

Characteristics of blood glucose excursions in type 2 diabetes mellitus patients with three different Traditional Chinese Medicine syndromes

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Abstract

OBJECTIVE: To explore the characteristics of blood glucose excursions of type 2 diabetes mellitus patients with three different Traditional Chinese Medi-

cine (TCM) syndromes.

METHODS: One hundred and nine patients with type 2 diabetes mellitus were recruited from the Department of Endocrinology and the Department of TCM of the Sixth People's Hospital affiliated to Shanghai Jiao Tong University. Subjects were divided into three groups according to TCM syndrome: intrinsic Damp ($n = 42$), *Yin* deficiency and internal Heat ($n = 25$), and *Qi* and *Yin* deficiency ($n = 42$). Subcutaneous interstitial glucose was monitored with a continuous glucose monitoring system for 3 consecutive days to investigate the glycemic profile in each group. Plasma C-peptide levels were measured, and an arginine test was taken in 10 patients randomly selected from each group. Glucose data and glycemic variability were analyzed to investigate the differences among the groups. The change in C-peptide levels and the results from arginine trial were used to evaluate β cell function.

RESULTS: Indicators reflecting blood glucose level were the highest in subjects with *Yin* deficiency and internal Heat syndrome, and parameters reflecting glycemic variability were the lowest in those with *Qi* and *Yin* deficiency syndrome. The change in C-peptide levels showed that subjects with *Qi* and *Yin* deficiency syndrome had the best β cell function among the three groups; this was confirmed by the arginine trial.

CONCLUSION: Patients with *Qi* and *Yin* deficiency syndrome had a more stable blood glucose profile, as glycemic variability was higher in those with intrinsic Damp syndrome and those with *Yin* deficiency and internal Heat syndrome.

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Key words: Blood glucose excursions; Glycemic variability; Symptom complex; Diabetes mellitus, type 2

INTRODUCTION

The incidence of type 2 diabetes mellitus (T2DM) is increasing every year, becoming the third biggest killer of humans following cancer and cardiovascular disease.^{1,2} Moreover, T2DM is closely related to the occurrence of cancer and cardiovascular disease.³ Therefore, more attention worldwide has been paid to T2DM in recent years. Recognizing the characteristics of the blood glucose (BG) profile is necessary for doctors and patients to control BG and delay complications of T2DM both in Western Medicine and Traditional Chinese Medicine (TCM).

The effect of the T2DM treatment regimen is usually assessed by measuring fasting BG and postprandial BG levels, which can only reflect the instant BG level; however, glycolated hemoglobin (HBA1C) reflects the average BG level of the previous 2-3 months.⁴ The continuous glucose monitoring system (CGMS) is a new technology applied in clinical practice that can provide a continuous glycemic profile and best reflect the individuals' current BG status.⁵ Doctors can then use this CGMS profile to design the optimal individual treatment regimen. Many previous studies have demonstrated that BG variability rather than hyperglycemia alone contributes to chronic complications in diabetes patients;⁶ hence, the importance of lowering BG stably rather than quickly has been emphasized in recent years.

Modern medicine can control BG levels, but it has limited effects on improving patients' symptoms and controlling complications. TCM treatment is chosen according to TCM syndrome differentiation, and plays an important role in the treatment of T2DM and its complications in China.⁷ Diabetes has a long history in TCM, and was first discussed in the book *Huang Di Nei Jing* under the name of Xiaoke.⁸ Chinese doctors in ancient years thought that *Yin* deficiency and dry Heat were the pathogenesis of diabetes accompanied by symptoms of large intake of food and drink, polyuria, and emaciation. However, changes in lifestyle and environment are changing the symptoms of diabetes, especially T2DM and its TCM syndrome differentiation. Currently, internal Damp and Blood stasis play an important role in the development of T2DM.⁹

Different clinical manifestations can be found in different T2DM patients in clinical practice. For example, some individuals suffer from diabetes without discomfort, while others manifest with typical symptoms. Previous CGMS studies have demonstrated that glycemic profiles differ from person to person.^{10,11} Thus, in this

study we selected three types of common T2DM TCM syndromes, including intrinsic Damp syndrome, *Yin* deficiency and internal Heat syndrome, and *Qi* and *Yin* deficiency syndrome. Intrinsic Damp syndrome manifests as a heavy sensation of the body and limbs, abdominal distention, oppressed feelings in the chest, poor appetite, a sticky and greasy tongue with a white-thick coating, and a slippery pulse. *Yin* deficiency and internal Heat syndrome manifests as overeating and large appetite, thirst and excessive cold drinking, vexation, sensitivity to heat, insomnia, dry stool, yellow urine with constipation, a red tongue with yellow coating, and a fast and stringy pulse. *Qi* and *Yin* deficiency syndrome manifests as tiredness, spontaneous sweating, shortness of breath, thirst and excessive drinking, dysphoria with a hot sensation in the chest, palms and soles, palpitations and insomnia, red tongue with little or no coating, and a thready and weak pulse or a stringy and weak pulse. We explored the relationship between BG profile and TCM syndrome differentiation, expecting to provide evidence and instructions for selection of prescriptions in TCM clinical practice.

MATERIALS AND METHODS

Subjects

We recruited 109 in-patients from the Department of Endocrinology and the Department of TCM at the Sixth People's Hospital affiliated to Shanghai Jiao Tong University between 1 January 2012 and 30 June 2013. All patients gave informed consent, and the trial was approved by the Ethics Committee of the Sixth People's Hospital affiliated to Shanghai Jiao Tong University. The subjects were divided into three groups: group 1 included those with intrinsic Damp syndrome ($n = 42$), group 2 included those with *Yin* deficiency and internal Heat syndrome ($n = 25$), and group 3 included those with *Qi* and *Yin* deficiency syndrome ($n = 42$).

Standard of diagnosis

T2DM was diagnosed according to the 1999 World Health Organization (WHO) criteria.¹² TCM diabetes was diagnosed according to the standard in the 2002 Guidelines for Clinical Research into New Chinese Drugs.¹³

Inclusion criteria

T2DM patients aged 20-80 years were eligible for enrollment in this study if they were diagnosed with intrinsic Damp syndrome, *Yin* deficiency and internal Heat syndrome, or *Qi* and *Yin* deficiency syndrome according to TCM syndrome differentiation, and voluntarily agreed to take part in clinical observation. Additionally, only those who had not changed their treatment regimen in the previous 3 months were selected. All study subjects must not have changed their therapy until the CGMS was removed.

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