Clin. Lab. 2025;71:XXX-XXX

CASE REPORT

PGII Higher than PGI: a Case Analysis and Literature Review

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SUMMARY

Background: **Serum pepsinogen (PG) testing, including PGI and PGII, is widely used for early screening, diagnosis, and prognostic assessment of gastric cancer. PGI mainly reflects the state of the gastric corpus mucosa, while PGII mainly reflects the state of the gastric fundus mucosa. The levels of PGI and PGII can reflect the degree of gastric mucosal atrophy, and when gastric mucosal lesions occur, the content of PGI and PGII in the serum will also change. In gastric cancer screening, serum pepsinogens can be used to judge the patient's condition through changes in PGI, PGII, and the PGI/PGII index, which is considered as "serological gastroscopy".**
Methods: **Chemiluminescence assay was used to detect serum pepsinogen I (PGI) and pepsinogen II (PGII) and to explore their clinical value before and after treatment.**
Results: **The PGI was measured at 89.45 ng/mL (reference range 70 - 240 ng/mL), PGII at 505.4 ng/mL (reference range 0 - 13 ng/mL), and PGR PGI/II at 0.18 (reference range greater than 3). The patient underwent endoscopic local surgery and two weeks later, the PGI was measured at 56.53 ng/mL, PGII at 81.58 ng/mL, and PGR PGI/II at 0.69. The PGI and PGII measurement method was Mindray (Shenzhen, China) chemiluminescence assay. The patient's endoscopic biopsy report indicated precancerous gastric lesions.**
Conclusions: **For the 70-year-old male patient mentioned in the document, the test results of PGI and PGII, as well as the PGR value, all suggest the risk of precancerous gastric lesions. After treatment, although PGI and PGII decreased, PGII is still higher than PGI, and PGR has improved, indicating that the patient still has the possibility of cancer development and requires further endoscopic examination and treatment.**
(Clin. Lab. 2025;71:xx-xx. DOI: 10.7754/Clin.Lab.2024.241104)

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Case Report accepted November 12, 2024

KEYWORDS

pepsinogen I (PGI), pepsinogen II (PGII), PGI/PGII ratio (PGR), Non-invasive Screening

INTRODUCTION

Gastric and duodenal ulcers are extremely common gastric diseases, characterized by localized circular or oval defects in the walls of the stomach and duodenum. Clinical studies have shown that the occurrence of gastric and duodenal ulcers is closely related to excessive gastric acid secretion [1]. The average basal acid secretion and maximum acid secretion of patients with these ulcers are 1 - 2 times higher than that of normal people [2]. When serum pepsinogen testing is performed on patients, an increase in PGI and PGII indicators will be observed, indicating that serum pepsinogen test results

are related to gastric acid content [3]. Gastric cancer is one of the common malignant tumors. Examination through other means can cause great pain to patients, and most people find it hard to accept and stop the examination. However, by detecting serum pepsinogens through changes in PGI, PGII, and the PGI/PGII index, the condition of the patient can be judged. Since the 1990s, based on clinical trials, serum PG has been included in gastric cancer screening projects in Japan as a marker for chronic atrophic gastritis, thereby identifying the population that benefits most from gastric cancer screening [4,5]. The results show that PG testing is beneficial for the detection of early gastric cancer.

In the clinical judgment of gastric and duodenal ulcers and other diseases, the health condition of the examinee can be judged based on the serum pepsinogen test results. When the examinee's results show PGI within the range of 70 - 200 μg/L, PGII within the range of 0 - 20 μg/L, and PGI/PGII > 3.0, it indicates that the examinee is healthy; when the examinee's results show PGI greater than 200 μg/L, PGII greater than 20 μg/L, and PGI/PGII > 3.0, it indicates that the examinee has gastric and duodenal ulcers; when the examinee's results show PGI less than 70 μg/L, PGII around 20 μg/L, and PGI/PGII > 3.0, it indicates that the examinee has gastric cancer. Based on the serum pepsinogen test results, the disease condition of the examinee can be classified, and targeted treatment can be administered to bring better therapeutic effects to the patients, promoting their recovery to health in the shortest possible time [5,6].

CASE PRESENTATION

A 70-year-old male patient came to our hospital with symptoms of gastric discomfort, acid reflux, and belching. The patient had a history of chronic atrophic gastritis. PGI was measured at 89.45 ng/mL (reference range 70 - 240 ng/mL), PGII at 505.4 ng/mL (reference range 0 - 13 ng/mL), and PGR PGI/II at 0.18 (reference range greater than 3). The patient underwent endoscopic local surgery and two weeks later, PGI was measured at 56.53 ng/mL, PGII at 81.58 ng/mL, and PGR PGI/II at 0.69. The PGI and PGII measurement method was Mindray (Shenzhen, China) chemiluminescence assay. The patient's endoscopic biopsy report indicated precancerous gastric lesions.

DISCUSSION

PG is a precursor of pepsin, which can be divided into two main types, type I and type II, both of which are secreted by the chief cells and mucous neck cells of the gastric fundus and corpus. PGII, not PGI, can also be produced by the pyloric glands of the gastric antrum and the Brunner glands of the proximal duodenum. As gastritis progresses, mild inflammation leads to increased concentrations of PGI and PGII in the circulation. However, as the disease further worsens, the chief cells are replaced by pyloric glands, PGII levels continue to rise, while PGI levels decrease, thus lowering the PGI/II ratio. This change reflects the histological state of the gastric mucosa. The EUROGAST study group used PG as a surrogate marker for atrophy, showing that in the same population of male patients, the incidence of gastric cancer is related to low serum PG levels [7]. Miki conducted a meta-analysis of 42 studies on the sensitivity and specificity of PG, with a sensitivity of 77% and a false-positive rate of 27% for PGI levels ≤ 70 ng/mL and PGI/II ratio ≤ 3. The positive predictive value is low, at 0.77% - 1.25%, while the negative predictive value is 99.08% - 99.90% [8].

From the examination results of patients treated in our hospital, when the PGI index is reduced, PGII is normal or increased, and the PGI/PGII ratio is decreased, it can be judged that the patient is likely to have gastric cancer. This is because gastric cancer patients also have severe atrophic gastritis, leading to atrophy of gastric glandular cells, intestinal metaplasia, significant loss of gastric fundic glands, and a reduction in chief cells, which in turn leads to a decrease in PG secretion [6]. The more severe the gastric mucosal atrophy, the more severe the decrease in PG, and the PGI/PGII ratio tends to decrease as well.

Serum pepsinogen II (PGII) is a biomarker closely related to the state of the gastric mucosa and plays an important role in the early screening, diagnosis, prognostic assessment, and diagnosis of HP infection in gastric cancer. There are differences in serum PGII levels among populations of different genders and ages, so these factors need to be considered when establishing reference intervals and clinical applications.

Serum pepsinogen I (PGI) and serum pepsinogen II (PGII) are the two main protease precursors secreted by the gastric mucosa, and they have important clinical significance in the early screening, diagnosis, and prognostic assessment of gastric cancer. PGI mainly reflects the state of the gastric corpus mucosa, secreted by the chief cells and mucous neck cells of the gastric glands.

PGII mainly reflects the state of the gastric fundus mucosa, secreted by the chief cells of the acid-secreting glands of the gastric body and fundus [9]. The levels of PGI and PGII can reflect the degree of gastric mucosal atrophy, and when gastric mucosal lesions occur, the content of PGI and PGII in the serum will also change [10,11].

Serum pepsinogens (PG), including pepsinogen I (PGI) and pepsinogen II (PGII), can reflect the number of gastric glandular cells and indirectly reflect the secretory function of different parts of the gastric mucosa [11-13]. They can be used as pre-endoscopy testing and gastric cancer screening criteria and have been recommended by several consensus opinions. Screening high-risk groups for gastric cancer and then performing further endoscopy confirmation can increase the detection rate of early gastric cancer [14,15].

The patient in this case had increased PGI and PGII,

Table. The values of PGI and PGII, and their PGR (PGI/II).

PGI (ng/mL)	PGII (ng/mL)	PGR (PGI/II)
89.45	**505.4**	**0.18**
56.53	**81.58**	**0.69**

with a PGR of 0.18. After a period of treatment, although PGI and PGII decreased, PGII was still higher than PGI, and PGR was 0.69, with a history of chronic atrophic gastritis, indicating the possibility of cancer-development. Endoscopic examination confirmed precancerous gastric lesions in the patient.

PG can enter the bloodstream through the gastric mucosa. When gastric cancer occurs, serum pepsinogens also change, thereby indirectly reflecting the secretory function of the gastric mucosa. It is considered "serological gastroscopy" and can avoid the harm of X-rays to the human body and the inconvenience of gastroscopy.

CONCLUSION

Pepsinogen monitoring is considered a non-invasive, simple, effective, cost-effective, and repeatable early cancer screening method that is superior to endoscopy. Currently, pepsinogens have become important indicators for monitoring gastric tumors. Especially when the increase in PGII is significant and greater than PGI, gastroscopy or hospitalization for surgical treatment should be considered.

Source of Support:
This work was supported by the Shaoxing City Science and Technology Bureau Grant (2023A14022) and the Zhejiang Province Medical and Health Science and Technology Plan (2024KY461).

Declaration of Interest:
All authors declare that they have no conflict.

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