Evaluation of the Sensitivity of the Double-Contrast Upper Gastrointestinal Series in the Diagnosis of Gastric Cancer

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Abstract

Objective : To evaluate the sensitivity, specificity and accuracy of the double-contrast upper gastrointestinal series (UGI series) in the diagnosis of gastric cancer.

Material and Method : The authors retrospectively reviewed the radiographs of the double-contrast UGI series for diagnosis of gastric cancer of 84 patients who had pathological confirmation by gastric biopsies and/or operations.

Results : The lesions were true positive in 45 patients, true negative in 28 patients, false positive in 8 patients and false nagative in 3 patients. The authors found pathologically proved gastric cancers in 48 patients. They were 42 adenocarcinomas (87.5%), 3 gastric mucosa-associated lymphoid tissue lymphomas (6.2%), one gastrointestinal stromal tumor (2.1%), one squamous cell carcinoma at the distal esophagus involving the cardia (2.1%) and one cancer of the pancreatic head with invading gastric antrum (2.1%). The sensitivity, specificity and accuracy of the present study were 93 per cent, 77 per cent and 86 per cent, respectively. They showed small differences compared to the previous studies.

Conclusion : The present findings indicate that the double-contrast UGI series has high sensitivity, specificity and accuracy. It should be considered a sensitive technique and initial examination in the diagnosis of gastric cancer.

Key word : Double-Contrast UGI Series, Gastric Cancer, Sensitivity, Specificity, Accuracy, Endoscopy

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Nowadays there is decrease in performing double-contrast upper gastrointestinal series (UGI series) to diagnose patients who have upper gastrointestinal symptoms and fail to respond to medical therapy. Endoscopy has replaced and become the first choice in examination of symptomatic patients in most institutions.

In the diagnosis of gastric cancer, endoscopy remains the gold standard for accurate diagnosis due to its greater sensitivity and specificity than the double-contrast UGI series[1].

However, many studies suggested that there were minor differences between the double-contrast UGI series and endoscopy in evaluation of UGI disorders[2].

Some studies reported that the double-contrast UGI series is approximately as accurate as endoscopy in detection of gastric cancer[3].

Gastric cancer is not within the top - ten cancers in Thailand. They are discovered in about 2 per cent, less than esophageal cancer[4]. Most of them are adenocarcinomas and usually advanced at presentation[5]. Local or distant spreadings often occur.

The screening for gastric cancer is performed by the double-contrast UGI series and endoscopy. Additional investigations are CT (Computed tomography), EUS (Endoscopic ultrasound) and MRI (Magnetic resonance imaging).

CT (Computed tomography) is performed to assess the involvement of the neighbouring structures, lymph node and liver metastasis before operation[6]. CT is useful for detection in both early and advanced gastric cancers due to wall thickening or a discrete mass[5,6]. However, CT is not the first choice of examination for screening gastric cancer.

EUS (Endoscopic ultrasound) is done to detect invasive depth of cancer, not for screening[6].

MRI (Magnetic resonance imaging) has a limited role in the evaluation of gastric cancer due to motion artifacts but MRI is also effective in detecting liver metastasis[6].

The purpose of this study was to evaluate the sensitivity, specificity and accuracy of the double-contrast UGI series in the diagnosis of gastric cancer, using pathological findings as the gold standard.

MATERIAL AND METHOD

The authors retrospectively reviewed the radiographs of a double-contrast UGI series of 84 patients who had pathological confirmation by gastric biopsies and/or operations from Bangkok Metropolitan Administration Medical College and Vajira Hospital from 1997 to 2002. All of the double-contrast UGI series were performed by radiologists, using the high-density barium suspension and effervescent powder.

The radiographs were diagnosed by two radiologists. Kappa statistic for agreement of two radiologists was 85 per cent. The statistics revealed very good agreement.

The radiographs were reviewed to determine the location and morphology of the tumors. Tumors were classified morphologically as polypoid, infiltrative/scirrhous or ulcerative[7].

Polypoid lesions were characterized by intraluminal protrusion, ranging from relatively flat, plaque-like elevation to large fungating mass[7].

Infiltrative/scirrhous lesions were characterized by circumferential extension of tumor, causing various degrees of luminal narrowing and often associated with mucosal nodularity, ulceration or thickened irregular folds[7,8].

Ulcerative lesions were characterized by radiographic appearances of malignant ulcer, such as mucosal nodularity or thickened irregular folds surrounding the central ulcer[7].

The lesions were interpreted by two radiologists who suggested gastric cancer or suspected cancer, indicating positive findings. Specimens for pathological confirmation were obtained by endoscopy alone in 43 patients, by endoscopy and surgery in 40 patients and by surgery alone in one patient.

RESULTS

Clinical findings

A total 84 patients, 49 men and 35 women, with an age range of 32-94 years (average 58 years) were enrolled in the study. Most clinical symptoms were dyspepsia, epigastric pain, UGI bleeding, iron deficiency anemia, weight loss and dysphagia. One patient presented with an epigastric mass. The results of the radiographic and pathological findings are shown in Table 1.

Radiographic findings

Of 84 patients, 45 revealed positive radiographs and pathological confirmation of gastric cancer (true positive). Twenty-eight patients had negative radiographs and pathological confirmations (true negative). Of 28 patients, 27 patients had benign ulcers and one had an inflammatory polyp. The gastric biopsies revealed *H. Pylori*-associated chronic gastritis in 9 patients, the remaining patients had chronic gastritis,

Table 1. Double-contrast UGI series and pathological findings.

Double-contrast UGI series	Pathological finding		
	Positive	Negative	Total
Positive	45	8	53
Negative	3	28	31
Total	48	36	84

acute and a chronic gastritis or chronic ulcer. Three patients had negative radiographs but positive pathological confirmation (false negative). Of 3 patients, 2 had small antral ulcers, 1 and 2 cm in diameter with slightly thickened radiating folds surrounding the ulcers (Fig. 1). Another one had a 4-cm ulcer at the lesser curvature of the distal gastric body. Eight patients revealed positive radiographs but negative pathological confirmations (false positive). Of 8 patients, 4 revealed antral lesions. There was one infiltrative lesion, one infiltrative and ulcerative lesion and 2 ulcerative masses. The gastric biopsies revealed 2 chronic gastritis, one acute and chronic gastritis and one *H. pylori*-associated chronic gastritis with chronic ulcer. The other 4 patients revealed large ulcers, range 5-10 cm in diameter, 3 lesions at the gastric body and one at the fundus. The gastric biopsies were 2 *H. pylori*-associated chronic gastritis and ulcerations and 2 chronic gastritis and ulcerations.

The gastric cancers were found in 48 patients, 31 men (64.6%) with an average age of 61.6 years (range 32-82 years) and 17 women (35.4%) with an average age of 55 years (range 36-72 years).

Morphology

The lesions were 7 masses (14.6%) (Fig. 2), 16 ulcerative masses (33.3%), 11 infiltrative/scirrhous lesions (22.9%), 7 infiltrative/scirrhous and ulcerative lesions (14.6%) and 7 ulcerative lesions (14.6%) (Fig. 1, 3). The average diameter of the lesions were 5.8 cm (range 3-10 cm) for polypoid masses, 5.1 cm (range 2-8 cm) for infiltrative/scirrhous lesions and 3.1 cm (range 1-5 cm) for ulcerative lesions.

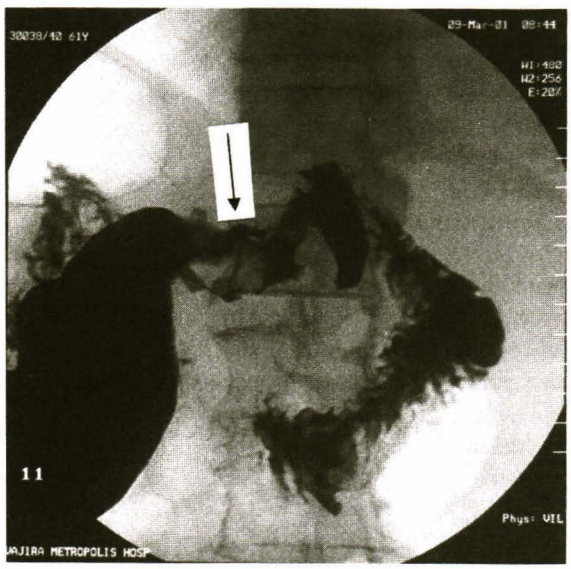

Fig. 1. Malignant gastric ulcer. The radiograph of the double-contrast UGI series shows an 1-cm ulcer (arrow) with thickened radiating folds, surrounding the ulcer at the spastic antrum. This case had wrong interpretation as the benign ulcer.

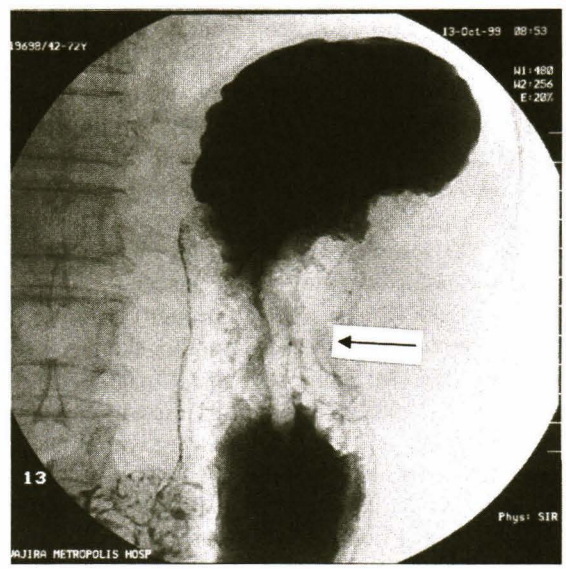

Fig. 2. Polypoid carcinoma. The radiograph reveals a 4 x 2 cm polypoid mass (arrow) on the greater curvature of the proximal gastric body.

Location

The tumors involved gastric cardia or fundus in 10 patients (20.8%), the body in 12 patients (25%) and antrum in 17 patients (35.4%). The remaining 9 patients (18.7%) had more diffuse lesions, involving the body and cardia or fundus in 7 patients and the body and antrum in 2 patients.

Of 5 patients with tumors involving the cardia there was evidence of invasion of the distal esophagus.

Of 8 patients with antral carcinomas there was evidence of gastric outlet obstruction and one of them had both gastric outlet obstruction and duodenal invasion. All gastric outlet obstructions were scirrhous lesions (Fig. 4).

Pathological findings

Of 48 patients, the pathological specimens were obtained in both gastric biopsies and operations in 40 patients. One patient underwent operation without gastric biopsy because the endoscope could not pass through the distal esophagus. Of 7 patients who had no operation, 2 had a history of breast cancer with distant metastases, 3 had advanced gastric carcinomas with liver and lung metatases, one refused to be operated on and the last one wanted to be treated in another hospital. Adenocarcinomas were found in 42 patients (87.5%), characterized by 19 masses (45.2%), 17 infiltrative/scirrhous lesions (40.5%) and 6 ulcerative lesions (14.3%). Most of them were advanced cancers, one patient revealed metastasis to the ovary (Krukenburg tumor).

Of 42 patients who had gastric adenocarcinomas, 2 had a history of breast cancer and one had a history of colonic cancer. So the gastric lesions could be either be primary or secondary. Gastric mucosa-associated lymphoid tissue lymphomas were found in 3 patients (6.2%) at the antrum and body. They were 2 ulcerative masses and one ulcerative lesion.

The gastrointestinal stromal tumor, leiomyosarcoma was found in one patient (2.1%), characterized by ulcerative mass at the fundus.

Of 48 patients, one (2.1%) revealed squamous cell carcinoma at the distal esophagus involving the cardia, characterized by ulcerative mass. The

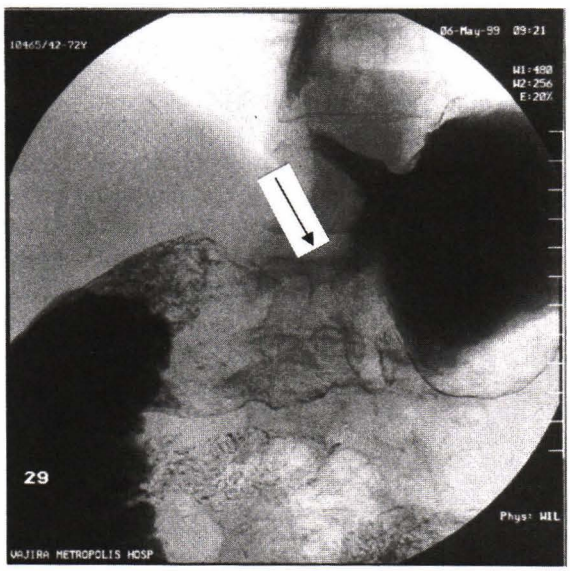

Fig. 3. **Malignant gastric ulcer. The radiograph shows a meniscoid ulcer (arrow) on the lesser curvature of the gastric body. Intraluminal ulcer with thickened radiating folds to the edge of the ulcer crater are the characteristic apperences of a malignant ulcer.**

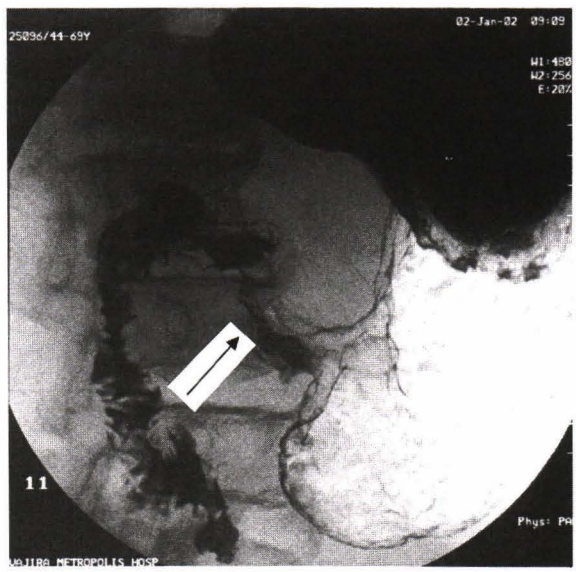

Fig. 4. **Scirrhous carrinoma of the gastric antrum. The radiograph reveals irregular narrowing of the antrum (arrow), causing partial gastric outlet obstruction.**

remaining one (2.1%) had cancer of the head of the pancreas (adenosquamous) and invasion of the gastric antrum, characterized by an infiltrative lesion.

Diagnostic test

Sensitivity 93 per cent, specificity 77 per cent, accuracy 86 per cent, positive predictive value 84 per cent, negative predictive value 90 per cent, post test likelihood if test negative 9 per cent, likelihood ratio 4.2.

DISCUSSION

In the present study of 84 patients, 48 revealed gastric cancers, there were 31 men (64.6%) with an average age of 61.6 years and 17 women (35.4%) with an average age of 55 years. Most of the lesions were adenocarcinomas (87.5%). The majority of the gastric tumors were masses and ulcerative masses (47.9%). The location of the tumors were mostly found at the antrums (35.4%). The sensitivity, specificity and accuracy of the double–contrast UGI series were 93 per cent, 77 per cent and 86 per cent, respectively. There were small differences compared to the previous studies.

Maruyama's studies showed that the sensitivity of the initial radiographic examination was 97.1 per cent, specificity was 32.3 per cent and accuracy was 33.8 per cent. With endoscopy, sensitivity was 99.8 per cent, specificity was 39.7 per cent and accuracy was 46.2 per cent[2].

Low VHS, et al revealed that the sensitivity of the double-contrast UGI series in the diagnosis of the gastric cancer was 96 per cent[7].

Dooley CP, et al showed that the sensitivity and specificity of the double-contrast UGI series were 54 per cent and 91 per cent. With endoscopy, the sensitivity was 92 per cent and specificity was 100 per cent[9]. Most of the authors accepted that the endoscopy reveals more sensitivity and specificity than the double-contrast UGI series. Many physicians advocate endoscopy rather than the double-contrast UGI series as the initial diagnostic test in patients with UGI symptoms. The disadvantages of endoscopy must also be considered because it is a more invasive procedure than the double-contrast UGI series and is associated with some risk of complications related to sedation or perforation of the UGI tract[10,11]. It is also more expensive than the double-contrast UGI series. Because the double-contrast UGI series is safer and less expensive than the endoscopy and because of its high diagnostic sensitivity, many authors believe that it is an excellent technic for detection of gastric cancers[2,3,6,7,12-14]. Both procedures significantly affect the clinical outcome of the patients, the effect of endoscopy being significantly greater than that of the double-contrast UGI series. Although errors with the barium study related predominantly to an inability to show subtle lesions, poor patient cooperation and perceptual and technical failures are additional significant factors. Endoscopy is recommended for certain groups of patients[9].

SUMMARY

In conclusion, an important goal of the double-contrast UGI series is to differentiate benign gastric lesions from malignant lesions.

In the present study, the double-contrast UGI series shows high sensitivity, specificity and accuracy. The authors believe that physicians prefer to use the double-contrast UGI series as the initial examination of patients with UGI symptoms to the endoscopy to avoid complications and reduce cost. The endoscopy must be performed in suspected patient to obtain a biopsy specimen.

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การวิเคราะห์ความไวของ Double-contrast Upper Gastrointestinal Series ในการวินิจฉัยโรคมะเร็งของกระเพาะอาหาร

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บทนำ : ปัจจุบันการส่งตรวจ Double-contrast UGI series ในผู้ป่วยที่มีอาการของโรคทางกระเพาะอาหารลดลงมาก เนื่องจากแพทย์ส่วนใหญ่จะส่งตรวจด้วยวิธีส่องกล้องแทนเพราะมีความไว, ความจำเพาะและความแม่นยำสูง

วัตถุประสงค์ : เพื่อที่จะวิเคราะห์ความไว, ความจำเพาะและความแม่นยำของการตรวจ Double-contrast UGI series ในการวินิจฉัยโรคมะเร็งของกระเพาะอาหาร

วิธีการ : ได้ทบทวนภาพรังสี Double-contrast UGI series เพื่อที่จะวินิจฉัยโรคมะเร็งของกระเพาะอาหารของผู้ป่วย 84 คน ที่มีผลทางพยาธิวิทยาพิสูจน์จากการตัดชิ้นเนื้อ และ/หรือการผ่าตัด

ผล : จากการศึกษาภาพรังสี Double-contrast UGI series พบมีผลบวกจริง 45 คน ผลลบจริง 28 คน ผลบวกปลอม 8 คน ผลลบปลอม 3 คน ความไว 93% ความจำเพาะ 77% และความแม่นยำ 86% พบมะเร็งของกระเพาะอาหาร 48 คน

สรุป : จะเห็นว่าการตรวจด้วย Double-contrast UGI series มีความไว ความจำเพาะ และความแม่นยำสูง นอกจากนี้ยังมีราคาถูก และมีผลแทรกซ้อนน้อยมาก ดังนั้นการตรวจด้วย Double-contrast UGI series ควรเป็นการตรวจอันดับแรก ในการวินิจฉัยโรคมะเร็งของกระเพาะอาหาร เมื่อสงสัยลักษณะของโรค จึงควรส่งตรวจด้วยวิธีส่องกล้องและตัดชิ้นเนื้อ

คำสำคัญ : การตรวจทางเดินอาหารส่วนบนด้วยสารทึบรังสี, มะเร็งของกระเพาะอาหาร, ความไว, ความจำเพาะ, ความแม่นยำ, การส่องกล้อง

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