New Phenomenon

Decreased serum brain-derived neurotrophic factor in Chinese patients with Type 2 diabetes mellitus

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Brain-derived neurotrophic factor (BDNF) is a member of the neurotrophin family associated with the proliferation, differentiation, activity-dependent plasticity, and survival of neurons in the central nervous system [1]. BDNF influences glucose metabolism and insulin sensitivity. For example, BDNF decreases serum glucose, insulin, and HbA1c levels in diabetic rats, suggesting that the BDNF may improve insulin sensitivity. In addition, animal models showed that BDNF levels in the central nervous system are highly related to peripheral serum BDNF levels [2]. It was found that BDNF may ameliorate glucose metabolism and prevent pancreatic exhaustion in obese diabetic mice [3].

However, there are also inconsistent findings about the influence of some physical conditions on BDNF levels [4]. For instance, some research showed positive relationship [5], negative association, or no relationship [6] between serum and/or plasma BDNF levels and obesity or body mass index (BMI). Furthermore, the BMI in non-Type 2 diabetes mellitus (T2DM) patients was negatively related to plasma BDNF [7]. Serum BDNF is low in young non-obese women with low insulin sensitivity [8].

In the present study, serum BDNF levels in patients with T2DM and healthy controls were measured. Table 1 shows the metabolic characteristics of the subjects. There were significant differences in fasting blood glucose (FBG), Tch, high density lipoprotein (HDL), HbA1c, and BDNF between the patients with T2DM and the healthy controls. The mean BDNF level in the patients with T2DM (22.04 ± 6.72 ng/ml) was significantly lower than that in healthy controls (28.53 ± 16.14 ng/ml) (P < 0.05) (Table 1), and the BDNF level was significantly higher in female patients (25.47 ± 6.36 ng/ml) than in male patients (20.39 ± 6.37 ng/ml) (P < 0.05) with T2DM (data not shown). However, there was no significant difference in serum BDNF levels between males (27.20 ± 16.44 ng/ml) and females (31.69 ± 15.70 ng/ml) in the healthy controls (data not shown).

It was also found that the serum BDNF levels in Chinese patients with T2DM were significantly lower than those in healthy controls. The BDNF levels in female patients with T2DM were higher than those in male patients. In Chinese patients with T2DM, the serum BDNF level was associated with HDL-C. These results suggested that the serum BDNF levels are different between females and males and its level reflects the lipid and glucose metabolism. Patients with T2DM also have higher BMI than the controls. So the phenomenon that the BDNF level was lower in patients with T2DM could be explained by the effect of BDNF on obesity.

Some previous results demonstrated that plasma BDNF levels were significantly lower in patients with T2DM compared with non-diabetic subjects. Suwa et al. [4] reported that serum BDNF levels in newly diagnosed female patients with T2DM were significantly higher than those in controls. In the present study, we observed lower serum BDNF levels in patients with T2DM than in healthy controls and higher levels in female than in male patients. Our study supports the hypothesis that patients with long-standing diabetes may have lower serum BDNF levels [9].

A previous study demonstrated that plasma or serum levels of BDNF were decreased in patients with T2DM [9]. Inverse correlation between serum BDNF levels and duration of diabetes was also found. Another study showed higher serum BDNF levels in newly diagnosed female patients with T2DM [4]. These inconsistent findings may be due to the duration of diabetes. It was hypothesized that insulin resistance in newly diagnosed T2DM patients contributes to higher levels of serum BDNF [4]. The lower serum BDNF levels were found in young non-obese subjects with low insulin sensitivity [8].

In summary, we found that the serum BDNF levels were lower in Chinese patients with T2DM than those in the healthy controls and its levels were higher in female patients.
with T2DM than those in male patients. These results suggested that diabetes affects the serum BDNF levels.

However, this was a pilot study. In the future, the samples should be enlarged. The serum BDNF levels between patients with T2DM and healthy controls, and other influencing factors of serum BDNF levels such as BMI need to be further explored. In addition, homeostasis model of assessment for insulin resistance index (HOMA-IR) is an important factor assessing insulin resistance. Future studies should also focus on the correlations between HOMA-IR and serum BDNF levels in patients with T2DM, which will be very useful to further understand the mechanism of T2DM.

References