

SHORT COMMUNICATION

Relationship between Body Mass Index and Pancreas Volume in Japanese Adults

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ABSTRACT

Context The volume of the pancreas increases with obesity. **Objective** This study was aimed to explore the relationship between body mass index (BMI) and pancreas volume in Japanese. **Methods** The pancreas volume was examined in a total of 103 (60 men and 43 women) Japanese adults who had undergone abdominal computed tomography (CT) scan. The pancreas was outlined by hand in each CT image and the pancreas volume was computed by summing the product of pancreas area of each image and the CT section thickness. **Results** There was a significant positive correlation between BMI and pancreas volume ($r = 0.41$, $P < 0.001$). This relationship was expressed by the following equation: $y = 23.8 + 2.48x$, where y is pancreas volume (cm^3) and x is BMI. **Conclusions** There is a positive correlation between BMI and pancreas volume in Japanese and this relationship is similar to that in Caucasians. This information will be useful to estimate the impact of obesity on pancreas volume in Japanese and for comparison among different ethnicities.

The volume of the pancreas increases with obesity. We have previously reported the relationship between body mass index (BMI) and pancreas volume assessed by computed tomography (CT) [1]. Based on this relationship, we have generated an equation to estimate pancreas volume as a function of BMI, i.e., $y = 26.0 + 1.95x$, where y is the pancreas volume (cm^3) and x is BMI (kg/m^2). This equation is useful to estimate the impact of pancreas volume in autopsy cases in which the pancreas volume is not available [2, 3]. However, since the majority of the study subjects were Caucasians [1], the application of this equation to other ethnicities may not be appropriate. Therefore, in this study we aimed to explore the relationship between BMI and pancreas volume in Japanese.

A total of 103 (60 men and 43 women) Japanese adults aged 20 to 75 years who had undergone abdominal CT scan between 2012 and 2013 were randomly selected from the Keio University School of Medicine Department of Radiology database. Since it has been shown that pancreas volume linearly increases in childhood and reaches plateau at 20 years, then starts to decline after 60 years of age [1], we chose this age range to minimize the age-related effect on pancreas volume. Cases were excluded if they had any abdominal condition potentially affecting pancreas morphology (e.g., pancreatitis and peritonitis). The

abdominal CT findings were evaluated by an independent radiologist to confirm the absence of pancreas pathology. Since the existence of diabetes affects pancreas volume [1], patients with diabetes were also excluded from the study.

CT images were acquired with a standard clinical abdominal CT protocol utilizing 64-detector row CT (Light Speed VCT: GE Healthcare, Milwaukee, WI, USA, and Aquilion 64, Toshiba Medical Systems, Otawara, Japan), and axial scans were reconstructed as 5-mm-thick sections with a 2-mm gap. All images were transferred to a standard commercially available workstation (Advantage workstation 4.6, GE Healthcare). The pancreas was outlined by hand in each CT image as previously described [1] and the pancreas volume was computed by summing the product of pancreas area (cm^2) of each image and the CT section thickness. This study was approved by the ethics committee of Keio University School of Medicine.

The mean (\pm SD) age of the subjects was 51 ± 12 years, height 1.64 ± 0.09 m, weight 60 ± 12 kg, and BMI 22.3 ± 3.5 kg/m^2 . The mean pancreas volume was 79.0 ± 21.6 cm^3 . There was a significant positive correlation between BMI and pancreas volume ($r = 0.41$, $P < 0.001$, Figure 1), and this relationship was expressed by the following equation: $y = 23.8 + 2.48x$, where y is pancreas volume (cm^3) and x is BMI. Height and weight were also significantly correlated with pancreas volume ($r = 0.24$, $P = 0.02$ and $r = 0.47$, $P < 0.001$, respectively). There was no significant correlation between age and pancreas volume in this age range (21-69 years, $r = -0.15$, $P = 0.12$).

The use of CT image reconstructed as 5-mm-thick sections with a 2-mm gap was a limitation of this study. The use of thinner reconstructed image such as 1-mm-thick sections might result in more accurate measurement of pancreas volume. Also, since we did not assess visceral adiposity in this study, we are not able to exclude the possibility that

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Key words Obesity; Pancreas; ethnology

Abbreviations CT: Computed Tomography

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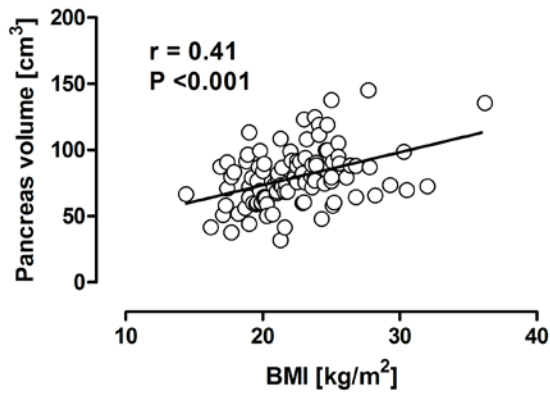


Figure 1. Relationship between BMI and pancreas volume in Japanese.

the relationship between visceral adiposity and pancreas volume may be different between the two ethnicities.

In conclusion, we demonstrated a positive correlation between BMI and pancreas volume in Japanese, and this relationship is similar to that in Caucasians. These findings suggest that the change in pancreas volume with obesity is comparable among different ethnicities, which is also in

line with our prior observation [4]. This information will be useful to estimate the impact of obesity on pancreas volume in Japanese and for comparison among different ethnicities.

Conflicting Interest

Authors declare to have no conflict of interest.

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