

Comparative study of ultrasonic contrast and endoscopic ultrasonography in preoperative staging of gastric cancer.

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Abstract

Objective: To investigate diagnostic value and clinical significance of ultrasonic contrast and endoscopic ultrasonography in preoperative staging of gastric carcinoma.

Methods: 65 patients with gastric cancer were randomly selected from our hospital from February 2015 to February 2017 as the study objects and all of them were treated with ultrasonic contrast and endoscopic ultrasonography followed by the comparison of accuracy rate of diagnosis of preoperative staging of gastric cancer between the two kinds of examination methods.

Results: There was no significant difference in the accuracy rate of diagnosis of T1, T2, T3 and T4 and total consistent rate of T staging between the two methods ($P>0.05$); the accuracy rate of diagnosis of N1, N2 and N3 and total consistent rate of N staging of ultrasonic contrast were significantly higher than those of endoscopic ultrasonography ($P<0.05$) with no significant differences in the accuracy rate of diagnosis of N0 ($P>0.05$) between the two examinations; and the total accuracy rate in the diagnosis of M0 and M1 and total consistent rate of M staging of ultrasonic contrast were significantly higher than those of endoscopic ultrasonography ($P<0.05$).

Conclusion: Ultrasonic contrast has some advantages in the T staging, N1, N2, N3, M1 and M0 and endoscopic ultrasonography N0, both of which therefore have good application value in diagnosis of preoperative staging of gastric cancer.

Keywords: Ultrasonic contrast, Endoscopic ultrasonography, Gastric carcinoma, Staging.

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Introduction

Gastric cancer is a common gastrointestinal malignancy with high morbidity and poor prognosis. With the changing of diet structure, the incidence of gastric cancer is increasingly rising, causing a great threat to the life safety of patients. Important factors that influence the prognosis of gastric cancer patients include metastasis of abdominal organs and invasion depth of surrounding lymph nodes as well as tumors [1,2]. The symptoms of gastric cancer include poor appetite, weight loss, abdominal pain, nausea, low red blood cell count, and so forth. However, unfortunately, early-stage stomach cancer rarely causes symptoms. This is one of the reasons stomach cancer is so hard to detect early. Given the value of early diagnose in curing cancer, the method used to diagnose gastric cancers in early stage is necessary. To study the diagnostic value of ultrasound contrast and endoscopic ultrasonography in preoperative staging of gastric cancer, 65 gastric cancer patients enrolled in our hospital from February 2015 to February 2017 were collected to screen the stage of cancer with both of ultrasonic contrast and endoscopic ultrasonography. The accuracy rate of those two methods in diagnosing and staging gastric cancer was compared and we

concluded that ultrasonic contrast has some advantages in the T staging, N1, N2, N3, M1 and M0 and endoscopic ultrasonography N0, both of which therefore have good application value in diagnosis of preoperative staging of gastric cancer.

Materials and Methods

General materials

65 gastric cancer patients enrolled in our hospital from February 2015 to February 2017 were randomly selected as the objects. They were aged at 52-70, 61.25 ± 9.03 y old on the average and with the course of 1-3 y, 2.02 ± 1.56 y on the average; the diseased regions include cardiac part in 3 cases, gastric angle in 9 cases, corpora ventriculi in 26 cases and 27 cases in gastric antrum.

Inclusion criteria

(1) The patients were confirmed as gastric cancer sufferers by pathologic diagnosis. (2) The patients were approved by the ethics committee. (3) The patients didn't go through treatment

of anti-cancer or anti-inflammatory before the study. (4) The patients and their families signed consent form before the study [3].

Exclusion criteria

(1) The patients have acute gastric bleeding, gastric perforation or acute gastric dilatation. (2) The patients suffer mental sickness, communication disorders and unconsciousness. (3) The patients have incomplete clinical data. (4) The patients and their families failed to support the study [4].

Methods

Ultrasonic contrast: DW-C8 color Doppler ultrasonic diagnostic apparatus produced by Xuzhou Dawei Electronic Equipment Co. Ltd was adopted with the probe frequency set as 3.5-9 MHz, gastrointestinal helping showing agent produced by Shanghai Muyue Industrial Co. Ltd. was applied. The patients were told not to drink and eat 8-12 h before the first examination. 50 g gastrointestinal helping showing agent was mixed with 500 ml boiling water followed by a stir into a paste, which was taken by the patients who were examined 1-5 min later with the scanning of such sites as gastric fundus, cardia, greater curvature and lesser curvature, anterior and posterior gastric branches, gastric antrum, duodenum, peri-gastric region, pelvis, abdomen, pancreas, liver and distant lymph nodes [5,6].

Endoscopic ultrasonography: Ultrasonography diagnostic unit manufactured by Jiangsu Jiahua Electronic Equipment Co., Ltd. was adopted with the frequency set as 7.5 MHz and the frequency of the probe 12 MHz and 20 MHz mainly with 360° rotating scan. The patients were told to have empty stomach and guided to take the left-lateral position; the air in the stomach was evacuated followed by the pouring of 300-500 ml degassed water to fill the water sac, which was examined mainly through back mirror method. If there were suspicious lesions at early stage, further examination was need through small probe of high frequency to judge the extent of gastric wall invasion [7,8].

Evaluation index

The staging of gastric cancer was evaluated according to TNM staging method established by International Union against cancer and ultrasonic features. Normal thickness of gastric wall

is 0.2-0.5 cm and the thick is uniform with good continuity. The tissue dissection and sonographic findings demonstrated the structure of five layers: mucous layer showed the first layer of high level echo and the second layer of low level echo, hyperechoic submucosa was the third layer of high level echo, the base was the fourth layer of low echo and serosal layer was the fifth layer of high echo [9,10]. The basic manifestation of the sonogram of gastric cancer included irregular thickening of gastric wall, masses with hypo echo and the fact that normal structures of the various layers of the stomach wall were somewhat disordered with the continuity interrupted or gone. Lymph node metastasis around the gastric wall: lymphadenectasis with invasion was seen with the diameter of sporadic or solitary lymph nodes beyond 1.0 cm, usually with low echo and clear boundary [11,12]. Non-lymph node metastasis: the node was seen to be with high echo, elliptical shape and blurred boundary. The distant metastasis of gastric cancer was only within abdominal cavity and periosteum, pelvic, kidney, spleen, pancreas and liver metastasis were mainly screened [13].

Statistical methods

Statistical software SPSS19.0 was used for the analysis. The count data (results of ultrasonic contrast and endoscopic ultrasonography) were expressed by "N, %" and tested by t test, $P < 0.05$ means that the difference is statistically significant.

Results

Comparison of diagnosis result and pathological diagnosis result between ultrasonic contrast and endoscopic ultrasonography in the T staging

The accuracy rate of ultrasonic contrast in the diagnosis of T1, T2, T3 and T4 were respectively 61.5%, 66.7%, 72% and 77.8% and the total coincidence rate was 69.2%; the accuracy rate of endoscopic ultrasonography in the diagnosis of T1, T2, T3 and T4 were respectively 84.6%, 83.3%, 80%, 55.6% and the total coincidence rate was 78.8%. There was no significant difference in the diagnostic accuracy of T1, T2, T3 and T4 staging between the two groups ($P > 0.05$) with the details shown as Table 1.

Table 1. Comparison of diagnosis result and pathological diagnosis result between ultrasonic contrast and endoscopic ultrasonography in the T staging.

Stage	Case	Ultrasonic contrast				Accuracy rate (%)	Endoscopic ultrasonography				Accuracy rate (%)
		T1	T2	T3	T4		T1	T2	T3	T4	
T1	13	8	3	1	1	61.5	11	2	0	0	84.6
T2	18	3	12	3	0	66.7	2	15	1	0	83.3
T3	25	1	3	18	3	72	0	2	20	3	80

T4	9	0	0	2	7	77.8	0	1	3	5	55.6
Sum	65					69.2					78.8

Comparison of diagnosis result and pathological diagnosis result between ultrasonic contrast and endoscopic ultrasonography in the N staging

The accuracy rate of ultrasonic contrast in the diagnosis of N0, N1, N2 and N3 were respectively 78.3%, 83.3%, 87.5% and 87.5% and the total coincidence rate was 83.1%; the accuracy rate of endoscopic ultrasonography in the diagnosis of N0, N1,

N2 and N3 were respectively 91.3%, 55.6%, 43.8% and 50% and the total coincidence rate was 64.6%. The diagnostic accuracy of ultrasonic contrast in N1, N2 and N3 was much higher than that of endoscopic ultrasonography of statistical significance (P<0.05); and there was no significant difference in accuracy rate of diagnosis between the two methods in N0 staging (P>0.05) with the details shown in Table 2.

Table 2. Comparison of diagnosis result and pathological diagnosis result between ultrasonic contrast and endoscopic ultrasonography in the N staging.

Stage	Case	Ultrasonic contrast				Accuracy rate (%)	Endoscopic ultrasonography				Accuracy rate (%)
		N0	N1	N2	N3		N0	N1	N2	N3	
N0	23	18	4	1	0	78.3	21	0	0	0	91.3
N1	18	1	15	1	1	83.3	4	10	3	1	55.6
N2	16	0	2	14	0	87.5	5	7	4	0	43.8
N3	8	0	0	1	7	87.5	1	2	4	1	50
Sum	65					83.1					64.6

Comparison of diagnosis result and pathological diagnosis result between ultrasonic contrast and endoscopic ultrasonography in the M staging

The diagnostic accuracy rate of ultrasonic contrast in M0 and M1 staging was respectively 93.8% and 88.2% and the total coincidence rate was 92.3%. The diagnostic accuracy rate of

endoscopic ultrasonography in M0 and M1 was respectively 58.3% and 58.8% and the total coincidence rate was 58.5%. The diagnostic accuracy and total coincidence rate of ultrasonic contrast in M0 and M1 were significantly higher than those of endoscopic ultrasonography of statistical significance (P<0.05) with the details shown in Table 3.

Table 3. Comparison of diagnosis result and pathological diagnosis result between ultrasonic contrast and endoscopic ultrasonography in the M staging.

Stage	Case	Ultrasonic contrast		Accuracy rate (%)	Endoscopic ultrasonography		Accuracy rate (%)
		M0	M1		M0	M1	
M0	48	45	3	93.8	20	28	58.3
M1	17	2	15	88.2	10	7	58.8
Sum	65			92.3			58.5

Discussion

Gastric cancer is the leading ailment of malignant tumors with high incidence in our country. It can occur in any part of the stomach and is frequently seen in the gastric antrum in people around the age of 50. With gradual aggravation of the disease, the patient will suffer from such symptoms as persistent pain in the upper abdomen, emaciation, malaise, anemia, malnutrition, dysphagia, and loss of appetite [14]. As to the patients with advanced gastric cancer, the tumor cells will continue to increase, which will infiltrate the surrounding normal tissues to different degrees, leading to the failure of surgical treatment. In

this case the metastasis rate and recurrence rate are both very high and the quality of life would be greatly reduced. In clinical practices, the disease is commonly treated through chemotherapy [15]. However, it is of great significance for the prognosis of the patients to make correct disease evaluation before operation, choose suitable operative type and formulate targeted chemotherapy protocols. The clinical diagnosis of gastric cancer was commonly performed through ultrasound, endoscopy and alimentary tract barium meal but the latter two can merely observe the pathological changes of gastric surface and fail to accurately judge the condition of the distant organs, surrounding lymph nodes, adjacent organs and invasion depth.

Meanwhile conventional abdominal ultrasound is affected easily by gastric content and stomach Qi, difficult to clearly show the early lesions of gastrointestinal and small diseases [16,17].

The research data showed that there was no significant difference in the accuracy rate of diagnosis of T1, T2, T3 and T4 and total consistent rate of T staging between the two methods ($P>0.05$); the accuracy rate of diagnosis of N1, N2 and N3 and total consistent rate of N staging of ultrasonic contrast were significantly higher than those of endoscopic ultrasonography ($P<0.05$) with no significant differences in the accuracy rate of diagnosis of N0 ($P>0.05$) between the two examinations; and the total accuracy rate in the diagnosis of M0 and M1 and total consistent rate of M staging of ultrasonic contrast were significantly higher than those of endoscopic ultrasonography ($P<0.05$). Main reasons: 1) endoscopic ultrasound is a kind of method commonly used for the preoperative diagnosis of gastric cancer, which can accurately and effectively judge whether there is lymph node metastasis and peripheral invasion as well as the infiltration depth and now it has been widely applied in clinical trials. 2) There is ultrasonic probe in the head end of ultrasound endoscope, which makes the combination of ultrasonic examination and endoscopic technique. The pathological changes of mucosa surface can be observed directly by gastroscopy. But endoscopic ultrasonography is costly and invasive, less likely to be accepted by the patients [18]. 3) Ultrasonic contrast is safe, convenient and acceptable and it can clearly show metastasis of lymph nodes and specific conditions of small lesions. 4) Ultrasonic contrast is moderately non-invasive and safe and the patients with oral gastrointestinal contrast agent can be involved in further examination, which is likely to be accepted by the patients having difficulty getting about and not willing to accept radiation examination of good application value in clinical trials [19].

In summary, while conducting preoperative staging of gastric cancer patients, clinicians can, in the basis of the patient's specific condition and financial situation, choose proper and well-directed inspecting methods to improve the accuracy of clinical diagnosis.

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