

Predictive Resting Metabolic Rate in Patients with Type 2 Diabetes Mellitus

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KEY WORDS

complication, diabetes mellitus, predictive resting metabolic rate

Metabolic disorders are a major global health problem in the 21st century, with type 2 diabetes mellitus (T2DM) being the most frequent and requiring effective treatment strategies. The global prevalence of T2DM in 2019 is projected to be 9.3% (463 million people), rising to 10.2% (578 million people) in 2030 and 10.9% (700 million people) in 2045¹⁾. The most important risk factor for T2DM, with or without obesity, is energy accumulation, or in other words, energy imbalance. The daily total energy expenditure is defined as the sum of the resting metabolic rate (RMR), the thermic effect of food, and physical activity energy expenditure. RMR is the rate at which the body burns energy when it is at complete rest. By calculating RMR, we can see how many calories are needed to perform basic functions such as breathing and circulation. Among three factors including RMR, the thermic effect of food, and physical activity energy expenditure, RMR accounts for 60-70% of the daily total energy expenditure in most people²⁾. Thus, RMR is the largest value for energy balance. The gold standard for RMR measurements is by indirect calorimetry (IC). However, IC can only be measured by waiting until steady-state conditions are reached, and it is difficult to determine how soon that can be obtained. Furthermore, measuring IC requires special equipment and trained clinical staff. Therefore, over the years, various equations have been developed to estimate RMR for clinical use³⁾. In a small number of studies using IC, patients with T2DM are said to have a higher RMR than controls of the same sex, age, and body mass index⁴⁾. From a clinical perspective, however, it is necessary to consider whether the predictive RMR, as indicated by a simple formula, is higher or lower in patients with T2DM.

In this issue of the journal, Thurairajasingam *et al.* present a systematic review of predictive RMR in T2DM patients. They showed that T2DM patients had significantly higher predictive RMR than controls, which was associated with disease progression and complications⁵⁾. As their results show, changes in predictive RMR can be used in clinical practice for early detection and management of complications of T2DM. However, two points should be noted here when using predictive RMR to manage T2DM. One is that the predictive RMR does not necessarily reflect an individual's metabolic state. Just because the predictive RMR is higher in patients with T2DM does not mean that they are hypermetabolic. Predictive RMR correlates with IC RMR from a population perspective, but does not accurately reflect metabolism in individuals. The accuracy of predictive RMR is also highly dependent on ethnic differences, and while the accuracy increases when predictive equations are created for that ethnicity, the accuracy still varies by gender and does not necessarily reflect the daily total energy expenditure level⁶⁾. The second is not to make the mistake of assuming that because a T2DM patient has a high predictive RMR, exercise therapy, etc., which has a metabolic boosting effect, is meaningless. Needless to say, moderate aerobic exercise that increases metabolism in T2DM patients not only improves caloric balance, but also has a positive effect on the cardiovascular system. Few estimation tools are tested in subjects with T2DM

and this results in a lack of accuracy especially for their particular patterns of activity⁷⁾. Therefore, prescriptions for physical activity for individual T2DM patients are not based on exact energy balance. Future research should consider sensors that combine different technologies and methods specifically designed to accurately assess the energy expenditure of patients with T2DM in their daily lives.

However, a high predictive RMR in patients with T2DM has been associated with complications by Thurairajasingam *et al.* Their study needs to be expanded upon and prospective studies should be conducted to determine whether changes in predictive RMR are associated with T2DM control status and complications and can be used as a guide for diabetes management. From the study by Thurairajasingam *et al.*, we can say that T2DM patients as a whole are inefficient at maintaining life at rest, so we need to consider what can be done to improve metabolic efficiency and whether a simple prediction formula can be created that is valid and limited to T2DM patients.

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CONFLICT OF INTEREST

None to declare

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