Gastrointestinal stromal tumor: Computed tomographic features

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METHODS: From 1995 to 2003, there were 47 patients with pathologically proven GISTs at our hospital. Of these, 17 patients underwent preoperative CT. We collected and analyzed these CT images. The CT imaging features included tumor diameter, number and location, tumor margin, location of metastasis, hounsfield units of tumor and effect of contrast. In addition, we also recorded the surgical findings, including complications, tumor size and location for comparative analysis.

RESULTS: The results showed that 12 (70%) tumors were located in the stomach and five (30%) were located in the jejunal mesentery. GISTs were extraluminal in 12 (70%) patients. The tumor margins of 13 (76%) tumors were well defined in 4 (24%) patients. There was no clearly invasive or vascular effect of contrast enhancement on GIST CT imaging was slight enhancement and 4 (24%) showed heterogeneous enhancement. The mean precontrast hounsfield units were 30.41±5.01 for precontrast images and postcontrast hounsfield units were 51.80±9.24.

CONCLUSION: The stomach was the commonest site of GIST occurrence among our patients. The CT features of GIST were well-defined tumor margins, homogenous enhancement on postcontrast CT images.

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INTRODUCTION

The term gastrointestinal stromal tumor (GIST) has traditionally been used as a descriptive term for soft tissue tumors of the gastrointestinal tract. Although their exact incidence is still somewhat unclear, it is now estimated that between 5 000 and 10 000 people each year develop GISTs in the world; men and women are equally affected[1]. GISTs were previously thought to be smooth muscle neoplasms, and most were classified as leiomyosarcoma. With the advent of immunohistochemistry and electron microscopy, it has become apparent that GIST may have myogenic features (smooth muscle GIST), neural attributes (gastrointestinal autonomic nerve tumor), characteristics of both muscle and nerve (mixed GIST) or may lack differentiation (GIST not otherwise specified)[2]. GISTs are often discovered incidentally at surgery and should be completely excised. The increasing use of computed tomography (CT) and endoscopy of the upper gastrointestinal tract is a non-or minimally invasive means for the detection of asymptomatic GISTs[3].

In this retrospective study, we analyzed our experience with 17 patients with GISTs who were presurgically investigated by using CT and described the anatomic distribution and imaging features of GIST.

MATERIALS AND METHODS

Patients’ data

From 1995 to 2003, there were 47 patients with pathologically proven GISTs at Taipei Medical University Hospital (TMUH) and Wan Fang Hospital (WFH). Of these, 17 (8 males, 9 females, with ages ranging from 33 to 91 years, mean age: 64 years) underwent preoperative CT. We collected and analyzed these CT images.

The abdominopelvic CT scans (HiSpeed CT/I; GE Medical Systems, Milwaukee, WI, USA) were typically obtained after oral administration of 1 000 mL 40 g/L iophendylate meglumine (Mallinckrodt, USA) and intravenous administration of 100 mL (350 mg/mL) iohexol (Nycomed, Norway) at a flow rate of 2 mL/s, with a section thickness of 10 mm and a pitch of 1.5. The CT imaging features included tumor diameter, number and location, tumor margin (well defined, irregular or clearly invasive), location of metastasis, hounsfield units of tumor and effect of contrast. These characteristics were reviewed blindly by three radiology diplomates. In addition, we also recorded the surgical findings, including complications, tumor size and location for comparison.

RESULTS

The CT imaging findings showed that 14 (82%) patients had one tumor and 3 (18%) patients had two tumors. GIST size ranged from 2 to 19 cm (5.4±1.8 cm). Tumors were located in the stomach in 12 (70%) patients and 5 (30%) patients had tumor located in the jejunal mesentery. GISTs were extraluminal in 12 (70%) patients and intraluminal in 5 (30%). GISTs caused intraluminal bowel obstruction in two patients.

The mean precontrast hounsfield units were 30.41±5.01 and the mean postcontrast hounsfield units were 51.80±9.24. The effect of contrast enhancement on GIST CT imaging was slight enhancement (Figure 1). Thirteen (76%) showed homogenous enhancement and 4 (24%) showed heterogeneous enhancement.

Tumors were well defined in 13 (76%) patients and irregular in 4 (24%) patients. There was no clearly invasive or vascular encasement of tumors among our patients. Three (18%) patients had metastasis, two to the liver and one to the lung. Twelve patients underwent follow-up CT (range of follow-up period from date of diagnosis, 2-40 mo, mean, 22 mo). No patients relapsed.

Operative findings showed that 14 (82%) patients had one tumor and 3 (18%) patients had two tumors. The smallest GIST was 2 cm×2 cm×1.8 cm and the largest was 19 cm×16 cm×8.5 cm in size. The commonest complications among our patients were gastrointestinal tract chronic inflammation, diarrhea and wound

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that of Conlon related to heterogeneous enhancement. Our result is similar to was 3.8±1.3 cm. We found that large tumor sizes appeared to be tumors was 11.6±2.1 cm and that of the homogenous tumors size. Of the 17 patients, 4 (24%) had heterogeneous contrast enhancement and 13 (76%) had homogenous contrast imaging, with 67% enhancement of the tumor, with a hounsfield unit of 57.58.

DISCUSSION

The distribution of 725 malignant smooth muscle tumors of the gastrointestinal tract was 47.3% in the stomach, 35.4% in the small intestine, 4.6% in the colon and 7.4% in the rectum, according to Skandalak and Gray[4]. In the report by Akwari et al.[5], 68.3% of GISTs were in the stomach, 25.4% were in the small intestine, 2.6% were in the colon and 3.7% were in the rectum. According to a previous study[6], GIST can also occur in the omental and mesenteric tissues, the duodenum and other sites of the gastrointestinal tract. In our study, 12 (70%) patients had tumors located in stomach and five (30%) patients had tumors located in the jejunal mesentry, a distribution more similar to that reported by Akwari et al.[5].

According to our results, the precontrast hounsfield units of the tumors were 30.41±5.01 and the postcontrast hounsfield units were 51.80±9.24. The postcontrast hounsfield units were 70% higher than the precontrast hounsfield units. Suster[7] reported hounsfield units of 33.2±1.25 on precontrast imaging and 55.32±5.22 on postcontrast imaging, with 68% enhancement. Ludwig[8] reported hounsfield units of 34.21±1.33 on precontrast imaging and 56.29±3.12 on postcontrast imaging, with 67% enhancement. We believe that precontrast hounsfield units of 30 to 35 and postcontrast hounsfield units of 50 to 60 are indicative of GISTs on CT.

We analyzed the correlation of contrast type and tumor size. Of the 17 patients, 4 (24%) had heterogeneous contrast enhancement and 13 (76%) had homogenous contrast enhancement. The mean tumor diameter of the heterogeneous tumors was 11.6±2.1 cm and that of the homogenous tumors was 3.8±1.3 cm. We found that large tumor sizes appeared to be related to heterogeneous enhancement. Our result is similar to that of Conlon et al.[9]. In addition, we found tumors in 13 (76%) of our patients were well-defined, and in Lee’s study[10], more than two-thirds of patients also had well-defined GISTs. Thus, well-defined tumors appear to be a feature of GISTs on CT imaging.

Licht et al.[11] proposed that the relationship between multiple tumors and metastasis needed further investigation. In our study, we had three patients with multiple tumors and also had three patients with metastases. Only one patient with liver metastasis had multiple tumors; the other two patients with metastasis had only single tumor. Our data appear to indicate that there is no evident correlation between multiple tumors and metastasis. Additionally, 3 (18%) of our patients had metastasis compared to other studies[12,13] in which 20% to 35% of patients had metastasis, but this difference was not statistically significant. Fong et al.[13] reported that the metastasis percentage was related to the degree of lymph node involvement. Based on our surgical findings, all the patients who had metastasis had no lymph node involvement. Thus, our results differed from those reported by Fong.

In conclusion, the stomach was the commonest site of GIST tumor location among our patients, with a mean tumor diameter of 5.4±1.8 cm. The CT features of GISTs included well-defined tumor margins and predominantly homogenous contrast enhancement, with precontrast hounsfield units of 30 to 35 and postcontrast hounsfield units of 50 to 60. According to the percentage presented above, we also found a “4 seventy rule” in our GIST images review: 70% tumors were located in the stomach, 70% tumors were extraluminal, 76 % tumor margins were well defined, 76% GIST CT imagings were homogenous enhancement. In addition, metastasis was not related to the degree of lymph node involvement or tumor number in our study.

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