Computed Tomographic Features of Gastrointestinal Stromal Tumor in Maharat Nakhon Ratchasima Hospital: 3 Years Review

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Abstract

Gastrointestinal stromal tumors (GISTs) are rare but are nevertheless the most common mesenchymal neoplasm of the gastrointestinal tract. Computed tomography (CT) is an imaging modality of choice for diagnosis of GISTs. **Aim:** To review the CT imaging feature of 15 GIST patients. **Patients and Method:** From 2006 to 2008, there were 21 patients with pathologically proven GISTs at Maharat Nakhon Ratchsima Hospital .Of these, 15 patients underwent preoperative CT and we collected and analyzed these CT images. The CT image features included the tumor diameter, the number and the location, the tumor margin, the location of metastasis, Hounsfield units of the tumor and the effect of the contrast. In addition, we also recorded the surgical findings, including complications, the tumor size and the location for comparative analysis. **Result:** The results showed that 6 (40.0%) tumors were located in the stomach, 8 (53.3%) were located in the jejunum, 1 (6.7%) were located in the colon. GISTs were found extraluminally in 12 (80.0%) patients. The margins of 11 (73.3%) tumors were well defined while those of 4 (26.6%) were irregular. The effect of contrast enhancement on GIST CT imaging were heterogeneous 12 (80.0%) and homogenous 3 (20.0%). The Hounsfield units were 31.47$\pm$6.53 for precontrast imaging and postcontrast Hounsfield units were 58.67$\pm$10.43. **Conclusion:** The jejunum was the commonest site of GIST occurrence among our patient .The CT features of GIST were well-defined tumor margins, heterogeneous enhancement on post-contrast CT imaging.

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บทคัดย่อ: ลักษณะเอกซเรย์คอมพิวเตอร์ของเนื้องอกทางเดินอาหารชนิดจีสต์ในโรงพยาบาลมหาราชนครราชสีมา ระยะเวลา 3 ปี

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เนื้องอกทางเดินอาหารชนิดจีสต์เป็นเนื้องอกที่พบได้น้อยมาก หากพบส่วนใหญ่มักเป็นเนื้องอกชนิด mesenchymal ของทางเดินอาหาร เอกซเรย์คอมพิวเตอร์เป็นอีกทางเลือกหนึ่งสำหรับวินิจฉัยเนื้องอกทางเดินอาหารชนิดจีสต์ **วัตถุประสงค์:** เป็นการศึกษาทบทวนย้อนหลังของลักษณะเอกซเรย์คอมพิวเตอร์ในผู้ป่วยเนื้องอกชนิดนี้ จำนวน 15 ราย **ผู้ป่วยและวิธีการ:** พบผู้ป่วยที่เป็นเนื้องอกทางเดินอาหารชนิดจีสต์ในโรงพยาบาลมหาราชนครราชสีมา ระหว่างปี พ.ศ.2549-2551 จำนวน 21 ราย ผู้ป่วยที่ได้ตรวจเอกซเรย์คอมพิวเตอร์ก่อนผ่าตัด 15 ราย ได้มีการรวบรวมและจำแนกลักษณะทางเอกซเรย์คอมพิวเตอร์ ขนาดของเนื้องอก จำนวนเนื้องอก ตำแหน่งของเนื้องอก ขอบเขตของเนื้องอก การแพร่กระจายของเนื้องอก Hounsfield units ของเนื้องอกและผลของสารทึบแสง ทั้งยังได้รวบรวมผลการผ่าตัด ผลแทรกซ้อน เพื่อเปรียบเทียบการแปลผลทางเอกซเรย์คอมพิวเตอร์ **ผลการศึกษา:** พบผู้ป่วยที่เป็นเนื้องอกทางเดินอาหารชนิดจีสต์ ในกระเพาะอาหารจำนวน 6 ราย (ร้อยละ 40.0) ในลำไส้เล็กส่วนเจจูนัม จำนวน 8 ราย (ร้อยละ 53.3) และพบที่ลำไส้ใหญ่จำนวน 1 ราย สามารถพบเนื้องอกทางเดินอาหารชนิดจีสต์อยู่ภายนอกท่อของลำไส้ 12 ราย (ร้อยละ 80.0) พบเนื้องอกชนิดขอบเรียบ 11 ราย (ร้อยละ 73.3) ขณะที่ 4 ราย (ร้อยละ 26.6) พบขอบไม่เรียบ ผลของสารทึบแสงที่มีต่อเนื้องอก พบมีการเข้าของสารทึบแสงแบบไม่สม่ำเสมอ 12 ราย (ร้อยละ80.0) และ มีการเข้าอย่างสม่ำเสมอของสารทึบแสง 3 ราย (ร้อยละ 20.0) พบ Hounsfield units 31.47$\pm$6.53 ในเนื้องอกก่อนการฉีดสารทึบแสง และ Hounsfield units 58.67$\pm$10.43 ในเนื้องอกหลังการฉีดสารทึบแสง **สรุป:** ตำแหน่งที่พบบ่อยของเนื้องอกทางเดินอาหารชนิดจีสต์คือ ลำไส้เล็กส่วนเจจูนัม และลักษณะเอกซเรย์คอมพิวเตอร์ของก้อนเนื้องอกเป็นแบบขอบเรียบและการเข้าของสารทึบแสงในก้อนเนื้องอกแบบไม่สม่ำเสมอ

Introduction

Gastrointestinal stromal tumors (GIST) are rare but are nevertheless the most common mesenchymal neoplasm of the gastrointestinal tract[1]. The term 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 estimated that between 5,000 and 10,000 people each year develop GISTs in the world: men and women are equally affected[2]. The diameter of GISTs, as a whole, can range from a few millimeters to more than 30 cm. Although large tumors have a rate of malignancy, the size does not predict benignity, and small GISTs have been known to behave malignant fashion[3-4]. Radiologic or histologic results may suggest GISTs, the diagnosis must be made immunochemically, independent on location, most GISTs express the CD34 antigen (70.0-78.0%) and CD117 antigen (72.0-94.0%). The CD34 protein is a hematopoietic progenitor cell antigen that occurs in a variety of mesenchymal tumor, CD117 also is known as the c-kits protein; it is a membrane receptor with a tyrosine kinase component. Mutation in the CD117 gene

has been linked to malignant behavior in GISTs[3,5-8]. 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 mean for the detection of asymptomatic GIST [9]. In this retrospective study, we analyzed our experience with 15 patients with GISTs who were preoperative investigated by using CT and described the anatomic distribution and imaging features of GIST.

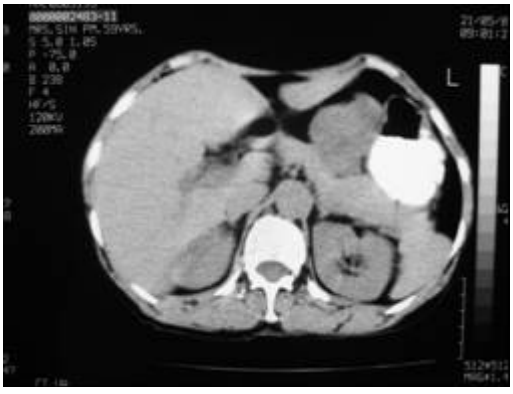
Patients & Method

From 2006 to 2008, there were 21 patients with pathologically proven GISTs by positive immuno-chemical staining for CD117 antigen at Maharat Nakhon Ratchasima Hospital. Of these, 15 (6 males, 9 females, with ages ranging from 24 to 75 years, mean age: 57 years) underwent preoperative CT. We collected and analyzed these CT images. The abdominopelvic CT scans (spiral CT; Hitachi W 2000) were performed after oral contrast administration of 1,000 ml, and intravenous administration of 100 ml (370 mg I/ml) (Iopromide 0.79 g) at a flow rate of 2 ml/s, with a section thickness of 10 mm and a pitch of 1. The CT imaging features included the tumor diameter, the number and location, the tumor margin (well defined, irregular or clearly invasive), the location of metastasis, Hounsfield units of the tumor and the effect of the contrast. These characteristics were reviewed independently by four radiology diplomates. In addition, we also recorded the surgical findings, including the tumor size and the location.

Results

The CT imaging findings showed that 13 patients (86.7%) had solitary mass while 2 patients (13.3%) had two masses. GISTs size ranged from 6 to 20 cm (mean size 12.75±4.55 cm). The tumor sites were as follow 6 (40.0%) in stomach (figure 1, 2), 8 (53.3%) in jejunum (figure 3) and 1 (6.7%) in colon (figure 4). GISTs were extraluminal in 12 patients (80.0%) and intraluminal in 3 patients (20.0%). The mean precontrast Hounsfield units were 31.47±6.53 and the mean postcontrast Hounsfield units were 58.67±10.43. The intraluminal and extraluminal lesions and the effect of contrast enhancement on GIST CT imaging were slight enhancement (figure 1, 2). Twelve (80.0%) showed

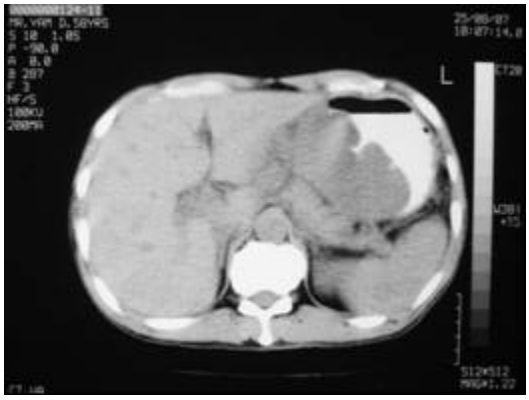
Figure 1 Precontrast and postcontrast CT scans of the tumor. (stomach)



A: Precontrast CT scan shows a well defined exophytic gastric tumor with slightly lower density than that of the liver.

B: Postcontrast CT scan shows heterogeneous enhancement of the tumor.

Figure 2 Precontrast and post contrast CT scans of the tumor. (stomach)



A: Precontrast CT scan shows a well-defined endophytic tumor with slighty lower density than that of the liver.

B: Postcontrast CT scan shows heterogeneous enhancement of the tumor.

heterogeneous enhancement while 3 (20.0%) showed homogeneous enhancement. Tumors were well defined in 9 patients (60.0%) and irregular in 6 patients (40.0%). There was no clear invasion or vascular enhancement of tumor among our patients. Three patients (20.0%) has liver metastasis (figure 5). The smallest size of these GIST was 6x5x4.5 cm and the largest one was 20x16x10.4 cm in size. In addition, all of 15 patients all underwent lymphadenectomies but no metastasis to the lymph node was found.

Discussion

In the report by Akwari et al[9], 68.3% of GISTs were in the stomach, 25.4% were in the small bowel, 2.6% were in the colon and 3.7% were in the rectum. In our study, 6 (40.0%) patients has the tumors in the stomach, 8 (53.3%) patient had the tumors in the jejunum and one (6.7%) patient had the tumor in the colon, the distribution was not similar to those reported by Akwari et al. In our study, the tumor in the jejunum was more common than that in the stomach. According to our

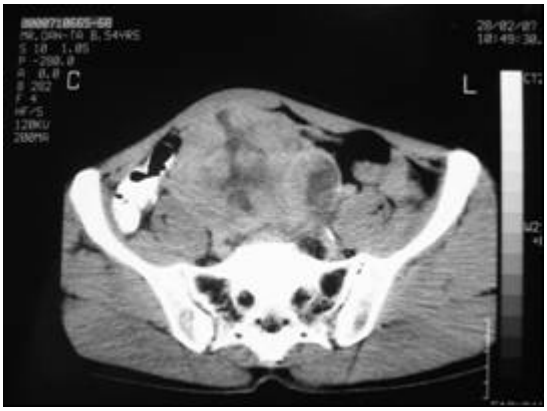
Figure 3 Precontrast and postcontrast CT scan of the tumor (jejunum)

A: Precontrast CT scan shows large well-define exophytic tumor with low density in the mass.

B: Postcontrast CT scan shows heterogeneous enhancement of the tumor.

Figure 4 Precontrast and postcontrast CT scan of the tumor (ascending colon)

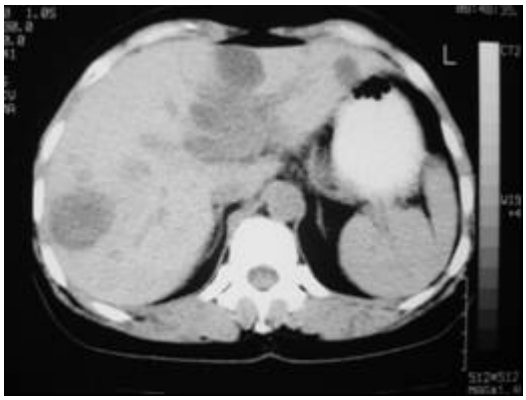
A: Precontrast CT scan shows large well-define exophytic lesion of the tumor with heterogeneous low density.



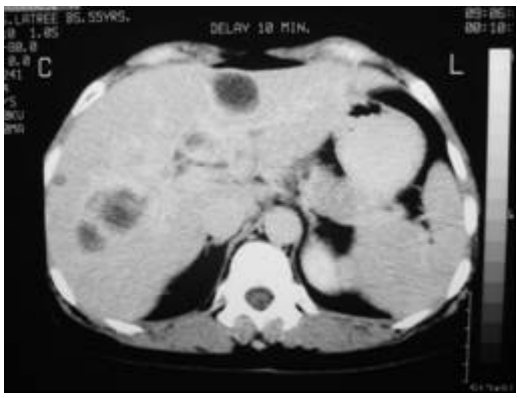
B: Postcontrast CT scan shows heterogeneous enhancement of the tumor with necrotic area in some part of the mass.

result, the precontrast Hounsfields units of the tumor were 31.47±6.53 and the postcontrast Hounsfiled units were 58.67±10.43. The postcontrast Hounsfield units were 86.0% higher than those of the precontrast Hounsfield units. Suster[10] reported Hounsfield unit of 33.2±1.25 on precontrast imaging and 55.32±5.22 on postcontrast imaging, with 68% enhancement. We believed that precontrast Hounsfield units of 30 to 35 in the combination with postcontrast Hounfield units of 50 to 60 were indicative of GIST on CT. We analyzed the correlation of contrast enhancement type and tumor size. Of 15 patients, 12 (80.0%) had heterogeneous contrast enhancement and 3 (20.0%) had homogeneous contrast enhancement. The mean diameter of heterogeneous tumors was 14.33±3.56 cm and that of the homogeneous tumors was 6.43±0.75 cm. We found that the large tumor size appeared to be related to the heterogeneous enhancement. Our result was similar to

Figure 5 Precontrast and postcontrast CT scan of the liver metastasis.



A: Precontrast CT scan shows multiple small and large low density mass in both lobe liver.



B: Postcontrast enhancement CT scan shows mild contrast enhancement into multiple lesions of both lobe liver.

the report of Conlon et al [11]. In addition, we found tumors in 9 (60.0%) in our patients were well defined while in Lee's study[12], 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. In our study, we had two patients with multiple tumors and three patients with liver metastasis. Only one patient with liver metastasis had multiple tumors whereas the other two with metastasis had primary solitaty tumor. Our data seems that there is no correlation between the number of primary tumor and metastasis. Additionally, the rate of metastasis in our patients which was 20.0%, was comparable to those of other studies [13-14]. Fong et al [14] reported that the metastasis percentage was related to the degree of lymph node involvement. Base on our surgical findings, all patients who had metastasis, had no lymph node involvement. Thus our results differed from those reported by Fong. The aim of radiologic examination is to locate gastrointestinal stromal lesions, evaluated local invasion and detect distant metastasis. Unfortunately, radiologic are not specific and may represent several entities. Also, the distinction between benign and malignant GISTs can not be made with radiologic examination unless metastasis disease or tumor invasion of adjacent structures is depicted. The definitive diagnosis of GISTs is made immunohistochemically. However, the diagnosis may be suggested in the case of a complex bowel mass with liver metastasis in the absence of lymphadenopathy[15].

Conclusion

The jejunum was the commonest site of GIST in our patients, with a mean tumor diameter 14.33±3.56 cm. The CT feature of GISTs included well defined tumor margins and predominantly heterogeneous contrast enhancement, with precontrast Hounfields units of 31.47±6.53 and postcontrast Hounfield unites of 58.67±10.43. In addition, metastasis was not related to the tumor number and no evidence of lymph node involvement in the study.

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