without any fever or gastrointestinal bleeding. During the physical examination, no special physical signs were found.

The gastroscopy revealed a large tumor mass about 5 cm in diameter located in the junction of the body and fundus of the stomach; it had been considered a benign tumor. Computed tomography confirmed a spherical tumor in the stomach, which was approximately 5.6 cm × 4.2 cm × 3.5 cm in size. The border of the tumor was clear and presented a significantly strengthened edge, and the center of the tumor was inhomogeneous. There were no visible signs of metastatic disease. Upper gastrointestinal imaging also found a circular tumor with smooth edges. The patient had no distinctive past medical history and denied any relevant family history. On March 30, 2009, the patient underwent a resection of the stomach tumor, and surgeons resected part of the omentum. An intraoperative pathology freezing study revealed mesenchymal neoplasms.

She had an uneventful recovery and was discharged after 9 d. The patient did not undergo any adjuvant treatment. She has remained under close follow-up supervision and is currently disease free.

The histopathological examination revealed a well-differentiated liposarcoma measuring 6 cm × 5 cm × 4 cm, which had infiltrated the muscle and serosal layers of the gastric wall (Figure 1). The immunohistochemistry findings were S-100+, CD34++, SMA+, Desmin++, CD117-, HMB45-, and Ki-67 < 1%. Fluorescent in situ hybridization (FISH) detection showed amplification of the MDM2 gene (Figure 2).

Case 2
A 69-year-old man was admitted to our department because of upper abdominal discomfort combined with nausea and anorexia that he had been experiencing for about 6 mo. During this period he lost 10 kg in weight. At first he pursued treatment with traditional Chinese medicine, and his symptoms were relieved. He underwent pituitary surgery in 2014 because of a pituitary tumor, and he had suffered from hypertension for 30 years. As a result of regular medication, his blood pressure was well controlled. His family history was unremarkable.

Our hospital’s endoscopic examination showed that a limited knurl was distributed from the lower part of the gastric body to the corner of the stomach (Figure 3A), and a knurl was also found in the gastric fundus (Figure 3B). Multiple biopsies were obtained, but they were all superficial and showed only unspecific inflammation of the gastric mucosa. Gastric endoscopic ultrasound (EUS) examination revealed that the tumor was mainly located in the submucosa of the gastric wall and was potentially a liposarcoma (Figure 4). Computed tomography confirmed a fat density tumor about 5.1 cm × 2.8 cm in size. No hepatic metastasis or nodal involvements were detected.
On August 1, 2016, an endoscopic submucosal dissection (ESD) was performed (Figure 5). During the operation, we found that the surface of the tumor was complete and smooth, and the substrate was sturdy. The operation was successful without any complications. The postoperative course was uneventful, and the patient was discharged on postoperative day 7. He did not undergo any adjuvant treatment and remained free of metastasis 20 mo after surgery.

The histopathological diagnosis was a well-differentiated liposarcoma (Figures 6 and 7). FISH testing demonstrated amplification of the MDM2 gene (Figure 8).

**DISCUSSION**

Liposarcoma, a kind of malignant tumor of mesenchymal origin, is one of the most common soft tissue sarcomas\(^1\). However, liposarcoma of the stomach is extremely rare. The first case was reported by Abrama and Tuberville in 1941, and until now only 37 cases (with a mean age of 57.0 years) have been reported worldwide (Table 1).

According to the 2013 WHO classification of soft tissue tumors, liposarcoma is a malignant fat cell tumor that can be histologically subdivided into the following five types: atypical lipomatous tumor/well differentiated liposarcoma, dedifferentiated liposarcoma, myxoid liposarcoma, pleomorphic liposarcoma, and liposarcoma, not otherwise specified\(^2\).

Both of our cases had well-differentiated liposarcomas. Well-differentiated liposarcoma (including atypical lipomas) is the most common subtype, accounting for about 40%-45% of all liposarcomas\(^3\). Under the
A limited knurl was distributed from lower part of the gastric body to the corner of the stomach (A), and a knurl was also found in the gastric fundus (B).

Endoscopic ultrasound examination located the tumor mainly in the submucosa of the gastric wall.

Process of the endoscopic submucosal dissection.

Common subtype is myxoid liposarcoma, which represents about a third of all liposarcomas\(^3\). Myxoid liposarcoma is characterized by a myxoid matrix\(^6\). Under the microscope, its cells look like normal fat cells. This kind of liposarcoma is usually a low-grade tumor in the early stages and grows slowly\(^4\). There is a risk of local recurrence but a low potential for metastasis\(^5\). Dedifferentiated liposarcomas and well-differentiated liposarcomas are related\(^1\). Approximately 10% of dedifferentiated liposarcomas are recurrences of well-differentiated liposarcomas\(^3\). The second most common subtype is myxoid liposarcoma, which represents about a third of all liposarcomas\(^3\). Myxoid liposarcoma is characterized by a myxoid matrix\(^6\). Under the microscope, its cells look less normal and may have a high grade component. Tumor cells infiltrate blood vessels in the fibromyxoid stroma that form characteristic clusters or branches. Therefore, we usually categorize myxoid liposarcomas as intermediate to high.
Table 1  Review of literature

| Year | Author et al | Age | Sex | Treatment | Size (cm) | Histologic subtype | Outcome |
|------|--------------|-----|-----|-----------|----------|-------------------|---------|
| 1941 | Abrams et al[23] | 52 | M | Exploratory laparotomy | Entire length of the stomach | Unknown | DOD in 4 mo |
| 1955 | Hoib et al[23] | 77 | M | S + radiation | 15 × 8 × 6 antrum | Unknown | WR in 8 mo |
| 1965 | Hawkins et al[23] | 86 | M | S | 10 × 10 fundus | MY | WR in 24 mo |
| 1968 | Orita et al[23] | 42 | M | S | 1.2 × 1.0 × 1.0 body | Unknown | WR 60 mo |
| 1969 | Souheil Suzuki et al[23] | 42 | F | S | 15 × 11 × 9.5 | Mixed | WR |
| 1983 | Hirakawa et al[23] | 41 | M | S | 4.0 × 3.5 × 1.5 | MY | DOD in 18 mo |
| 1984 | Lopez et al[23] | 24 | M | S | 10 in diameter | MY | WR |
| 1986 | Kiyoshi Kagawa et al[23] | 64 | F | Tumor resection | About hen-egg | WD | WR |
| 1986 | Shokouhi-Amiri et al[23] | 15 | M | S | 30 × 20 Greater curvature | MY | WR 8 mo |
| 1986 | Laky et al[23] | 67 | F | P | 5 × 2 × 1.5 antrum | Mixed | WR 12 mo |
| 1988 | Toshihiro Hirao et al[23] | 66 | M | T | 10 × 8 × 3 | My | Dissemination |
| 1992 | Sacchiho Matsusaki et al[23] | 42 | F | S | about 600 g | MY | WR |
| 1993 | Toshiki Hirose et al[23] | 30 | M | S | 9 in diameter | WD | WR |
| 1993 | Matsuzawa et al[23] | 56 | F | P | Child’s head 1300 g | WD | Unknown |
| 1994 | Yoshibumi Suzuki et al[23] | 9 | M | T | / | Dedifferentiated | Unknown |
| 1995 | Ferrozzio et al[23] | 58 | M | Tumor resection | 25 × 20 × 8 antrum | Pleomorphic | Unknown |
| 1995 | Shigebaru Suzuki et al[23] | 57 | M | S + chemotherapy | 4.8 in diameter | WD | WR |
| 1995 | Yamamoto et al[23] | 58 | M | P + endoscopic resection | 1.3 × 0.5 Greater curvature | Mixed | WR 12 mo |
| 1996 | Mitsuyoshi Sakayanagi[23] | 72 | F | T | 17.5 × 7.5 × 1.3; 1700 g | Pleomorphic | Unknown |
| 2000 | Tsutomu Andou et al[23] | 68 | F | T | 10.6 × 4 | WD | Unknown |
| 2002 | Masahiro Matsuama[23] | 34 | F | Distal gastrectomy | 3.5 × 3 × 3 | MY | Unknown |
| 2002 | Lopez-Negrete[23] | 74 | F | T | 15 in diameter minor curvature | Mixed | Sudden death |
| 2002 | Seki et al[23] | 68 | F | T | 10.5 × 5.5 × 4 body | WD | WR 15 mo |
| 2000 | Philips et al[23] | 74 | F | S | 3.4 × 1.3 × 0.5 antrum | MY | WR 15 d |
| 2002 | Hisanobu Sagemura et al[23] | 34 | F | S | 4 × 2.8 minor curvature | WD | WR in 36 mo |
| 2005 | Noushini et al[23] | 62 | M | S | 7 × 6 minor curvature | WD | Unknown |
| 2007 | Konstantinos et al[23] | 68 | M | T | 9 × 4 fundus | WD | WR in 24 mo |
| 2007 | Michiels et al[23] | 27 | F | Distal gastrectomy, liver, diaphragm, pancreas, spleen, pericardium; adjuvant chemotherapy | 30 × 20 (5 kg) minor curvature | Pleomorphic | DOD in 16 mo |
| 2012 | Mohamed et al[23] | 51 | M | T | 9 × 7.5 × 5 antrum | WD | WR in 12 mo |
| 2013 | Akin et al[23] | 59 | F | Distal gastrectomy | 4 × 3 × 2.5 antrum | WD | WR in 12 mo |
| 2014 | Kim et al[23] | 46 | F | Laparoscopic, distal gastrectomy; adjuvant treatment | 7 in diameter body | WD | Unknown |
| 2015 | Abderharram et al[23] | 70 | M | Antrectomy + adjuvant therapy | 36 in diameter antrum | MY | DOD in 11 mo |
| 2016 | Matone et al[23] | 76 | M | Laparoscopic + P | 7.5-7.0 in diameter antrum | WR | WR in 6 mo |
| 2017 | Jiang et al[23] | 55 | F | P + tail of pancreas and spleen was resected | 1.5 in diameter fundus | WD | WR in 48 mo |
| 2017 | Hisata et al[23] | 79 | F | Surgery for the cardiac tumor | 0.5-1.0 in diameter greater curvature | Dedifferentiated | DOD in 55 d |
| 2017 | Tomofuji et al[23] | 61 | F | Laparoscopic total gastrectomy | 5 in diameter fundus | WD | WR in 14 mo |
| 2018 | Girardot-Miglierina et al[23] | / | / | / | Gastro-esophageal junction | Unknown | Unknown |
| 2016 | Our case | 70 | M | Endoscopic resection | 6 × 3.5 × 2 minor curvature | WD | WR in 20 mo |
| 2009 | Our case | 45 | F | Tumor resection | 6 × 5 × 4 body | WD | WR in 9 yr |

DOD: Death of disease; WR: Without recurrence; MY: Myxoid liposarcoma; Mixed: Mixed type liposarcoma; WD: Well-differentiated liposarcoma; S: Subtotal gastrectomy; P: Partial gastrectomy; T: Total gastrectomy.

grade tumors. Pleomorphic liposarcoma is considered the least common subtype and has been properly characterized only recently. It accounts for approximately 5% of liposarcomas and is a highly malignant lesion[27]. Pleomorphic liposarcoma is characterized by increased mitotic activity and hemorrhage as well as necrosis[28].
on the location and size of the tumor and the presence of tract bleeding. The type of symptom that appears depends on vomiting, anorexia, abnormal bowel movements, asthenia, of gastric liposarcoma range from dyspepsia, nausea, and to differentiate between low-grade and high-grade tumors. The symptoms it presents an extra-luminal growth, and the patient can remain asymptomatic for a long time. The symptoms of gastric liposarcoma range from dyspepsia, nausea, vomiting, anorexia, abnormal bowel movements, asthenia, and epigastric abdominal pain to upper gastrointestinal tract bleeding. The type of symptom that appears depends on the location and size of the tumor and the presence of ulcerations. Space-occupying lesions of the stomach or abdominal cavity contribute to the appearance of clinical symptoms. When the submucosal mass extrudes into the lumen, it can cause traumatic and inflammatory changes and result in necrosis, ulceration, and hemorrhage. For patients with giant tumors, the main clinical sign may be the presence of a large abdominal mass of unknown origin. In our cases, the main clinical sign in both patients was epigastric abdominal pain that continued for longer than 6 mo. In both cases, the typical exophytic growth explains the lack of specific gastrointestinal symptoms and the delayed diagnosis. Some cases of gastric liposarcoma can involve other organs synchronously, and unique symptoms may be present.

Unfortunately, because of the lack of specific symptoms, it is difficult to achieve an early diagnosis. The diagnosis of gastric liposarcoma mainly relies on pathological examination. Cytogenetics and molecular biology provide effective tools for differentiating among types of lipomatous tumors. Macroscopically, liposarcoma present intricate myxomatous zones, which include round cells, pleomorphic clearly differentiated lipoblastic aspects, and hemorrhagic areas. Because endoscopic biopsies do not penetrate the submucosa, the diagnostic value of the endoscopy is unclear, and it is difficult to make a precise judgment on the basis of biopsy findings. Endoscopic biopsies may be useful when the tumor presents endoluminal development. With the guidance of EUS or abdominal ultrasound, biopsy may be possible, and a histological examination, immunohistochemistry, and a cytogenetic study can be performed. Detection of MDM2 is probably important in diagnosis. In terms of imaging, computed tomography is considered the most informative examination. The presence of fat density areas is pathognomonic for fatty tumors, and an association with enhanced areas is highly suggestive of the diagnosis. CT scans can also show secondary lesions in the liver, lung, peritoneum, or other places.

Currently, the main therapy for gastric liposarcoma is surgical removal. The type of gastrectomy chosen depends on the location of the tumor. According to the rules of sarcoma resection, surgeons should resect the tumor with a wide margin of healthy tissue around it and make sure there is no remaining tumor tissue. Lymph node dissection may be unnecessary. In consideration of the successful application of ESD in early gastric cancer, we believe this method is available for a low-grade tumor in the early stages. Chemotherapy and radiotherapy combined with surgery have been successful in most malignant tumors; however, we still cannot develop a guideline for chemotherapy and radiotherapy in patients with gastric liposarcoma. There is very little information in the literature about the use of chemotherapy for gastric liposarcoma. Because of a high local recurrence rate.
of 70%-90% for high-grade soft-tissue sarcomas, adjuvant therapy may be necessary. On the contrary, Matone et al. hold the opinion that there is currently no evidence that chemotherapy or radiotherapy improves survival rates. Three drugs, ifosfamide, doxorubicin, and dacarbazine are active in the therapy of adult soft tissue sarcoma; they provide a potential therapeutic pathway for gastric liposarcoma. Radiation therapy may be beneficial by killing tumor cells and reducing the chance of the tumor returning in the same location and may be widely used in the treatment of sarcoma. Only six cases reported in the literature received adjuvant treatment. In our cases, patients did not undergo any adjuvant or neoadjuvant therapy. Both patients are free from recurrence after sarcoma resection.

The main prognostic factor for the primary tumor is histological type, and other factors include the scope and location of the tumor. Kim et al. believe the main prognostic factor for the primary tumor is anatomical location. According to our statistics, mortality associated with gastric liposarcoma is usually found in cases of dedifferentiated liposarcoma, myxoid liposarcoma, pleomorphic liposarcoma, and mixed type liposarcoma. Of the 37 cases described, six patients died of the disease, while the outcome for nine patients is not known. Their survival time ranged from sudden death to 18 mo (specifically, the times were immediate, 55 d, 4 mo, 11 mo, 16 mo, and 18 mo). Some studies reported that 30% of well-differentiated liposarcomas present with local recurrence; however, metastasis is hardly ever seen. Pleomorphic liposarcoma is considered a highly malignant lesion and may indicate a poor outcome. Due to the lack of sufficient data, we still cannot clearly determine the relationship between histological type and disease prognosis. The outcome of gastric liposarcoma is still unclear, and further study is needed.

From the reported cases and literature review, we conclude that liposarcoma is rarely seen in the viscera, especially the stomach. Diagnosis of this tumor mainly depends on histopathological examination. Gastric liposarcomas are extremely rare tumors for which there is no therapeutic consensus. Although medications and devices have improved in recent years, surgery may be the most reasonable treatment, and the role of adjuvant treatment is not clearly defined. The prognosis is still unclear, and more research is needed. However, we
believe that if the tumor is diagnosed early and treated effectively, the postoperative outcome may be positive.

**ARTICLE HIGHLIGHTS**

**Case characteristics**
Epigastric abdominal pain that continued for longer than 6 mo.

**Clinical diagnosis**
Gastrointestinal stromal tumor (GIST) and gastric lipoma.

**Differential diagnosis**
Differential diagnosis: GIST and gastric lipoma. Definitive diagnosis is reached only by histopathological examination.

**Laboratory diagnosis**
Gastric liposarcoma.

**Imaging diagnosis**
Computed tomography: Gastric lipoma.

**Pathological diagnosis**
Gastric liposarcoma.

**Treatment**
Partial gastrectomy and endoscopic submucosal dissection.

**Related reports**
The first case was reported by Abram and Tuberville in 1941, and until now only 37 cases have been reported worldwide (Table 1).

**Term explanation**
Two cases of gastric liposarcoma are reported and a review of the literature.

**Experiences and lessons**
Diagnosis of gastric liposarcoma mainly depends on histopathological examination, and surgery may be the most reasonable treatment.

**REFERENCES**

1. Bostanoğlu A, Yıldız B, Kulaçoğlu S, Aşarı F. Primary liposarcoma of the stomach. Turk J Gastroenterol 2013; 24: 167-169 [PMID: 23934465 DOI: 10.4318/tjg.2013.0510]
2. Fletcher CDM, Bridge JA, Hogendoorn PCW. World Health Organization classification of tumours. Pathology and genetics of tumours of soft tissue and bone. Lyon: IARC Press, 2013: 10-238
3. Elhouri J, Jaitel L, Mahfoud T, Belhamedi S, Bounaim A, AitAli A, Sair K, Zentar A. Giant Gastric Liposarcoma: A Fatal Exceptional Location. J Gastrointest Cancer 2016; 47: 482-485 [PMID: 26558372 DOI: 10.1007/s12029-015-9779-x]
4. Matone J, Okazaki S, Macappani GN, Amanco TT, Filippi RZ, Macedo AL. Giant gastric liposarcoma: case report and review of the literature. Einstein (Sao Paulo) 2016; 14: 557-560 [PMID: 28076660 DOI: 10.1590/S1679-45082016003000013]
5. Wu JM, Montgomery E. Classification and pathology. Surg Clin North Am 2008; 88: 483-520, v-vi [PMID: 18514695 DOI: 10.1016/j.suc.2008.03.007]
6. Tepetek G, Christodoulakis G, Spyridakis ME, Nakou M, Koukouli G, Zappasodi FK. Liposarcoma of the stomach: a rare case report. World J Gastroenterol 2007; 13: 4154-4155 [PMID: 17696242 DOI: 10.3748/wjg.v13.i30.4154]
7. Michiels A, Hubens G, Ruppert M, Balliu L, Vaneerdegw W. Giant liposarcoma of the stomach involving the mediastinum. Acta Chir Belg 2007; 107: 468-471 [PMID: 17966553 DOI: 10.1080/0015458.2007.11680102]
8. Einarsdóttir H, Skoog L, Söderlund V, Bauer HC. Accuracy of cytology for diagnosis of lipomatous tumors: comparison with magnetic resonance and computed tomography findings in 175 cases. Acta Radiol 2004; 45: 840-846 [PMID: 15690614 DOI: 10.1080/028418504001008180]
9. Laky D, Stoica T. Gastric liposarcoma. A case report. Pathol Res Pract 1986; 181: 112-117 [PMID: 3703739 DOI: 10.1016/S0344-0338(86)80202-3]
10. Arndt CA, Crist W, Common musculoskeletal tumors of childhood and adolescence. N Engl J Med 1999; 341: 342-352 [PMID: 10423470 DOI: 10.1056/NEJM1999072934110507]
11. Hamdan MM, Brahim EB, Salah MB, Hassoua N, Bouhaifa A, Chedly-Debbieh A. Giant gastric lipoma mimicking well-differentiated liposarcoma. Gastroenterol Hepatol Bed Bench 2012; 5: 60-63 [PMID: 24834200]
12. Seki K, Hasegawa T, Konegawa R, Hizawa K, Sano T. Primary liposarcoma of the stomach: a case report and review of the literature. Jpn J Clin Oncol 1998; 28: 284-288 [PMID: 9657017]
13. Hisata T, Yaski Y, Kozaki S, Yamada T. A case of dedifferentiated liposarcoma of the heart and stomach. Int J Surg Case Rep 2017; 41: 36-38 [PMID: 29031176 DOI: 10.1016/j.ijscr.2017.10.001]
14. Jiang HF, Ying XJ. Synchronous liposarcoma of pancreas and stomach: a case report and literature review. Int Surg J 2017, 4: 780-783 [DOI: 10.12033/2349-2002q.iss20170231]
15. Noushin AM, Safaei M. Primary Liposarcoma of the Stomach: A Rare Mesenchymal Tumor. Medical J Islamic Republic of Iran 2005, 19: 275-278
16. López-Negrete L, Luyando L, Sala J, López C, Menéndez de Llano R, Gomez JL. Liposarcoma of the stomach. Abdom Imaging 1997; 22: 373-375 [PMID: 9158753 DOI: 10.1007/s002619900213]
17. Mutter D, Marescaux J. Gastrectomies pour lesions benignes. Techniques chirurgicales-Appareil digestif 2001, 16: 40-320 [DOI: 10.1016/S1282-9129(01)72065-X]
18. Bramwell VH. Adjuvant chemotherapy for adult soft tissue sarcoma: is there a standard of care? J Clin Oncol 2001; 19: 1235-1237 [PMID: 11230463 DOI: 10.1200/JCO.2001.19.5.1235]
19. Kim MJ, Gu MJ, Choi JH, Kim SW, Kim KO. Gastric liposarcoma presenting as a huge pedunculated polyp. Endoscopy 2014; 46 Suppl 1 UCTN: E441-E442 [PMID: 25314184 DOI: 10.1055/s-0034-1377501]
20. Hohf RP, Engel KL, Capos NJ. Liposarcoma of the stomach. Ann Surg 1955; 142: 1029-1033 [PMID: 13269065]
21. Hawkins PE, Terrell GK. Liposarcoma of the stomach: a case report. JAMA 1965; 191: 759-759 [PMID: 14245524 DOI: 10.1001/jama.1965.03080090072023]
22. Orita K, Kokumai Y, Kawada K, Takagi S, Kawaehara T. Liposarcoma of stomach: report of a case. Acta Med Okayama 1968; 22: 167-173 [PMID: 4239074]
23. Hisanobu S, Toshihi S, Yasuhide O, Tetsuya I, Kouichi M, Ryugo O, Kenji S, Taiji A. Primary Gastric Liposarcoma, Report of a Case and Review of the literature. Gastroenterol Endosc 2002; 44: 1168-1174 [DOI: 10.11280/gee1973b.44.1168]
24. Seki H, Kataha Y, Okamura R, Namatame K, M Hagiwara M. Metastatic Liposarcoma of the Stomach Report of a Case. Gastroenterological Endoscopy 1983; 4: 628-635 [DOI: 10.11280/gee1973b.25.628]
25. Ferrozzi F, Bova D, Garlaschi G. Gastric liposarcoma: CT appearance. Abdom Imaging 1993; 18: 232-233 [PMID: 8500801 DOI: 10.1007/BF00198110]
26. Yamamoto K, Teramae N, Uchiha H, Wakabayashi N, Fukuda S, Kodama T, Kashina T, Tsuichihashi Y. Primary liposarcoma of the stomach resected endoscopically. Endoscopy 1995; 27: 711 [PMID: 8903993 DOI: 10.1055/s-0027-1005798]
27. Philipp B, Lörken M, Manegold E, Kasperk R, Schumpelick V. [Primary liposarcoma of the stomach—we a rare mesenchymal tumor]. Chirurg 2007; 71: 334-336 [PMID: 17089053]
28. López de la Riva M, Uragio Tomati H. [Gastric liposarcoma. Presentation of a case]. Rev Esp Enferm AparDig 1984; 66: 015458.2007.11680102

Kang WZ et al. Liposarcoma of the stomach
Kang WZ et al. Liposarcoma of the stomach

335-338 [PMID: 6515090]

29 Shokouh-Amiri MH, Hansen CP, Moengaard F. Liposarcoma of the stomach. A case report. *Acta Chir Scand* 1986; 152: 389-391 [PMID: 3739551]

30 Costa e Silva N, Melo CM, Naves EB, Dias MA. [Gastric liposarcoma: report of a case]. *Rev Hosp Clin Fac Med Sao Paulo* 1992; 47: 89-91 [PMID: 1340019]

31 Tomofuji K, Watanabe J, Ishida N, Kajiwara S. Gastric liposarcoma resected by laparoscopic total gastrectomy to achieve a wide surgical margin. *BMJ Case Rep* 2017; 2017 [PMID: 29212871 DOI: 10.1136/bcr-2017-221703]

32 Girardot-Miglierina A, Clerc D, Suter M. Gastric liposarcoma in a patient with severe obesity. *Ann R Coll Surg Engl* 2018; 100: e88-e90 [PMID: 29484946 DOI: 10.1308/rcsann.2018.0018]

P- Reviewer: Lim SC, Odes S, Soriano-Ursua MA
S- Editor: Wang XJ
L- Editor: Filipodia
E- Editor: Huang Y
