

A New Ultrasonographic Scoring System to Differentiate Malign and Benign Gastric Pathologies

BENIGN VE MALIGN MİDE PATOLOJİLERİNİN AYIRIMINDA
YENİ BİR ULTRASONOGRAFİK SKORLAMA SİSTEMİ

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SUMMARY

In a prospective clinical study 93 patients with gastric pathologies (56 malign and 37 benign) were examined ultrasonographically. Gastric wall-layer disturbance, gastric wall thickness, lesion length and protrusion into the lumen were searched. Then a scoring system was set according to the distribution of these parameters and the score of each patient is calculated retrospectively. Six of the malign cases had scores in benign range. All of the benign cases had scores in the benign range. The overall sensitivity of this scoring system was 89% and specificity 100%. The positive predictive value was 100%, the negative predictive value was 86% and overall diagnostic accuracy was 93%. This scoring system was considered to be a useful aid in the differential diagnosis of gastric pathologies.

Key Words: Ultrasonography, Gastric pathologies,
Scoring system

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Although upper gastrointestinal tract x-ray studies with barium meals and fiber-optic endoscopy combined with biopsy are the main procedures used in the diagnosis of gastric pathologies, the recent technical accomplishments and the increased familiarity with ultrasonography made it possible to visualize the gastric wall changes precisely (1-5). Endoscopic ultrasonography is widely used for this purpose, but conventional transabdominal way has also proved to be suitable. (6)

It is very important to determine the nature of a lesion in terms of malignancy once it is detected.

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ÖZET

Bu prospektif klinik çalışmada gastrik patolojisi olan 93 hasta (56 malign ve 37 benign) ultrasonografik olarak incelendi. Mide duan tabakaları, mide duvarı kalınlığı, lezyon büyüklüğü ve tümene protrüzyon dikkate alındı. Bakılan bu parametrelerin hastalardaki dağılımına göre tek tek skorlandı. Buna göre malign hastalardan sadece 6'sında skor benign sınırlar içinde bulundu, benign olguların hepsinde skor benign sınırlar içinde idi. Skorlama sisteminin sensitivitesi %89 ve spesifitesi %100 olarak bulundu. Bu skorlama sisteminin gastrik patolojilerin aydınlatılmasında yararlı ilave bir yöntem olacağı kanaatine vardık.

Anahtar Kelimeler: Ultrasonogram, Mide patolojileri,
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Some paramours are defined for determining gastric malignancies by ultrasonography (4, 6), but objective criteria are lacking.

The aim of this study is to define an objective ultrasonographic scoring system helping the differential diagnosis of gastric pathologies when malignancy is suspected.

MATERIALS AND METHODS

Ninety-three patients with endoscopically diagnosed and histologically proved gastric pathologies were included in the study. Of this 93 cases 37 had benign and 56 had malign gastric lesions (Table I). In all of these cases the diagnosis was known by the ultrasonographer prior to the examination.

Patients were examined after overnight fasting and were given 500-1000 ml. of commercial orange juice to drink. No medications were administered. To

get a systematic view of the stomach the patients were examined in left lateral, supine, right lateral and prone positions.

The instrument used was Toshiba model SAL 77A gray scale real time ultrasonograph with 3.5 MHz electronic convex probe.

The number of gastric wall layers disturbed (intact, 1 or 2 layers, 3 layers or more than 3 layers, gastric wall thickness (less than 5 mm, 5-15 mm or more than 15 mm), lesion length (less than 10 mm, between 10-30 mm or more than 30 mm) and protrusion into the lumen (absent or present) are recorded when a lesion was detected.

A scoring system was defined by giving arbitrary points to these parameters according to their distribution (Tables II and III). Then the score of the each patient is calculated retrospectively.

"Student't" test is use for significance analyses.

Tablet. The distribution of the endoscopic diagnoses of the study group

	Benign Cases (n)	Malign Cases (n)
Vegetating Mass	—	41
Polyp	4	1
Submucosal Mass	3	2
Ulcer	30	10
Early Gastric Ca	—	1
Lymphoma	—	1
TOTAL	37	56

Table II. The distribution pattern of the findings according to searched parameters

		Malign Cases (n)	Benign Cases (n)
Number of intact gastric layers disturbed	intact	—	23
	1-2	13	14
	3	32	—
	>3	11	—
Gastric wall thickness	<5 mm	—	21
	5-15 mm	27	12
	>15mm	29	4
Protrusion into the lumen	absent	11	32
	present	45	4
Lesion length	<10mm	2	33
	10-30 mm	25	4
	>30 mm	29	—

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Table III. The ultrasonographic scoring system

		Points
Number of gastric layers disturbed	intact	0
	1-2	1
	3	3
	>3	4
Gastric wall thickness	<5 mm	0
	5-15 mm	1
	>15 mm	3
Protrusion into the lumen	absent	0
	present	3
Lesion length	<10mm	0
	10-30 mm	1
	>30 mm	3

0-6 points : Benign

7-13 points : Malign

RESULTS

In twenty-three of the 37 benign cases gastric wall layers were normal. In the remaining 14 cases only 1 or 2 layers were affected (Table II, Figure 2).

Gastric wall layers were disturbed in various degrees in all of the malign cases (Table II). Disturbance of three layers were most common (Figure 2). In 11 cases more than three layers were effected (Figure 3).

The mean gastric wall thickness of benign cases at the lesion site was 7.50 mm (SD: 8.35) with less than 5 mm the most common and more than 15 mm the least common. The mean wall thickness of malign cases at the lesion site was 17.86 mm (SD: 9.65), there were no cases with less than 5 mm. The diffe-



Figure 1. An ultrasonogram of a patient with benign antral ulcer (arrow). First two gastric layers are disturbed (1 points), gastric wall thickness is 12 mm (1 pts), lesion length is 15 mm (1 pts) and there is no protrusion (0 pts). The score is 3 points (benign).

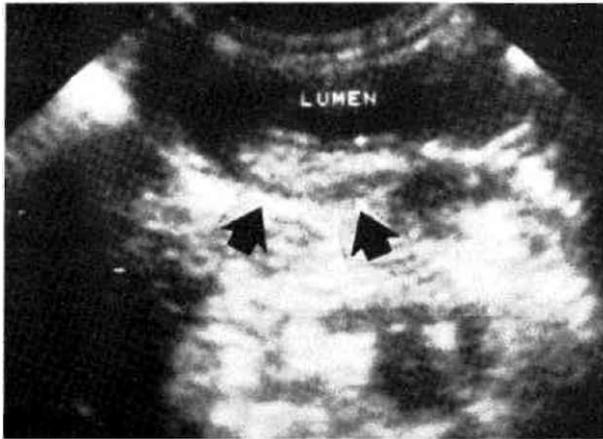


Figure 2. An ultrasonogram of a patient with malignant submucosal tumor (arrow). Gastric layers 3 and 4 are disturbed (1 points), gastric wall thickness is 16 mm (3 pts), lesion length is 29 mm (1 pts) and there is protrusion into the lumen (3 pts). The score is 8 points (malign).

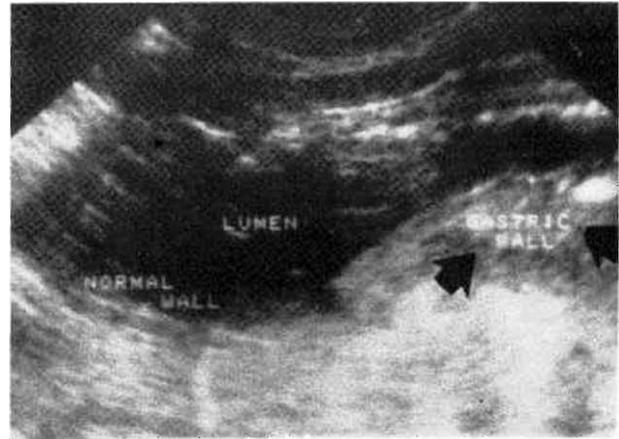


Figure 3. An ultrasonogram of a patient with malignant vegetating tumor with mucosal ulcerations (arrows). No gastric layering is seen (4 points), gastric wall thickness is 21 mm (3 points), lesion length is 41 mm (3 points) and there is protrusion into the lumen (3 points). The score is 13 points (malign).

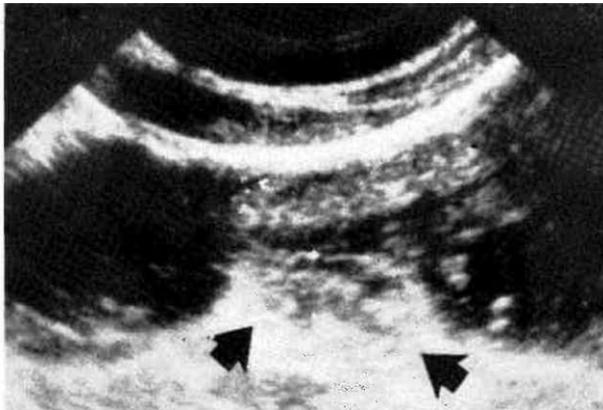


Figure 4. An ultrasonogram of a patient with malignant ulcero-vegetating mass. Gastric layers 1,2,3 and 4 are disturbed (3 points), gastric wall thickness is 19 mm (3 pts), lesion length is 22 mm (1 pts) and there is severe protrusion (3 pts). The score is 10 points (malign).

rence between the two groups were highly significant ($p < 0.001$).

The most common lesion length was less than 10 mm for benign cases and more than 30 mm for malignant cases.

In 45 of the 56 malignant cases severe protrusion of lesion into the gastric lumen was seen, whereas it was seen in only 4 of 36 of the benign cases (Figure 4).

In the retrospective analysis of the distribution of the calculated scores of the patients it was observed that (Tables II and III): 1. The mean score of the patients with malignant lesions was 8.52 (SD: 2.61). In 50 (89%) out of 56 patients the score was 7; 2. The mean score of the patients with benign lesions was

Table IV. Sensitivity, specificity, positive and negative predictive values for detecting gastric malignancies and overall diagnostic accuracy of the scoring system

		PATHOLOGY	
		MALIGN (n:56)	BENIGN (n:37)
Sensitivity	>7	True + n: 50	False + n: 0
	>7	False - n: 6	True - n: 37

Sensitivity = 50/56 (89 %); Specificity = 37/37 (100 %)

Positive predictive value = 50/50 (100 %)

Negative predictive value = 37/43 (86 %)

Overall diagnostic accuracy = 93/87 (93 %)

1.50 (SD: 1.71). In all of these patients (100 %) the score was 7; 3. The difference between the scores of benign and malignant cases were highly significant ($p < 0.001$). Therefore, the "cut-off" point which would be set as 7 was suitable.

The overall sensitivity of the scoring system was found to be 89%, the specificity 100%, the positive predictive value 100% and the negative predictive value 86%. The overall diagnostic accuracy was 93 (Table IV).

DISCUSSION

About 15 years ago it was almost impossible to use US as a diagnostic tool in gastrointestinal tumors. In 1972 Holm stated that the tumors of the gastrointestinal tract were not suitable for the ultrasonographic investigation (7). However, several factors including the recent technical achievements, greater understanding and the experience with the procedure,

have contributed to the increasing role of ultrasound in the gastrointestinal tract tumors.

Filling the stomach with water enables the ultrasonographer to examine stomach, by resolving problems such as abdominal gas or pseudomasses (8). Water itself has some disadvantages such as microbubbling. Worlicek used orange juice instead of water to fill the stomach and claimed that the results are better (6,9). We also used commercial orange juice instead of water to fill the stomach in ultrasonographic examination and agree with Worlicek.

As in endoscopic ultrasonography, fluid filled stomach also reveals layers of the wall. There are five layers of echo structures corresponding the histological structure of the stomach wall (Figure 5) : inner hyperechoic layer corresponding the boundary between the intragastric fluid and the gastric mucosa (layer 1); hypoechoic layer corresponding the mucosa (layer 2); the middle larger hyperechoic layer corresponding the submucosa (layer 3); next hypoechoic layer corresponding the muscularis propria (layer 4) and finally the outer hyperechoic layer corresponding the serosa (layer 5) (1,2,4,10,11). The disturbance of this wall layerings is indicative of a pathological lesion.

The definitions of benign and malignant lesions of the stomach in terms of ultrasonographic findings are obscure. According to Worlicek, sharply delimited roundish or oval shaped submucosal space occupying lesion suggests a benign process, and circumscribed irregular thickening of the wall is indicative of a malignant process (6). But one cannot exclude the other possibility.

In his study, Miyamoto set up criteria in determining the depth of lesions, using gastric wall layer invasions (4).

We intended to set up a scoring system combining the criteria and definitions suggested by other authors earlier. This would hypothetically enable us to have objective means to determine a lesion whether it



Figure 5. /The five layers of the normal part of gastric wall (antrum) of one of our patients (arrows).

is malignant or benign. The parameters looked for were the presence or absence of gastric wall layerings, the gastric wall thickness and lesion length and the presence or the absence of protrusion of the lesion into the gastric lumen.

Fifty (89 %) patients out of 56 in malignant group had scores 7 or above, which corresponds to malignancy. Five of the remaining 6 cases had smaller malignant ulcers without thickened gastric wall and confined to mucosa and submucosa. The sixth patient had early gastric carcinoma. In all of these cases the lesion thickness was less than the 15 mm and only 1 or 2 layers of gastric wall was absent. We believe that it is not easy and always possible ultrasonographically to determine whether it is malignant or benign if the lesion is a small sized ulcer of stomach. In the benign group there were no patients having scores 7 or above.

We conclude that, the scoring system defined is highly sensitive and specific, and could be a useful supplement to the other measures, such as endoscopy and endoscopic ultrasonography, in the differential diagnosis of gastric pathologies.

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