Gastric Leiomyosarcomas

T. Craig Nauert[1]
Jesus Zornoza[1]
Nelson Ordonez[2]

A retrospective study was made of 28 patients who had gastric leiomyosarcomas to identify histologic patterns and radiologic appearances. Three histologic patterns were identified: spindle cell, epithelioid, and pleomorphic. The histopathologic type of tumor did not correlate with the size, the grade of malignancy, or the location of the mass within the stomach. All but one tumor presented as a submucosal mass by barium contrast examination. Ulceration was present in 17 of 28 patients. Sonographic examination in six patients and computed tomography (CT) in one provided further information about the degree of extragastric extension. Sonographically the masses were echogenic in three patients, hypoechoic in two, and anechoic in one. Surgery remains the only curative therapy and surgical excision is recommended regardless of mass size.

Gastric leiomyosarcomas are unusual tumors, accounting for 1%–3% of primary gastric malignancies [1–4]. Despite their rarity, their diagnosis is important because of the more favorable prognosis associated with this tumor than that of gastric carcinomas. The presence of the disease is usually first indicated radiographically. In an earlier clinical study from this institution, it was found that gastric abnormalities were documented by radiography of the upper gastrointestinal tract in 98% of patients [5]. Recently, computed tomography (CT) and sonography have also been used in the preoperative staging of these tumors as well as postoperative follow-up. Angiography is no longer used in the diagnosis of these tumors; however, it is assuming a role in the therapy of patients with, or at high risk for developing, hepatic metastases through the use of intraarterial infusion chemotherapy and transcatheter embolization. We review the experience with gastric leiomyosarcomas over a 36 year period at M. D. Anderson Hospital and Tumor Institute.

Materials and Methods

The recordings of the University of Texas M. D. Anderson Hospital registry were examined for the period 1945–1981. Over this period, 62 patients with the diagnosis of gastric leiomyosarcomas were found. Some of these patients had surgery at other institutions before referral. Hospital charts, radiographic examinations of the upper gastrointestinal tract, and pathologic specimens were available for review in 28 patients. Hospital charts were reviewed for age at presentation, gender, race, and clinical symptoms. Barium contrast examinations of the upper gastrointestinal tract were reviewed for each patient, as were all available angiograms and images from CT and sonography.

Hematoxylin-eosin-stained sections were examined for every patient, and, for some patients, Masson trichrome, Snook silver impregnation (periodic acid-Schiff), alcian blue, and oil red O stains were also used. A minimum of three slides and an average of seven slides were studied per patient by one of us (N. O.). The following histologic features were evaluated: cellularity; histologic type (epithelioid, spindle, pleomorphic) [6, 7]; cellular atypia; and mitotic activity. The number of mitoses were established using methods

Received February 3, 1982; accepted after revision April 19, 1982.

[1]Department of Diagnostic Radiology, University of Texas, M. D. Anderson Hospital and Tumor Institute, Houston, TX 77030. Address reprint requests to J. Zornoza.

[2]Department of Pathology, University of Texas, M. D. Anderson Hospital and Tumor Institute, Houston, TX 77030.

AJR 139:291–297, August 1982
0361–803X/82/1392–0291 $00.00

TABLE 1: **Gastric Leiomyosarcomas: Relation of Tumor Size and Histologic Grade**

Grade	Tumor Size (cm diameter)			
	0–2	3–9	10–19	>20
I	3	2	1	0
II	0	0	4	0
III	0	3	9	1
IV	0	0	4	1

TABLE 2: **Gastric Leiomyosarcomas: Relation of Histologic Pattern and Tumor Size**

Pattern	Tumor Size (cm diameter)			
	0–2	3–9	10–19	>20
Spindle	1	4	8	1
Epithelioid	2	1	7	0
Pleomorphic	0	0	3	1

previously described [8]. The tumors were categorized in four grades using the following criteria: grade I included tumors with moderate cellularity, mild atypia, and 0–4 mitoses per 10 high power fields (HPF); grade II consisted of lesions showing mild to moderate cellular atypia, and 5–9 mitoses/10 HPF; grade III tumors were characterized by marked cellularity, moderate atypia, and hypermitotic activity (>10 mitoses/10 HPF); and grade IV included poorly differentiated tumors with marked pleomorphism, hypercellularity, and numerous mitoses (>10/10 HPF), which are very often atypical [9, 10].

Results

Clinical

There were 18 men and 10 women and the age at presentation was 18–78 years (men, mean 60 years; women, mean 48 years). Eleven patients had melena; 10, abdominal pain; six, an abdominal mass; and five each, hematemesis, weight loss, and weakness and fatigue. Less common complaints, seen in only one patient each, were bone pain due to pelvic metastasis, abdominal distension, intestinal obstruction, fever of unknown origin, gastric ulcer failing to heal, anemia, and vomiting. In two patients the clinical information was not available.

Pathology

In the 28 resected specimens, the size ranged from 2 to more than 20 cm in diameter. At presentation, 20 of the 28 tumors were 10 cm or more in diameter, showing their propensity to grow to large size before being discovered. All tumors with a diameter of 2 cm or less were grade I. The only two masses greater than 20 cm in diameter were grades III and IV. All grade IV tumor were 10 cm or more in diameter (table 1). Tumor size did not correlate well with any particular histologic type, except that all pleomorphic tumors were 10 cm or more in diameter (table 2).

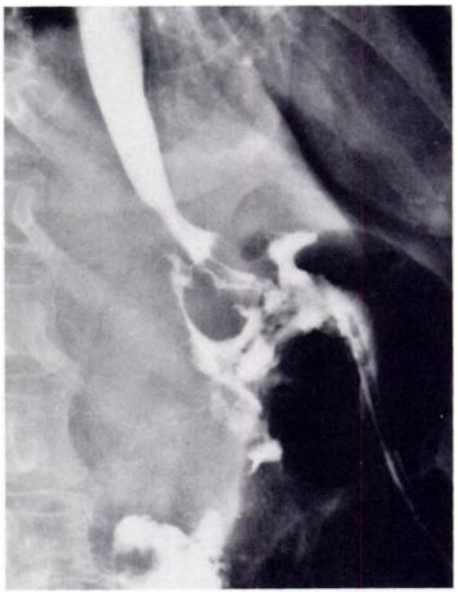


Fig. 1.—Multiple masses at gastric fundus. One partly obstructs esophagus.

According to their predominant histologic patterns, 14 (50%) patients were classified as having spindle cell type leiomyosarcomas (fig. 5C), 10 (35.7%) as having epithelioid type (fig. 8B), and only four (14.3%) as pleomorphic type (fig. 3B). When histologic features and grading of the tumor were considered and correlated with survival, no statistically significant difference was noticed between patients who had epithelioid or spindle cell neoplasms. However, survival was longer if cellular atypia was mild rather than moderate or severe. Grade I indicates a better prognosis than grade III or IV.

Radiographic Findings

Of the 28 patients studied by upper gastrointestinal examinations, 13 of the tumors involved the fundus of the stomach, 14 the body of the stomach, and one arose in the gastric antrum. Two of the 13 patients whose tumors involved the fundus had tumor extension into the cardia, one of which caused partial obstruction to the flow of barium (fig. 1). No correlation could be made between the location of the tumors within the stomach and the different histologic types.

Twenty-seven of the tumors appeared as submucosal masses and one as a gastric ulcer with no radiographically demonstrable mass (fig. 2). Of the 27 submucosal masses, 19 were predominately exogastric (fig. 3), three were endogastric (fig. 4), and in five both components were about the same. Ulceration was present in 17 patients. Small ulcers were seen in 11 patients (fig. 5) and large excavating ulcers were seen in six (fig. 6). Two patients' ulcers perforated, one into the chest (fig. 7) and the other into the peritoneal cavity. In two patients, there were multiple communications between the tumor and the stomach lumen (fig.

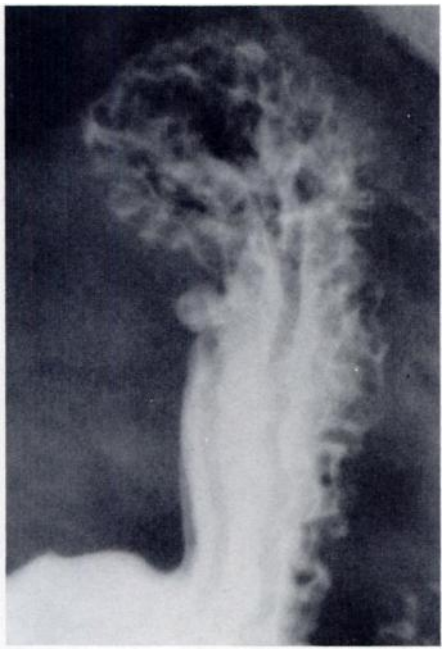
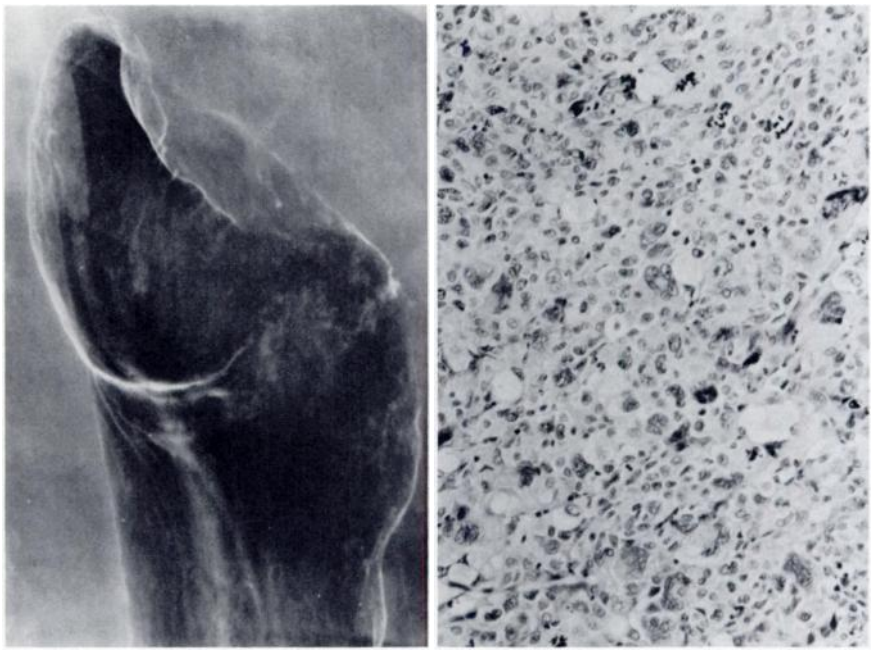


Fig. 2.—Gastric ulcer at lesser curvature. No evidence of mass.



A B

Fig. 3.—**A**, Air contrast radiograph of gastric fundus shows exogastric mass. **B**, Pleomorphic leiomyosarcoma with marked cellular atypia and numerous mitosis. (H and E ×120)

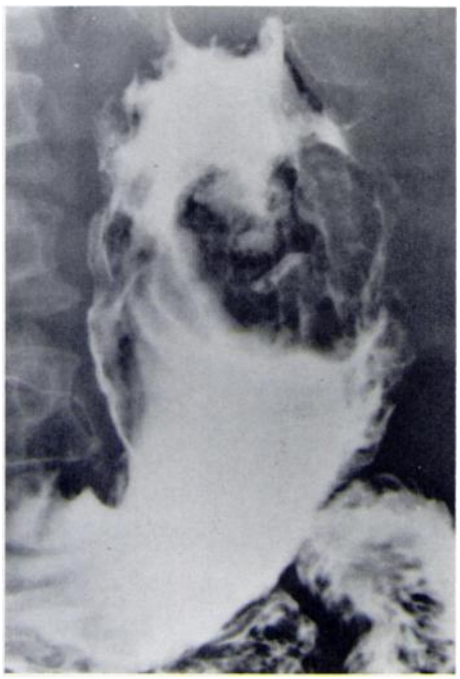


Fig. 4.—Barium study of stomach. Large intraluminal mass.

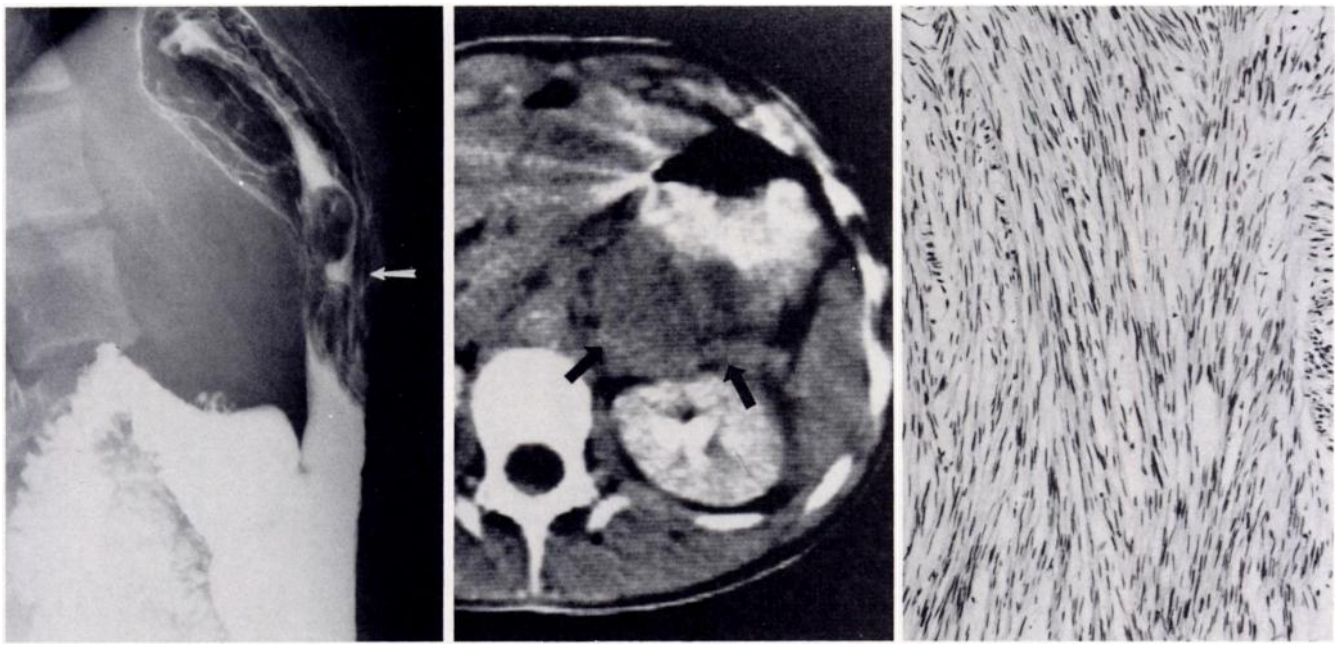
8). Angiography in five patients demonstrated tumor vessels and increased vascularity. In six patients, sonograms were available. Three showed large echogenic masses (fig. 9), two solid hypoechoic masses (fig. 10), and one a large necrotic mass with tumor nodules (fig. 11). CT of one patient defined a larger exogastric component than that indicated by the barium study (fig. 5B).

Discussion

Because of the rarity of gastric leiomyosarcomas, only a few reports of large series of these tumors are found in the recent literature [7, 11–14]. However, considerable progress has been made in recent years toward determining the natural history of this tumor and, consequently, providing better treatment planning.

From their usual site of origin in the muscularis propria, these tumors may remain confined to the gastric wall and appear as intramural lesions, or they may extend primarily toward the submucosa, at times even infiltrating the mucosa, and appear as endogastric masses with or without associated ulceration. Conversely, when their growth is primarily toward the subserosa, the mass will appear as an exogastric lesion, assuming massive proportions before diagnosis. These tumors may undergo central excavation and may perforate into the peritoneal cavity. The most common modes of spread are over the peritoneal surface, often with extension to the spleen, and by metastasis to the liver. There may be invasion of the retroperitoneal structures, including the pancreas, kidneys, adrenals, and duodenum. Less commonly there are metastases to lung and bone. Lymph node involvement is uncommon.

With the possible exception of those patients who have acute onset of massive hematemesis and whose initial evaluations might consist of upper gastrointestinal endoscopy



A B C

Fig. 5.—**A**, Lateral film of stomach. Large, ulcerated gastric mass (*arrow*). Extrinsic mass effect also present. **B**, CT of upper abdomen. Large exogastric component (*arrows*). **C**, Well differentiated spindle cell–type gastric leiomyosarcoma. (H and E ×120)

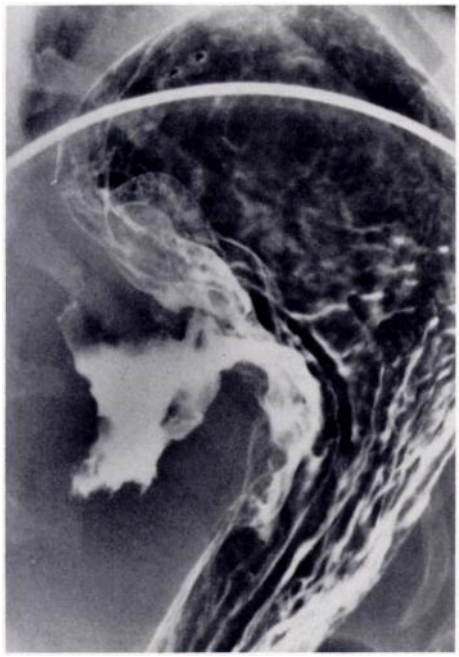
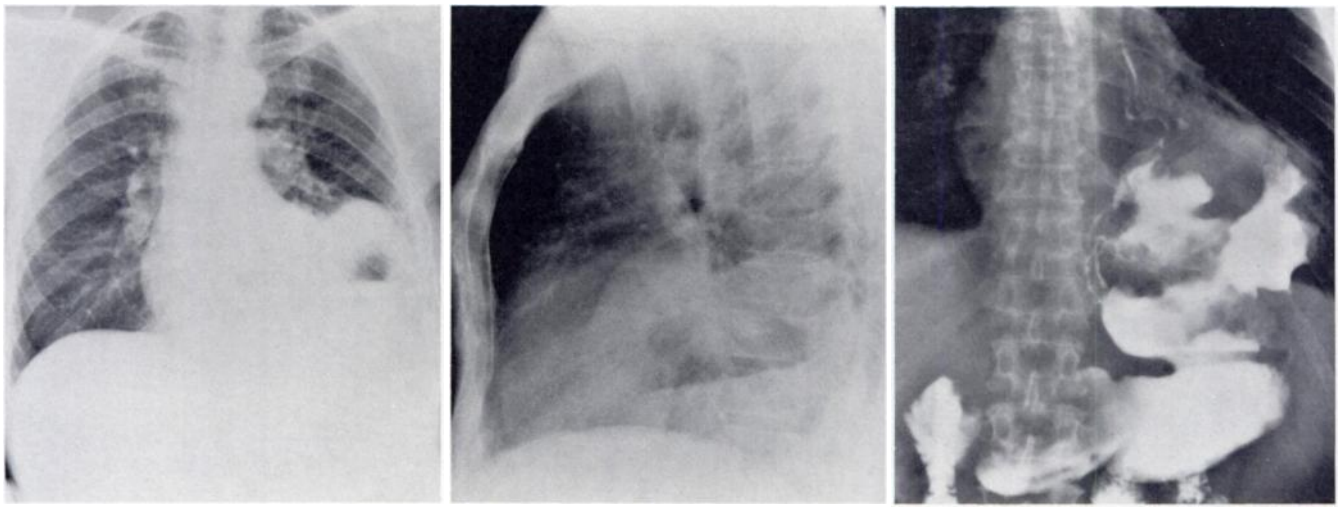


Fig. 6.—Double contrast examination of stomach. Large and irregular ulceration and submucosal mass effect.

with or without angiography, virtually all patients who are eventually diagnosed as having gastric leiomyosarcoma have complaints leading to barium contrast examinations of the upper gastrointestinal tract early in their evaluations. The spectrum of radiographic findings follows those patterns seen in the gross pathologic specimens. They may be seen as small submucosal lesions, while others may have large endogastric or exogastric components, depending on the primary direction of their growth. These lesions cannot be differentiated from benign submucosal tumors on radiographic criteria alone and require surgical excision. Sonography and CT provide further information in these patients as to the degree of local extension and invasion of the tumor, as well as showing the presence or absence of liver metastases.

The tumors in this series were classified according to their predominant histologic pattern, and it was not unusual to find more than one pattern in the same tumor. Therefore, a biopsy showing well differentiated cellular elements would not exclude the presence of more atypical areas elsewhere in the mass. Also, one should not be falsely reassured that small submucosal masses are benign (fig. 12). It should be noted that all masses in our series measuring 2 cm or less in diameter when resected were grade I. Therefore, it is recommended that all submucosal gastric masses in patients with no known primary malignancy be surgically resected regardless of size or previous partial biopsies.

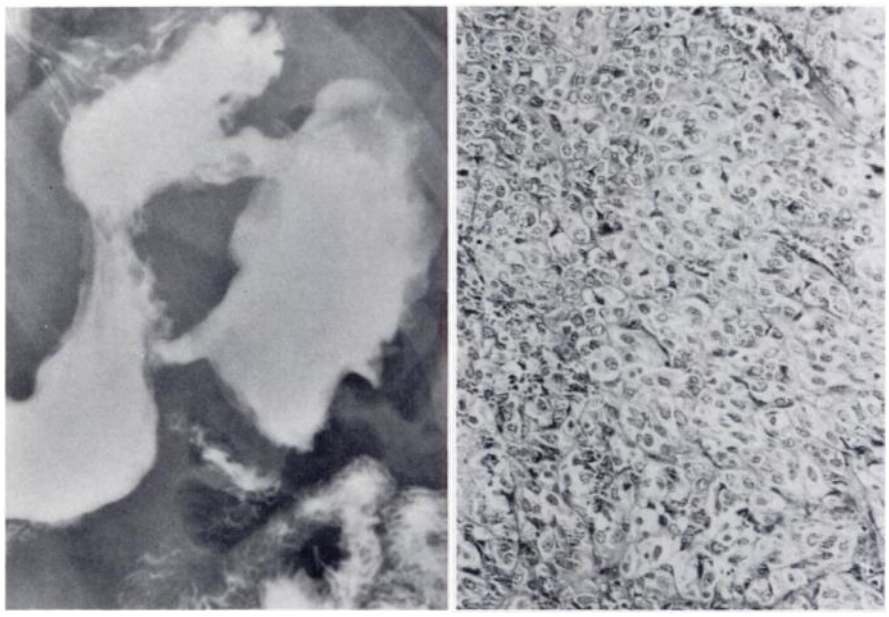
Surgery remains the only curative therapy for the primary tumor. While extensive resections often have been performed for this tumor, Appleman and Helwig [6] found in their series of epithelioid leiomyosarcomas that there was no difference in survival between those patients who had subtotal or total gastrectomies and those who had the least amount of surgery that entirely resected the tumor. In the three most recent large series, the median survival was about 22 months [5, 7, 11], and the 5 year survival rate was



A B C

Fig. 7.—Posteroanterior (**A**) and lateral (**B**) chest films. Large cavitating lesion at left lung base. **C**, Upper gastrointestinal examination. Excavating mass projects into chest cavity.

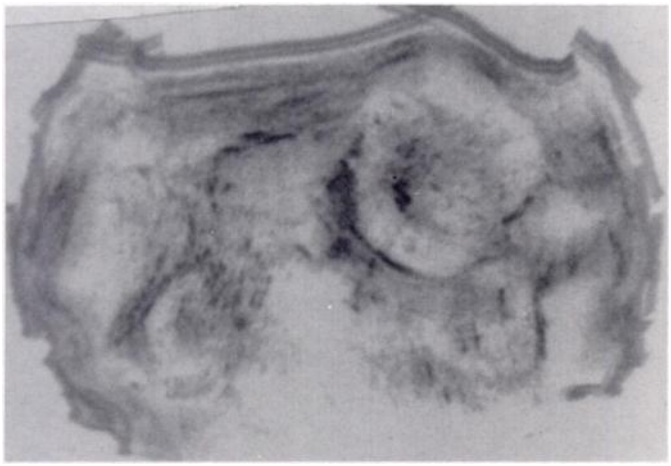
Fig. 8.—**A**, Large cavitating mass communicating with stomach by two fistulous tracts. **B**, Epithelioid leiomyosarcoma with moderate atypia and cellularity. (H and E × 120)



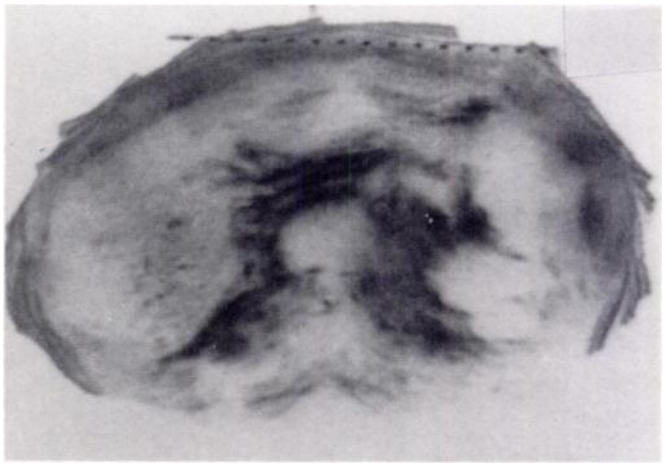
A B

30%–54%; epithelioid leiomyosarcomas had more favorable median and 5 year survivals than the spindle cell and pleomorphic varieties.

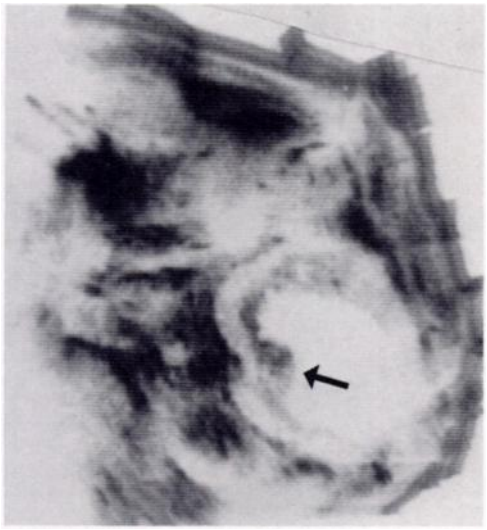
Radiotherapy has been unrewarding in therapy of these tumors, but chemotherapy has shown some promise in extending survival time [7]. For those patients with metastatic disease to the liver, or in those patients at high risk of developing hepatic metastases (i.e., those with tumors greater than 8 cm in diameter, those with serosal extension of the tumor, and those with poorly differentiated primaries), hepatic artery infusion chemotherapy may prove to be of some benefit, as it has in colorectal cancer [15]. Another possible mode of therapy is transcatheter hepatic artery embolization of hepatic metastases, which until now has been used only in those patients with unresectable disease or in those who are poor surgical risks and in whom systemic or hepatic artery infusion chemotherapy, or both, as failed [16, 17].



9

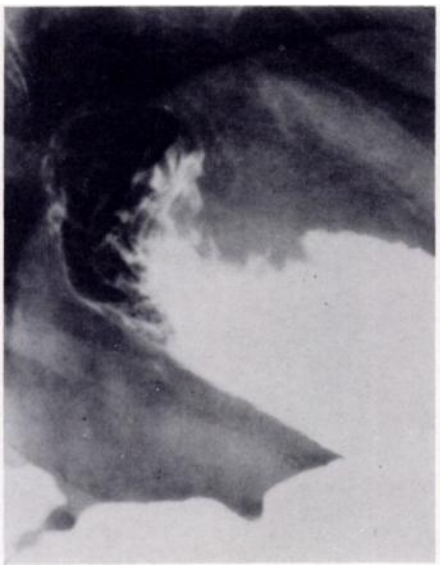


10

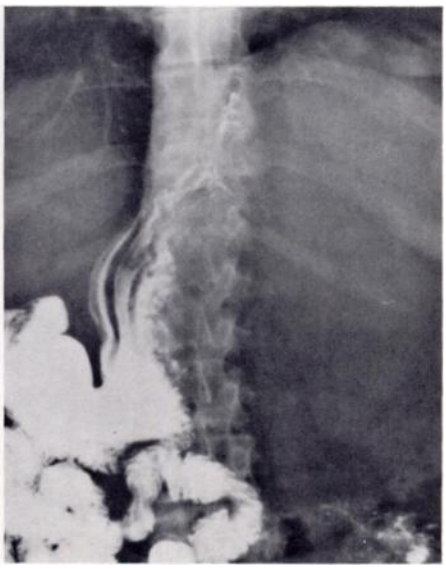


11

Fig. 9.—Sonogram of upper abdomen. Well demarcated large echogenic mass.
Fig. 10.—Transverse sonogram. Lobulated, solid, hypoechoic mass.
Fig. 11.—Transverse sonogram of left upper quadrant. Large necrotic mass with tumor nodule (*arrow*).



A



B

Fig. 12.—67-year-old woman with melena. **A**, Upper gastrointestinal barium examination shows 5-cm-diameter submucosal mass in fundus of stomach. The patient refused surgery. **B**, 10 months later. Mass markedly enlarged and occupies most of left side of abdomen.

REFERENCES

1. Bedikian AY, Valdivieso M, Khankhanian N, et al. Chemotherapy for sarcoma of the stomach. *Cancer Treat Rep* **1979**; 63:411–414
2. Phillips JC, Lindsay JW, Kendall JA. Gastric leiomyosarcoma: roentgenologic and clinical findings. *Dig Dis Sci* **1970**; 15:239–246
3. Stanley WM, Groshong LE. Leiomyosarcoma of the gastrointestinal tract. *Am Surg* **1969**;35:809–816
4. Cathcart PM, Cathcart RS, Yarbrough DR. Tumor of gastric smooth muscle. *South Med J* **1980**;73:18–20
5. Bedikian AY, Khankhanian N, Heilburn LK, Valdivieso M. Primary lymphomas and sarcomas of the stomach. *South Med J* **1980**;73:21–24
6. Appleman HD, Helwig EB. Gastric epitheliod leiomyoma and leiomyosarcoma (leiomyoblastoma). *Cancer* **1976**;38:708–728
7. Appleman HD, Helwig EB. Sarcomas of the stomach. *Am J Clin Pathol* **1977**;67:2–10
8. Ranchod M, Kempson RL. Smooth muscle tumors of the gastrointestinal tract and retroperitoneum. A pathological analysis of 100 cases. *Cancer* **1977**;39:255–263
9. Akwari OE, Dozois RR, Weiland LH, et al. Leiomyosarcoma of the small and large bowel. *Cancer* **1978**;42:1375–1384
10. Morrissey K, Cho ES, Gray GF, Thorbjanarson B. Muscular tumor of the stomach. Clinical and pathological study of 113 cases. *Ann Surg* **1973**;178:148–155
11. Shiu MH, Farr GH, Papachristou DN, Hajdu SI. Myosarcomas of the stomach: natural history, prognostic factors and management. *Cancer* **1982**;49:177–187
12. Abramson DJ. Leiomyoblastomas of the stomach. *Surg Gynecol Obstet* **1973**;136:118–125
13. Lavin P, Hajdu SI, Foote FW Jr. Gastric and extragastric leiomyoblastomas. Clinicopathologic study of 44 cases. *Cancer* **1972**;29:305–311
14. Giberson RG, Dockerty MB, Gray HK. Leiomyosarcoma of the stomach: clinicopathological study of 40 cases. *Surg Gynecol Obstet* **1954**;98:186–196
15. Patt YZ, Mavligit GM, Chuang VP, et al. Percutaneous hepatic arterial infusion (HAI) of mitomycin C and floxuridine (FUDR)—an effective treatment for metastatic colorectal carcinoma of the liver. *Cancer* **1980**;46:261–265
16. Chuang VP, Wallace S. Hepatic artery embolization in the treatment of hepatic neoplasms. *Radiology* **1981**;140:51–58
17. Chuang VP, Soo CS, Wallace S. Ivalon embolization in abdominal neoplasms. *AJR* **1981**;136:729–733