

Letter to the Editor



Decreased Gastric Body Mucosa Obestatin Expression in Abdominal Obesity Patients With Normal Body Mass Index*

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The aim of the study was to investigate whether the expression of obestatin in gastric body mucosa in abdominal obesity patients with normal body mass index (BMI) is different compared with healthy controls. Twenty abdominal obesity patients with normal BMI and twenty healthy controls were included in the study. The number of obestatin-positive cells in gastric body mucosa was significantly lower in abdominal obesity patients with normal BMI than that in healthy subjects. There was a positive correlation between the numbers of obestatin-positive cells in the gastric body mucosa and plasma obestatin levels in abdominal obesity subjects and control group.

At present, obesity has become a serious public health problem affecting people's health. Abdominal obesity with normal body mass index (BMI) is a subtype of obesity, which also has higher risk of diabetes, hyperlipidemia, coronary heart disease and cerebrovascular disease^[1]. But it was frequently undetected because of its normal weight index.

In 2005, obestatin was found from rat stomach. It is a peptide derived from the same gene as ghrelin^[2]. Its potential role in the regulation of food intake and weight gain has been of much interest. Plasma obestatin concentrations in obese patients were studied by many investigators. In most research of them, circulating obestatin levels were significantly changed in obese subjects compared with normal weight individuals^[3]. To our best knowledge, no data has been published about obestatin expression in gastric mucosa in abdominal obesity patients with normal BMI.

According to the criteria of the guidelines for prevention and control of overweight and obesity in Chinese adults, 20 abdominal obese subjects with normal BMI (Waist Circumference of men \geq 90 cm, Waist Circumference of women \geq 85 cm, $24 \text{ kg/m}^2 > \text{BMI} \geq 18.5 \text{ kg/m}^2$) and 20 age-matched normal

subjects (Waist Circumference of men $<$ 90 cm, Waist Circumference of women $<$ 85 cm, $24 \text{ kg/m}^2 > \text{BMI} \geq 18.5 \text{ kg/m}^2$) were enrolled in the study.

After overnight fasting for 12 h, blood samples were drawn in all 40 subjects at 8:00 a.m. All subjects were performed upper gastrointestinal endoscopy immediately after blood sample collection. Biopsy specimen from gastric body mucosa was obtained from the middle body of the greater curvature.

Expression of obestatin in the gastric body mucosa was studied by immunohistochemistry. Fasting plasma obestatin levels were measured by radioimmunoassay with commercial RIA kit. Serum levels of total cholesterol, triglyceride were measured by enzymatic methods using an autoanalyzer. Plasma insulin levels were measured by radioimmunoassay. Insulin resistance was calculated by the homeostasis model of assessment for insulin resistance (HOMA-IR) approach, calculated as fasting insulin (microunits per milliliter) \times fasting blood glucose (millimoles per liter)/22.5.

Data are expressed as mean \pm standard deviation. All variables were normally distributed as tested by the Kolmogorov-Smirnov test. Two-tailed unpaired *t* test was used to assess significant differences between two groups where appropriate. The relationship between plasma obestatin levels and the numbers of the obestatin immunoreactive cells in the gastric mucosa was examined by bivariate correlations. *P*-values <0.05 were considered statistically significant. Analyses were performed using the SPSS version 13.0 for Windows.

Characteristics of all subjects are summarized in Table 1. Age, gender values were similar between the two groups. Subjects in abdominal obesity subjects with normal BMI displayed higher HOMA-IR, serum total cholesterol and triglyceride compared to normal control ($P < 0.01$). There was no significant difference in fasting glucose levels between the two

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Table 1. Characteristics of the Two Different Groups (Values are Mean±SD)

Items	Abdominal Obesity Subjects with Normal BMI (n=20)	Healthy Subjects (n=20)	Zor t-values	P-values
Age (years)	44.7±6.3	43.7±7.1	0.47	0.64
Male/female	12/8	11/9	0.00	1.00
BMI (kg/m ²)	22.3±0.9	21.8±0.8	1.86	0.07
Waist circumference (cm)	91.9±3.7	75.7±3.9	13.48	0.00
FBG (mmol/L)	4.9±0.4	4.8±0.2	1.00	0.32
FINS (mU/L)	9.1±1.1	7.8±1.2	3.57	0.00
HOMA-IR	1.9±0.2	1.7±0.2	3.16	0.00
Triglyceride (mmol/L)	2.1±0.3	1.5±0.4	5.37	0.00
Total cholesterol (mmol/L)	5.0±0.5	4.7±0.4	2.10	0.04
Plasma obestatin concentrations (pg/mL)	55.5±6.7	69.7±7.5	6.31	0.00
Obestatin positive cells (per 0.1662 mm ²)	25.4±4.1	30.1±5.5	3.06	0.00

groups. Plasma obestatin concentrations were lower in abdominal obesity subjects with normal BMI compared to normal control ($P<0.01$). Obestatin immunoreactive cells were noted in the body of the stomach in two groups. It was found to be mainly located in the cytoplasm of gastric glandular cells both in abdominal obesity subjects with normal BMI and controls. The number of obestatin-positive cells in the gastric body mucosa in abdominal obesity subjects with normal BMI was significantly lower than that in controls. There was a positive correlation between the numbers of obestatin-positive cells in the gastric mucosa and circulating obestatin levels in abdominal obesity subjects ($r=0.267$, $P=0.04$) and control group ($r=0.312$, $P=0.02$).

A large number of studies have confirmed that higher level of BMI is related to many metabolism disorders, such as insulin resistance^[4]. Through our study, we found that there is an obvious dyslipidemia and insulin resistance in abdominal obesity subjects with normal BMI compared with normal control group. It confirmed that the waist measurement is importance to the evaluate of obesity.

Researchers pay much attention on peripheral blood obestatin levels in obese patients with the high level of BMI. Preprandial obestatin levels were lower in the obese Czech women compared with controls^[5]. But, Vicennati et al.^[6] found that obese women were characterized by higher circulating obestatin concentrations. The reasons for these differences remains poorly understood. We thought that conflicting results might be due to the ethnic-specific values. In our study, abdominal obesity with normal BMI was associated with

decreased circulating obestatin levels. The obestatin-producing cells in stomach were X/A-like cells which distributed in the basal part of the oxyntic mucosa^[7]. Serum obestatin concentrations were greatly reduced after total gastrectomy in rats^[8]. We found that the number of obestatin-positive cells in the gastric body mucosa from abdominal obesity with normal BMI were significantly lower, and the number of obestatin-positive cells were positively correlated with circulating obestatin in two groups. This supports the notion that the decreased obestatin expression of gastric body mucosa may lead to the decreased plasma obestatin levels in abdominal obesity subjects with normal BMI.

There are some contradictions of obestatin on its regulation of adipocyte metabolism. *In vitro* assays, obestatin seemed to promotes adipogenesis of 3T3-L1cells^[9]. Other results showed that abdominal fat mass were exhibited a significant reduction with the treatment of obestatin for one week in mice^[10]. Though the relationship between obestatin and abdominal obesity is unclear, our study provides some evidence that obestatin maybe play a role in abdominal obesity subjects with normal BMI.

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