Diagnoses of gastric cancer and other gastric diseases by serum pepsinogen I and II levels

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Abstract Serum pepsinogens I and II (PG I, PG II) levels were determined by PG I and PG II-RIA kits in 84 healthy controls and 128 patients of gastric diseases including 42 patients with gastric cancer. The results showed peptic ulcer cases had elevated PG I and PG II levels. The atrophic gastritis cases had low PG I levels and the gastric cancer cases had low PG I and low PG I/PG II ratio. Using the cut-off values of PG I<35μg/L and PG I/PG II<1.5 for clinical purpose, the sensitivity and specificity of the test for gastric cancer was 73% and 78%, respectively. Combined with endoscope examination, the serum PG I and PG II levels are valuable for the early diagnosis of gastric cancer.

Keywords Pepsinogen, Radioimmunoassay, Gastric cancer, Early diagnosis

1 Introduction

Many recent foreign and domestic reports showed the human serum pepsinogen(PG) levels were valuable in the diagnosis of gastric diseases.[1,2,3] The pepsinogen consists of two immunologically different groups of isozymogens, namely group I pepsinogen (PG I) and group II pepsinogen (PG II). Their levels in the healthy controls were determined and reported by using the radioimmunoasssay (RIA) methods developed by ourseleves.[4] In this study, we have measured the serum PG I and PG II levels in more healthy controls and 128 patients with various gastric diseases including 42 gastric cancer cases. The results are analyzed and their values for the diagnosis in the gastric cancer and other gastric diseases are discussed.

2 Materials and methods

2.1 Blood samples

Healthy controls: serum samples were obtained from 84 subjects free from upper abdominal complaints and without evidences of gastroduodenal disorder, liver diseases and renal diseases after health examination.

Patients: patients blood samples were collected from routine endoscope examinations. The diagnoses of all cases were determined by histologic examination of endoscopic biopsy specimens. There were 98 male and 30 female patients whose blood samples were collected. The range of age was 24 to 75 years old. These samples are divided into the following groups: (a) Peptic ulcer: 40 patients with peptic ulcer disease, including 30 with duodenal ulcer and 10 with gastric ulcer. (b) Atrophic gastritis: histologically proven moderate or severe atrophic gastritis. (c) Gastric cancer: total 49 cases, all proven by histologic examination, including 42 cases before therapy, 3 cases with total gastrectomy, 3 cases with partial gastrectomy and 1 case with recurrence of gastric cancer after total gastrectomy. (d) Others: 7 cardiac cancer cases and 5 upper gastrointestinal hemorrhage cases.

2.2 Methods

The serum PG I and PG II levels were determined by pepsinogens RIA kits prepared by us . The ranges of standard concentration were 8~256μg/L for PG I and 2~ 64μg/L for PG II RIA. The standard curves were all drawn on log-logit paper.

3 Results

The serum levels of PG I and PG II, and the PG I/PG II ratio are shown in Table 1 for the different diagnostic groups. Obviously, both serum PG I and PG II levels in patients with duodenal ulcer and gastric ulcer were significantly higher than those in the controls. In contrast, the PG I levels were significantly lower in

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patients with gastric cancer. PG I levels also showed some lower in patients with atrophic gastritis, cardiac cancer, but not so significant as gastric cancer groups. PG I/PG II ratio was also significantly lower in gastric cancer. The PG I and PG II levels were extremely lower in three patients with total gastrectomy, but the levels in one patient with recurrence of gastric cancer after total gastrectomy were abnormally high.

Table 1 PG I and PG II levels and ratio in healthy controls and patients

Diagnosis	n	PG I		PG II/$\mu g \cdot L^{-1}$	PG I/PG II	
		(mean±SD)/$\mu g \cdot L^{-1}$	(<35μg/L)	(mean±SD)	(mean±SD)	(<1.5)
Healthy controls	84	54.5±16.2	12%	23.4±12.1	2.94±2.10	17%
Peptic ulcer:	40					
Duodenal ulcer	30	69.5±20.8[1]	0	40.1±33.1[1]	2.25±1.04	10%
Gastric ulcer	10	61.2±22.7[2]	0	30.6±28.4[2]	2.4±1.06	10%
Atrophic gastritis	27	47.1±17.2[2]	22%	24.9±14.8	2.41±1.29	19%
Cardiac cancer	7	46.3±28.0[2]	29%	28.2±9.6	1.98±1.43	29%
Gastric cancer	42	36.5±18.4[1]	56%	22.1±10.9	1.7±0.59[1]	44%
Total gastrectomy	3	9.7±9.9[3]		7.0±8.2[3]		
Partial gastrectomy	3	42.1±14.4		16.3±9.9		
Recurrence after total gastrectomy	1	>256		>64		
Upper gastrointestinal hemorrhage	5	50.1±25.6		20.2±6.4	2.51±0.99	

[1] P <0.01, [2] P <0.05 [3] P <0.001

Table 1 also shows the percentages of patients in each group with abnormally low value for serum PG I (<35μg/L) and PG I/PG II (<1.5) compared with healthy controls. Loss serum PG I and low PG I/PG II ratio were found significantly more frequently in gastric cancer patients. The sensitivity and the specificity of the tests are 22% and 96% respectively if the PG I and PG II ratio both below the cut off values. Relatively high sensitivity and specificity (73% and 78%) can be obtained if one of the PG I and PG II ratio below the cut off values.

4 Discussion

The chief and mucus neck cells of gastric mucosa are the major source of PG I. The cardiac glands, pyloric glands and Brunner's glands, as well as chief and neck cells, produce PG II. The secretory ability of gastric mucosa reduces due to the low of the chief cells when atrophic gastritis and gastric cancer occur. So the serum PG I levels in patients with gastric cancer are much lower, and the atrophic gastritis is considered as important risk factor for the development of malignancy. PG II levels in the two groups showed no differences due to the originating from the widespread area of gastric mucosa. The reason of higher pepsinogen levels in peptic ulcer may lie in the increase of pepsinogen producing, secreting activities or the chances into the blood circulation.

The gastric mucosa cells are the major source of pepsinogens. PG I and PG II levels are extremely lower after total gastrectomy in three cases, two of them below the detection range, but can remain at a certain level in partial gastrectomy case. It is interesting that serum pepsinogens rise again when recurrence of gastric cancer occurs after total gastrectomy. It indicates that serum pepsinogens levels may be an useful marker for detecting the recurrence of the gastric cancer after total gastrectomy. Such research is undergoing.

This study shows the positive rate of gastric cancer reach 73% when PG I levels and PG I and PG II ratio used as combined tests. We conclude that the PG I and PG II levels are valuable in the screening of gastric cancer, and the early diagnosis rate of gastric cancer will get improvement when the serum tests and endoscopy are combined.

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