A Study of Wall Thickness of Gastric Antrum: Comparison among Normal, Benign and Malignant Gastric Conditions on MDCT Scan

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Objective: *To evaluate the normal antral wall thickness on MDCT and to determine the optimal cut-off value for differentiating normal and benign from malignant gastric wall thickening.*

Material and Method: *MDCT scans of 154 patients, 22 malignancies, 66 benign conditions, and 66 normal findings, whose underwent both gastroscopy and MDCT within 30 days were retrospectively reviewed. The degree of gastric distention, antral wall thickness, pattern of wall thickness, and enhancement, the presence or absence of perigastric fat stranding and perigastric lymphadenopathy were evaluated. ROC curve analysis was used to determine the optimal cut-off value of antral wall thickness to differentiate normal and benign from malignant antral wall thickening.*

Results: *The antral wall thickness in malignancy, benign and normal groups were 16.64 ± 7.28 mm, 5.265 ± 2.21 mm, and 5.68 ± 2.13 mm, respectively. There was statistically significant difference between the normal and malignant group ($p < 0.001$) as well as benign and malignant group ($p < 0.001$). Whereas, there was no significant difference between normal and benign group ($p = 0.78$). By using a 10 mm-cutoff value, the sensitivity, specificity, negative predictive value (NPV), positive predictive value (PPV) for prediction of gastric malignancy were 81.8%, 97.7%, 97.0%, 85.7%, and 95.5%, respectively. Most gastric malignancies had diffused irregular gastric antral wall thickening (87.7%), heterogeneous enhancement with obliterated normal gastric wall layering (88.1%), perigastric fat stranding (72.7%), and perigastric lymphadenopathy (72.7%).*

Conclusion: *Normal antral wall thickness ranges from 1 to 16 mm, depends on degree of antral luminal distention. The authors suggest 10 mm antral wall thickness as the optimal cut-off point for differentiating malignancy and non-malignancy conditions. Moreover, the diffuse irregular wall thickening, heterogeneous wall enhancement, presence of perigastric fat stranding and perigastric lymphadenopathy often associate with malignancy. These findings are particularly helpful in interpreting MDCT of patients with inadequate antral luminal distention.*

Keywords: *gastric wall thickening, antral thickening, gastric carcinoma*

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Gastric cancer is the fourth most common cancer worldwide, following cancers of the lung, breast, colon, and rectum[1]. In far eastern countries, such as Korea, China and Japan, gastric cancer is the most prevalent malignant neoplasm and the leading cause of cancer death[2]. In Thailand, gastric cancer is the tenth most common cancer occurring in males[3].

The clinical presentations of gastric carcinoma are nonspecific including epigastric pain, nausea, vomiting, dysphagia, anorexia, upper gastrointestinal bleeding, and iron deficiency anemia. These symptoms can be caused by other benign conditions such as ulcers or gastritis[4].

Although gastroscopy is the gold standard for diagnosis of gastric cancer, computed tomography (CT) scan are frequently obtained in these patients who present with nonspecific abdominal symptoms. The overlook of subtle clues on CT scan can lead to the delayed diagnosis of early gastric cancer. Thus, it is vital for radiologists to be able to screen for the potential malignancies on CT scan that necessitated the further assessment with endoscopy. Gastric wall thickening is an important sign of gastric cancer. Many

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prior studies report that the gastric wall is normally less than 5 mm in an adequately distended stomach[5,6]. However, the gastric antral wall is usually thicker than the other part of the stomach. Pickhardt et al[7] found that the antral wall thickness commonly exceeds 5 mm and can be measured up to 12 mm in a normal population.

The aims of the present study were to evaluate the normal antral wall thickness on MDCT and to determine the optimal cut-off value and other associated findings for differentiating normal and benign from malignant gastric wall thickening.

Material and Method

Patient selection

Between January 2007 and December 2008, 12,176 patients underwent gastroscopy at our institute. Among 12,176 patients, 110 patients had been pathologically diagnosed with gastric malignancies. Of these 110 patients, 22 gastric malignancy patients who completed all the criteria were included in the present study. Those criteria were 1) the malignancy involving gastric antrum, 2) underwent thin-sliced contrast-enhanced MDCT within 30 days, 3) the patient had no history of prior gastric surgery, 4) there was no adjacent organ malignancy with extension of lesion to gastric antrum, and 5) clinical records and the MDCT were available for review on the authors' picture archiving and communication (PACS) workstation.

All controls were also randomized selected from the list of patients who were not diagnosed of gastric cancer, proven by gastroscopy, during the same period. These patients also had available thin-slice contrast-enhanced MDCT scan within 30 days of gastroscopy. Using the same inclusion criteria of malignancy group, 66 cases of the most recent normal patients and benign conditions (1:3 cases: control) were included in the present study.

Finally, 154 patients were included in the present study, comprised of 22 malignancies, 66 benign conditions, and 66 normal patients.

Our institutional review board approved all aspects of this retrospective study and did not require informed consent from the patients whose record was included in the present study.

Imaging acquisition

All MDCT examinations were performed with one of the following MDCT scanners, a Lightspeed VCT (GE Healthcare), or a Somatom (Siemens). Each patient received 100 ml of nonionic intravenous contrast material at a rate of 3 to 5 ml/s using an automatic power injector. Non-contrast and portovenous phase (80 seconds after contrast injection) MDCT images were obtained during full inspiration. Image reconstructions were performed with 1.25 to 1.5 mm slice thickness. Either water or water-soluble contrast was given orally in order to distend the stomach for better visualization of gastric wall.

Image interpretation

All MDCT were reviewed by an experienced abdominal radiologist without prior knowledge of endoscopic or pathological findings. The reviewer evaluated the images for gastric distention, antral wall thickness, pattern of antral wall thickness and wall enhancement pattern on a PACS workstation.

Gastric antral wall thickness and luminal diameter was measured on multiplanar reformatting images (MPR image) parallel to the long axis of stomach (Fig. 1).

The degree of gastric luminal distension was evaluated by measuring the gastric luminal diameter at mid gastric body and mid gastric antrum, excluding the rugal fold. Both were graded into three levels, following the study of Sibel Kul et al[8].

A luminal diameter at mid gastric antrum measured less than 2.5 cm was interpreted as grade 0, between 2.5 and 4 cm was interpreted as grade 1; and greater than 4 cm was interpreted as grade 2.

The pattern of antral wall thickening were evaluated and classified into three patterns, 1) diffuse smooth, 2) diffuse irregular and 3) focal wall thickening. In patients who had diffuse smooth antral wall thickness, the measurements were obtained at mid-point between the incisura angularis and antropyloric junction and were taken perpendicular to

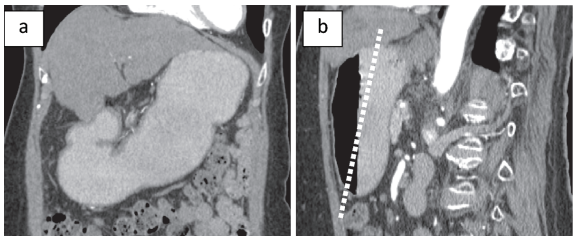

Fig. 1 Multiplanar reformation images of the stomach displayed on three-dimentional workstation
The multiplanar reformation images of stomach along its longitudinal axis (a) were created on the three-dimenstional workstation by selecting the reconstructed plane (white dot line) passing from fundus to antrum on sagittal view (b)

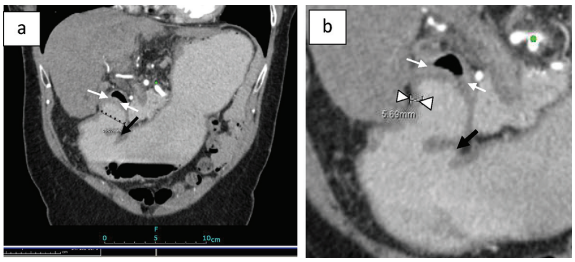

Fig. 2 The illustrations show the measurements of antral luminal diameter and antral wall thickness
(a) The antral luminal diameter (black dot line) was measured at mid-point between incisura angularis (black arrow) and antropyrolic junction (white arrows) and taken perpendicular to the gastric wall excluding rugal fold
(b) MPR image shows measurement of antral wall thickness (white arrow heads) at mid-point between incisura angularis (black arrow) and antropyrolic junction (white arrows) and taken perpendicular to the gastric wall excluding rugal fold

the gastric wall using electronic calipers, excluding the rugal fold (Fig. 2). In whom the wall thickness is non-uniform (diffuse irregular and focal wall thickening), the wall thickness was measured at the point of maximum thickness.

The wall enhancement pattern was classified into two types; 1) heterogeneous enhancement with obliteration of wall layering, and 2) thin mucosal enhancement with preservation of normal enhancing mucosal layer.

The presence or absence of adjacent perigastric fat stranding and perigastric lymphadenopathy were also recorded.

Statistical analysis

The statistical analysis was performed with SPSS statistical package version 13 (SPSS Inc., Chicago, Illinois, USA).

Mean, range and 95% confidence interval of gastric antral wall thickness in each group were calculated. The differences in antral wall thickness between normal, benign and malignancy groups were evaluated by using ANOVA test. The p-value less than 0.05 were considered statistically significant. To determine the optimal antral thickness cut-off value that predicts malignancies, a series of receiver-operating characteristic (ROC) curves were used. For each cut-point, the positive predictive value (PPV), negative predictive value (NPV) and accuracy were calculated. The point with the highest sensitivity and lowest false-positive rate (closest to the left-upper corner of ROC curve) was suggested to be the optimal cut-point.

The relationships of the luminal distention and gastric wall thickness, antral wall thickening pattern, wall enhancement pattern, the adjacent perigastric fat stranding and perigastric lymphadenopathy were analyzed statistically using Chi-square test. The p-value less than 0.05 were considered statistically significant.

Results

Among 154 patients included in the present study, there were 22 patients with malignancies (11 men and 11 women, age range 43 to 90 years), 66 patients with benign conditions (35 men and 31 women, age range 61 to 85 years), and 66 patients with normal gastric antral finding (33 men and 33 women, age range 37 to 94 years). The mean age of the patients were 60.4 years, 59.9 years, and 50.8 years in malignant, benign, and normal group, respectively ($p > 0.05$).

In the malignancy group, the final pathological diagnosis comprised of adenocarcinoma (17/22 patients) and lymphoma (5/22 patients). Adenocarcinoma group comprises of 15 patients with stage IV and two patients with stage II disease, according to the American Joint Committee on Cancer TNM classification. Lymphoma group comprises of two patients with stage IE, two patients with stage IIE, and one patient with stage IE disease, according to Ann Arbor Classification[8].

In the benign group, the final diagnosis according to the endoscopic results included gastritis (44/66 patients), gastric ulcer (6/66 patients), erythematous mucosa (5/66 patients), portal hypertensive gastropathy (5/66 patients), erosive gastropathy (3/66 patients), non-erosive gastropathy (2/66 patients), gastric ulcer (1/66 patient), and multiple telangiectasia (1/66 patient).

The mean interval time between gastro-endoscopy and MDCT scan was 8.4, 11.8, and 10.86 days for malignancy, benign and normal group, respectively ($p > 0.05$).

All patients with malignancy were symptomatic. The most common symptoms were abdominal pain (81.8%), followed by weight loss (54.5%), gastrointestinal bleeding (45.5%), nausea and vomiting (31.8%). The other miscellaneous symptoms include anorexia, anemia, palpable abdominal mass, constipation, diarrhea, dysphagia, jaundice, heart burn, and fever (22.7%).

On the other hand, 86.4% patients with benign conditions, and 80.3% patients with normal gastric

findings were symptomatic. Of which, abdominal pain was the most common complaint, occurring in 51.5% in the benign group and 28.8% in the normal group. Gastrointestinal bleeding and weight loss were found in 28.8% and 4.5% of patients with benign conditions, and in 13.6% and 9.1% of patients with normal gastric finding, respectively.

The mean (± SD) antral wall thickness in the malignancy group was 16.64 (± 7.28) mm; range from 4.84 to 37.00 mm. The mean (± SD) antral wall thickness in the benign group was 5.265 ± 2.21 mm; range from 1.04 to 10.76 mm. The mean (± SD) antral wall thickness in the normal group was 5.68 ± 2.13 mm; range from 1.43 to15.89 mm.

There were statistically significant differences between normal and malignant group ($p < 0.001$) as well as benign and malignant group ($p < 0.001$). Whereas, there was no significant difference between normal and benign group ($p = 0.78$) (Table 1).

The ROC curve for differentiation of malignancy from non-malignancy (benign or normal) condition is illustrated in Fig. 3.

By using the cut-off value of 10 mm, the sensitivity, specificity, negative predictive value (NPV), and positive predictive value (PPV), and accuracy for diagnosis of malignancy were 81.8%, 97.7%, 97.0%, 85.7%, and 95.5%, respectively.

At the cut-off value of 11 mm, the sensitivity, specificity, negative predictive value (NPV), and positive predictive value (PPV), and accuracy for diagnosis of malignancy were 77.3%, 99.2%, 96.3%, 94.4%, and 96.1%, respectively.

Most patients with gastric malignancy (81.8%) had antral luminal narrowing with luminal diameter less than 2.5 cm (grade 0 antral distention), whereas approximately half of the patients with normal and benign gastric diseases show luminal narrowing with grade 0 antral distention. In normal and benign groups, the wall thickness tends to be thinner as the luminal diameter increase (negative correlation with $p < 0.05$). In contrast, the authors found no significant difference in the degree of antral wall thickness between grade 0, 1, 2 antral distention in patients with malignant gastric disease ($p = 0.922$) (Table 2).

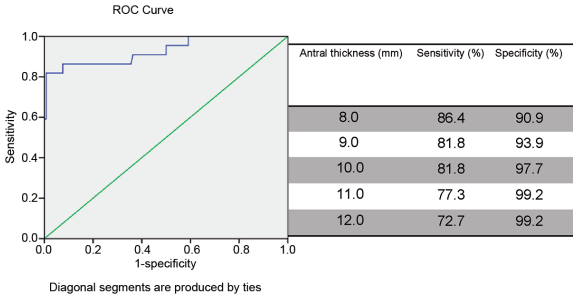

Fig. 3 ROC curve of sensitivity and 1-specificity of gastric antral wall thickness between malignancy group and non-malignancy group

The wall thickness pattern, wall enhancement pattern, and other additional MDCT findings are summarized in Table 3. The results showed that malignant gastric diseases frequently demonstrated diffused irregular wall thickening (77.3%), heterogeneous enhancement and obliteration of normal gastric mucosal layer (81.8%), and perigastric fat stranding and lymphadenopathy (72.7%) (Fig. 4). While on the contrary, all patients with normal and benign gastric conditions had diffuse smooth antral wall with preservation of normal wall layers. Diffuse irregular wall thickening, perigastric fat stranding, and lymphadenopathy are rarely seen in the normal or benign group (Fig. 5).

Discussion

Gastric wall thickening is one of the most common and important signs of various gastric diseases seen on abdominal CT images. Radiologists should be able to differentiate normal or benign findings from

Table 1. Summarized the antral wall thickness on MDCT scan in malignancy, benign and normal group

Group	Number of patients	Mean antral wall thickness ± SD (mm)	95% confidence interval	Range of antral wall thickness (mm)
Normal	66	5.68 ± 2.13	5.159-6.21	1.43-15.89
Benign	66	5.27 ± 2.22	4.72-5.81	1.04-10.76
Malignant	22	16.64 ± 7.28	13.41-19.87	4.84-37.00
Total	154	7.07 ± 5.17	6.25-7.89	1.04-37.00

The difference between antral wall thickness in normal and benign groups is no statistically significant (p-value = 0.61)
The difference between antral wall thickness in normal and malignancy groups is statistically significant (p-value < 0.001)
The difference between antral wall thickness in benign and malignancy groups is statistically significant (p-value < 0.001)

Table 2. Correlation between antral luminal distention and antral wall thickness on MDCT scan

Final diagnosis	Antral luminal distention	Number of patients	Mean antral wall thickness ± SD (mm)	Antral wall thickness range (mm)	p-value
Normal	Grade 0	33/66 (50%)	6.40 ± 2.19	3.50-15.89	0.021
	Grade 1	24/66 (36.3%)	5.02 ± 1.60	2.74-9.16	
	Grade 2	9/66 (13.7%)	4.82 ± 2.47	1.43-15.89	
Benign	Grade 0	30/66 (45.4%)	6.14 ± 2.14	1.48-10.76	0.008
	Grade 1	28/66 (42.4%)	4.68 ± 2.00	1.04-9.43	
	Grade 2	8/66 (12.2%)	4.01 ± 2.20	1.40-7.72	
Malignancy	Grade 0	18/22 (81.8%)	16.94 ± 7.59	4.84-37.00	0.922
	Grade 1	3/22 (13.6%)	15.04 ± 7.88	6.00-20.50	
	Grade 2	1/22 (4.6%)	16.20	-	

Table 3. Summarized of additional MDCT finding in normal, benign and malignancy groups

Associated CT finding	Endoscopic finding		
	Normal	Benign	Malignant
Wall thickness pattern			
Focal	0/66 (0%)	0/66 (0%)	1/22 (4.5%)
Diffuse smooth	65/66 (98.5%)	66/66 (100%)	4/22 (18.2%)
Diffuse irregular	1/66 (1.5%)	0/66 (0%)	17/22 (77.3%)
Enhancement pattern			
Thin mucosal enhancement with preservation of normal wall layer	66/66 (100%)	66/66 (100%)	4/22 (18.2%)
Heterogeneous enhancement with obliteration of normal wall layer	0/66 (0%)	0/66 (0%)	18/22 (81.8%)
Perigastric fat stranding			
Absent	65/66 (98.5%)	66/66 (100%)	6/22 (27.3%)
Present	1/66 (1.5%)	0/66 (0%)	16/22 (72.7%)
Perigastric lymphadenopathy			
Absent	64/66 (97.0%)	66/66 (100%)	6/22 (27.3%)
Present	2/66 (3.0%)	0/66 (0%)	16/22 (72.7%)

malignancy or potential malignant lesions that warrant further investigations.

Most studies report that a normal gastric wall thickness is 5 mm or less in an adequately distended stomach at CT. However, the antral wall is usually thicker than the other parts of the stomach wall[5].

Using MDCT, Pickhardt et al[7] measured the antral wall thickness on CT scan of 153 patients without gastric disease. They reported that the normal antral wall thickness commonly exceeded 5 mm and can be up to 12 mm (mean (± SD) 5.1 ± 1.6 mm). These results are similar to the study of Sibel Kul et al[9] who reviewed CT images of 99 patients without gastric diseases, and concluded that normal antral thickness commonly exceeds 5 mm.

Cho SG et al[10] studied the differences between gastric cancer and pseudo-wall thickening of the gastric antrum. They retrospectively reviewed 120 cases in which two-phase spiral CT scans showed focal wall thickening at prepyloric antrum. Their results show the mean antral wall thickness of 19 mm in the cancer group and 12.5 mm in the normal group. Moreover, pseudo-wall thickening frequently show thin-layer mucosal enhancement, whereas, tumor frequently show thick enhanced mucosal layer with diffusely enhanced whole-wall thickness.

Insko EK et al[11] evaluated the sensitivity and specificity of CT for differentiating benign from malignant stomach lesions in patients with gastric wall thickening. They found that the gastric wall thickness of 1 cm or greater had a sensitivity of 100% and a specificity of 42% for detection of malignant or potentially malignant gastric lesions. However, their study is not limited to the measurement of gastric antrum.

The recent study by Austrian researcher (Matzek WK et al, Efficacy of hydro MDCT in differentiation between normal and pathologic antral

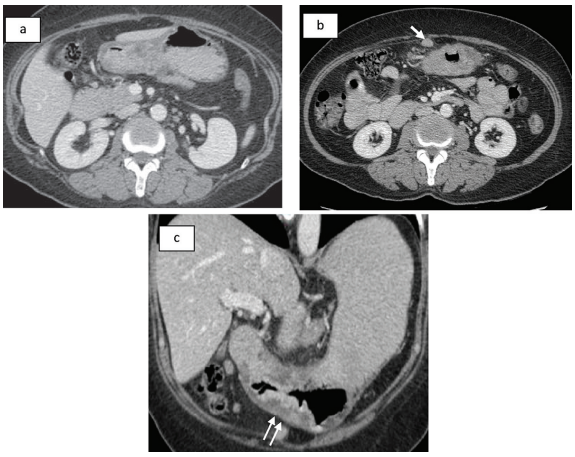

Fig. 4 Abdominal CT scan with contrast of a 53-year old woman with adenocarcinoma at antrum
(a) Axial CT abdomen shows focal antral wall thickening with heterogeneous enhancement, obliterated normal gastric mucosa layering and periegastric fat stranding
(b) Axial CT of same patient reveals perigastric lymphadenopathies (white arrow)
(c) MPR image shows focal antral wall thickening (double arrows)

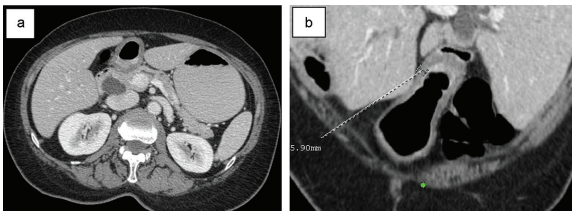

Fig. 5 CT upper abdomen of a 66-year-old woman with gastritis at antrum, body and fundus
(a) Axial and (b) MPR view of CT of upper abdomen shows homogeneous enhancement of gastric antral wall with smooth wall pattern. Neither perigastric fat stranding nor perigastric lymphadenopathy was seen. Wall thickness of antrum was measured about 5.90 mm

wall thickening of the stomach, presented at the 2010 annual meeting of the European Congress of Radiology in Vienna, Austria) reported a mean antral wall thickness of 18.5 mm in patients with gastric malignancies and 5.9 mm in patients without antral tumor. The investigators suggested that antral wall thickening beyond 11 mm on hydro MDCT scan is highly suggestive of antral tumor.

In the present study, the authors found no statistically significant difference of the antral wall thickness between normal and benign gastric disease groups ($p = 0.61$). Most patients had antral wall thickness greater than 5 mm with mean antral thickness of 5.68 ± 2.13 mm, and 5.27 ± 2.22 mm in normal and benign group, respectively. The antral thickness can be measured up to 16 mm in normal patients, who had inadequate antral luminal distension (grade 0, luminal diameter less than 2.5 cm). In the malignancy group, the antral wall thickness ranges from 4.84 to 37 mm with mean antral wall thickness of 16.64 ± 7.28 mm. There is statistically significant difference between non-malignancy and malignancy groups ($p < 0.001$).

According to the ROC analysis, MDCT offers very high sensitivity and specificity in differentiating normal or benign and malignant gastric conditions. By using 10 mm wall thickness cut-off value, the sensitivity and specificity of MDCT in diagnosis of gastric malignancy are 97.7% and 81.8%.

At 11 mm cut-off value, the specificity increases to 99.2% but the sensitivity drops to 77.3%. Therefore, the authors recommend using 10 mm antral wall thickness as an optimal cut-off value for diagnosis of gastric malignancy since the higher sensitivity is necessary for screening test in order to minimize the false-negative rate. The authors' optimal cut-off value is slightly less than that of prior reported by Matzek WK.

Unlike the study by Sibel Kul et al[6] that reported no correlation between the gastric distention and the antral wall thickness ($p = 0.578$). The authors found negative correlation between degree of antral luminal distention and antral wall thickness in the normal and benign group. Since in these patients, the gastric lumen is still distensible and its pliability is preserved, the gastric wall tends to decrease with increasing gastric luminal distention. On the contrary, the authors found no correlation between antral luminal distention and wall thickness in the malignancy group. Moreover, these patients mostly show inadequate antral luminal distention (grade 0). The basis of this result is that the infiltrating tumor does not only cause marked gastric wall thickening but also limit its pliability.

As mentioned earlier, the antral wall thickness can be measured up to 16 mm in normal patients who inadequate luminal distention, thus, leads to false positive diagnosis. As the result, the adequate gastric distention is crucial and the degree of gastric luminal distention should be taken into account when evaluating gastric wall thickness.

The MDCT findings that often associate with malignancy include diffuse irregularity of gastric wall, heterogeneous enhancement of gastric wall with obliteration of normal wall layer, enlarged perigastric

lymphadenopathy, and presence of perigastric fat stranding. These findings are infrequently found in normal or benign group. The authors believe that the specificity and accuracy of MDCT in diagnosis of antral malignancy, particularly in the patient who had inadequate gastric distention, can be improved when these MDCT findings are taken into consideration.

There are several limitations of the present study. First, this is a retrospective study. Only the patients who underwent gastroendoscopy were selected. Most of these patients had some abdominal symptoms and indications for the endoscopic examination. Patients with early gastric malignancy who had no clinical symptom and did not undergo endoscopic examination were not included in the present study. Therefore, the selection bias toward advanced disease, especially in the malignancy group, may occur. Second, the relationship between the degree of antral wall thickness and staging of malignancy were not evaluated due to the small number of patients in the malignancy group. Third, the authors could not evaluate all the patients with normal and benign gastric conditions in the present study due to very large numbers of patients in non-malignancy groups (more than 12,000 cases). However, the randomized cases selection was done in order to control this bias. Fourth, all MDCT scans were reviewed by one reviewer and only single measurements were obtained so that the interobserver and intraobserver variability were not determined. Fifth, there is lack of pathological proven in most normal and benign patients since the diagnosis of these conditions was mostly based on the endoscopic finding alone. Last, antral wall thickness may be underestimated in some patients on whom positive oral contrast materials were used since the positive contrast material can obscure the enhancing gastric mucosa.

Conclusion

Normal antral wall thickness ranges from 1 to 16 mm, depends on degree of antral luminal distention. The authors suggest 10 mm antral wall thickness as the optimal cut-off point for differentiating malignancy and non-malignancy conditions. Moreover, the diffuse irregular wall thickening, heterogeneous wall enhancement, presence of perigastric fat stranding and perigastric lymphadenopathy often associate with malignancy. These findings are particularly helpful in interpreting MDCT of patients with inadequate antral luminal distention.

Potential conflicts of interest

None.

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การศึกษาความหนาของผนังกระเพาะอาหารส่วนแอนทรัมด้วยเครื่องคอมพิวเตอร์สแกนชนิดมัลติดีเทคเตอร์ โดยเปรียบเทียบระหว่างคนปกติผู้ป่วยโรคกระเพาะอาหารที่ไม่ใช่มะเร็งและผู้ป่วยโรค มะเร็งกระเพาะอาหาร

รณิษฐา ทองดี, ลลิตศา กองแก้ว, ตรงธรรม ทองดี

วัตถุประสงค์: *เพื่อศึกษาเปรียบเทียบความหนาของผนังกระเพาะอาหารส่วนแอนทรัม โดยการตรวจด้วยเครื่องคอมพิวเตอร์สแกนชนิดมัลติดีเทคเตอร์ในคนปกติ, ผู้ป่วยโรคกระเพาะอาหารที่ไม่ใช่มะเร็ง และผู้ป่วยโรคมะเร็งกระเพาะอาหาร*

วัสดุและวิธีการ: *โดยการศึกษารวบรวมข้อมูลของผู้ป่วยที่ได้รับการส่องกล้องตรวจกระเพาะอาหาร และการทำคอมพิวเตอร์สแกนชนิดมัลติดีเทคเตอร์จากสาเหตุต่าง ๆ จำนวน 154 ราย ซึ่งประกอบด้วยผู้ป่วยโรคมะเร็งกระเพาะอาหารจำนวน 22 ราย และเป็นโรคกระเพาะอาหารอื่นที่ไม่ใช่มะเร็งจำนวน 66 ราย และผู้ที่มีผลส่องกล้องปกติจำนวน 66 ราย ความหนาและลักษณะหลังฉีดสารทึบรังสีของผนังกระเพาะอาหารส่วนแอนทรัม ระดับความโป่งพองของกระเพาะอาหาร รอยโรคของเนื้อเยื่อไขมันรอบกระเพาะอาหาร และต่อมน้ำเหลืองเฉพาะที่โตที่เห็นจากภาพคอมพิวเตอร์สแกนของผู้ป่วยเหล่านี้ได้รับบันทึก และนำมาวิเคราะห์เพื่อหาค่าความหนาของผนังกระเพาะอาหารส่วนแอนทรัมที่เหมาะสมในการแยกระหว่างผู้ป่วยทั้งสามกลุ่ม และเพื่อหาความแตกต่างของลักษณะภาพคอมพิวเตอร์สแกนอื่น ๆ ที่อาจช่วยในการวินิจฉัยโรค*

ผลการศึกษา: *ค่าความหนาของผนังกระเพาะอาหารส่วนแอนทรัมในผู้ป่วยมะเร็งกระเพาะอาหารโดยเฉลี่ยเท่ากับ 16.64 ± 7.28 มิลลิเมตร ผู้ป่วยโรคกระเพาะอาหารอื่นที่ไม่ใช่มะเร็งโดยเฉลี่ยเท่ากับ 5.265 ± 2.21 มิลลิเมตร และคนปกติโดยเฉลี่ยเท่ากับ 5.68 ± 2.13 มิลลิเมตร ซึ่งค่าเหล่านี้มีความแตกต่างอย่างมีนัยสำคัญทางสถิติระหว่างผู้ป่วยกลุ่มที่เป็นมะเร็งและผู้ป่วยกลุ่มอื่น แต่ไม่มีนัยสำคัญทางสถิติระหว่างผู้ป่วยโรคกระเพาะอาหารชนิดอื่นที่ไม่ใช่มะเร็งและคนปกติ หากใช้ค่าความหนาของกระเพาะอาหารที่ 10 มิลลิเมตร พบว่ามีค่าความไวและความจำเพาะต่อการวินิจฉัยโรคมะเร็งกระเพาะอาหารเท่ากับ 81.8% และ 97.7% ตามลำดับ นอกจากนี้ ลักษณะอื่น ๆ ที่พบร่วมกับโรคมะเร็งกระเพาะอาหารได้บ่อยคือ ลักษณะของผนังถุงน้ำดีหนาตัวขรุขระ (87.7%), มีสีไม่สม่ำเสมอเมื่อฉีดสารทึบรังสี (88.1%), มีรอยโรคในเนื้อเยื่อไขมันรอบกระเพาะอาหาร (72.7%) และมีต่อมน้ำเหลืองเฉพาะที่โต (72.7%)*

สรุป: *ผนังกระเพาะอาหารส่วนแอนทรัมในคนปกติอาจมีค่าได้ตั้งแต่ 1 ถึง 16 มิลลิเมตร ขึ้นอยู่กับความโป่งพองของกระเพาะอาหารจากการศึกษาพบว่าค่าความหนาที่ 10 มิลลิเมตร คือค่าที่เหมาะสมที่สุดในการแยกระหว่างผู้ป่วยโรคมะเร็งออกจากผู้ป่วยที่ไม่ใช่มะเร็ง*