Editorial
Epidemiology
Diabetes Metab J 2018;42:128-129
https://doi.org/10.4093/dmj.2018.42.2.128
pISSN 2233-6079 · eISSN 2233-6087

dmj
DIABETES & METABOLISM JOURNAL

Insulin Resistance versus β-Cell Failure: Is It Changing in Koreans?

Mi-kyung Kim

Division of Endocrinology and Metabolism, Department of Internal Medicine, Inje University Haeundae Paik Hospital, Inje University College of Medicine, Busan, Korea

Type 2 diabetes mellitus (T2DM) is characterized by insulin resistance and β-cell failure. Although there were many debates, it has been thought to be triggered firstly by insulin resistance, which is compensated by increased β-cell response, but eventually leads to T2DM due to exhaustion of pancreatic β-cells. At first, this hypothesis was proposed based mainly on studies of Caucasian subjects [1-3].

A study in early 1970s showed that insulin response to ingestion of glucose in Japanese, in both normal glucose tolerance (NGT) and T2DM groups, was much lower than that in Caucasian [4,5]. Later, cross-sectional studies showed that the insulin secretory function of NGT, impaired glucose tolerance (IGT), and T2DM patients was relatively decreased in Japanese in comparison to those of Caucasian [6,7]. Other East Asians including Koreans and Chinese were also reported to have reduced insulin secretory capacity, especially in the early phase [8.9]. Therefore, insulin secretion failure was suggested as the main pathophysiology for T2DM in East Asia, which is different to Caucasian [10].

Recent studies determining for the difference in pathophysiology of T2DM between Japanese and Caucasians showed interesting results [11,12]; the basal β-cell function and insulin resistance after glucose challenge were higher in Caucasians compared with Japanese, which is similar to previous studies. However, they found that android fat, waist circumference, trunk fat, body mass index (BMI), hip circumference, body weight, whole-body fat, and triglycerides were the single factors for insulinogenic index. Among them, BMI was the most important covariate for insulin sensitivity and β-cell response. After adjusting for difference in BMI, they reported similar insulin sensitivity and β-cell responsiveness in the two ethnic cohorts. Disposition index (DI), which is the combined effect of insulin sensitivity and β-cell responsiveness, showed that Japanese and Caucasian NGT, IGT, and T2DM subjects have similar β-cell function relative to insulin resistance. This provides evidence that the ability to compensate for increasing insulin resistance is similar in Caucasians and Japanese. On the basis of these results, they proposed a similar pathophysiology of T2DM in Caucasians and Japanese with respect to insulin sensitivity and β-cell function.

One recent Korean study suggested that the main pathogenesis in participants with newly diagnosed T2DM is insulin resistance [13]. Their result is in contrast to the traditional belief that insulin secretion is main pathogenesis for East Asians. They proposed that insulin resistance became the more prominent pathophysiology because the prevalence of diabetes is shifting toward younger and more obese populations in South Korea. They also analyzed their data according to differences in BMI, and showed that insulin resistance and insulin secretion index were both positively correlated with BMI. Therefore, DI were similar in various BMI groups as evidenced by other studies comparing Caucasians and Japanese [11,12]. They showed that obese participants with T2DM had relatively more insulin resistance, whereas relatively more non-obese participants with T2DM had β-cell dysfunction, which is consistent with the study demonstrating that body composition is

Corresponding author: Mi-kyung Kim https://orcid.org/0000-0003-1111-9122
Department of Internal Medicine, Inje University Haeundae Paik Hospital, Inje University College of Medicine, 875 Haeun-daero, Haeundae-gu, Busan 48108, Korea
E-mail: kmkdoc@paik.ac.kr

the main determinant for the differences in T2DM pathophysiology between Japanese and Caucasians [12].

This study can give us some lessons. All Koreans that were newly diagnosed with T2DM did not show β-cell function as the main defect. We have to try to understand the pathophysiological differences in different patients, especially by BMI and age. Overweight and obese T2DM are more common than non-obese T2DM in Koreans nowadays, so we should focus on strategies to reduce insulin resistance for the prevention and treatment of T2DM.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Lyssenko V, Almgren P, Anevski D, Perfekt R, Lahti K, Nissen M, Isomaa B, Forsen B, Homstrom N, Saloranta C, Taskinen MR, Groop L, Tuomi T; Botnia study group. Predictors of and longitudinal changes in insulin sensitivity and secretion preceding onset of type 2 diabetes. Diabetes 2005;54:166-74.
2. Ogihara T, Mirmira RG. An islet in distress: β cell failure in type 2 diabetes. J Diabetes Investig 2010;1:123-33.
3. DeFronzo RA. Pathogenesis of type 2 diabetes mellitus. Med Clin North Am 2004;88:787-835.
4. Seino Y, Kurahachi H, Goto Y, Taminato T, Ikeda M, Imura H. Comparative insulinogenic effects of glucose, arginine and glucagon in patients with diabetes mellitus, endocrine disorders and liver disease. Acta Diabetol Lat 1975;12:89-99.
5. Kosaka K, Kuzuya T, Akanuma Y, Hagura R. Increase in insulin response after treatment of overt maturity-onset diabetes is independent of the mode of treatment. Diabetologia 1980;18:23-8.
6. Fukushima M, Usami M, Ikeda M, Nakai Y, Taniguchi A, Matsuura T, Suzuki H, Kurose T, Yamada Y, Seino Y. Insulin secretion and insulin sensitivity at different stages of glucose tolerance: a cross-sectional study of Japanese type 2 diabetes. Metabolism 2004;53:831-5.
7. Tripathy D, Carlsson M, Almgren P, Isomaa B, Taskinen MR, Tuomi T, Groop LC. Insulin secretion and insulin sensitivity in relation to glucose tolerance: lessons from the Botnia Study. Diabetes 2000;49:975-80.
8. Kim DJ, Lee MS, Kim KW, Lee MK. Insulin secretory dysfunction and insulin resistance in the pathogenesis of Korean type 2 diabetes mellitus. Metabolism 2001;50:590-3.
9. Qian L, Xu L, Wang X, Fu X, Gu Y, Lin F, Peng Y, Li G, Luo M. Early insulin secretion failure leads to diabetes in Chinese subjects with impaired glucose regulation. Diabetes Metab Res Rev 2009;25:144-9.
10. Yabe D, Seino Y, Fukushima M, Seino S. β Cell dysfunction versus insulin resistance in the pathogenesis of type 2 diabetes in East Asians. Curr Diab Rep 2015;15:602.
11. Moller JB, Dalla Man C, Overgaard RV, Ingwersen SH, Tornoe CW, Pedersen M, Tanaka H, Ohsugi M, Ueki K, Lynge J, Vasconcelos NM, Pedersen BK, Kadowaki T, Cobelli C. Ethnic differences in insulin sensitivity, β-cell function, and hepatic extraction between Japanese and Caucasians: a minimal model analysis. J Clin Endocrinol Metab 2014;99:4273-80.
12. Moller JB, Pedersen M, Tanaka H, Ohsugi M, Overgaard RV, Lynge J, Almind K, Vasconcelos NM, Poulsen P, Keller C, Ueki K, Ingwersen SH, Pedersen BK, Kadowaki T. Body composition is the main determinant for the difference in type 2 diabetes pathophysiology between Japanese and Caucasians. Diabetes Care 2014;37:796-804.
13. Ha KH, Park CY, Jeong IK, Kim HJ, Kim SY, Kim WJ, Yoon JS, Kim IJ, Kim DJ, Kim S. Clinical characteristics of people with newly diagnosed type 2 diabetes between 2015 and 2016: difference by age and body mass index. Diabetes Metab J 2018;42:137-46.