Supplemental Materials

METHODS

Study population

Asan Medical Center provides comprehensive health examinations for employees in large organizations as well as for individuals throughout the country. In general, ultrasonography is included for the screening of internal abdominal organs, and in cases of abnormal findings that warrant further evaluation, abdominal computed tomography (CT) scanning is allowed. In addition, if a subject with a family history of cancer wants to undergo a CT scan for screening purposes, CT scans are sometimes allowed after providing a warning about the hazards of exposure to radiation. Each subject completed a questionnaire regarding medication usage, history of previous medical and/or surgical diseases, and habits including drinking, smoking, and exercise. We excluded 2,652 individuals with missing data as well as those with any systemic disorders that could affect the body composition including cancer (except thyroid cancer), chronic renal insufficiency, chronic obstructive lung disease, and overt thyroid dysfunction. We also excluded 6,259 individuals who lacked abdominal ultrasonography data, had excessive alcohol intake (>30 g/day in men; >20 g/day in women), or had known liver disease including liver cirrhosis and hepatitis B or C. Finally, 14,400 individuals were included in the study.

Physical activity was assessed using the validated Korean version of the International Physical Activity Questionnaire (IPAQ) and converted to metabolic equivalent task minutes per week (MET-min/week) according to the IPAQ scoring protocol. Regular aerobic exercise was defined as engaging in moderate-intensity aerobic activity for 30 minutes for at least three days per week. Regular resistance exercise was defined as engaging in resistance training sessions for at least two days per week. Smoking status was categorized as non-current or current. Alcohol consumption was calculated in g/day by considering the beverage-specific alcohol content, frequency of drinking, and amount consumed.

Laboratory measurements

After overnight fasting, early morning venous blood samples were collected and analyzed by a central, certified laboratory. Fasting total cholesterol, high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C), and triglyceride (TG) levels were measured with enzymatic colorimetric methods using an autoanalyzer (Toshiba Medical System Co., Ltd., Tokyo, Japan). Creatinine levels were measured using the Jaffe method. High-sensitivity C-reactive protein (hsCRP) was measured using the immunoturbidimetric method, and fasting plasma glucose (FPG) levels were measured using the hexokinase method (Toshiba, Japan). Serum insulin concentrations were determined with an immunoradiometric assay (TFB, Tokyo, Japan). Ion-exchange high-performance liquid chromatography (Variant II^{TM}; Bio-Rad Laboratories, Inc., Hercules, CA, USA) was used to measure glycated hemoglobin (HbA1c) levels. The homeostatic model assessment for insulin resistance (HOMA-IR) was calculated as the product of fasting serum insulin (μU/mL) and FPG (mmol/L) levels divided by 22.5. The HOMA-IR was calculated in subjects not receiving antidiabetic medications because we were unable to obtain detailed information regarding these agents.

Anthropometric and body composition measurements

Body weight, height, and waist circumference were measured by trained nurses according to standardized methods. Body mass index (BMI) was calculated as body weight (kg) divided by the square of height (m^2). Blood pressure (BP) was measured using an automatic manometer. Body composition was measured with direct segmental multi-frequency bioelectrical impedance analysis using InBody 720 (InBody Co., Ltd, Seoul, Korea). Appendicular skeletal muscle mass (ASM) was calculated as the sum of the lean muscle mass in both arms and legs. ASM was adjusted by the square of the height (m^2), weight (kg), or BMI. The

percentage of body fat (PBF) was calculated as fat mass in kilograms divided by body weight (kg).

CT image acquisition

We used a standardized CT acquisition protocol for health examinations. Abdominal and pelvic CT examinations were performed using the Somatom Definition (Siemens Healthineers, Erlangen, Germany), Discovery CT750 HD (GE Healthcare, Milwaukee, WI, USA), or LightSpeed VCT scanner (GE Healthcare). All image data were reconstructed with a slice thickness of 5 mm using the filtered back-projection technique with the soft tissue reconstruction algorithm (B30f kernel; Siemens Healthineers; Standard kernel, GE Healthcare). For contrast enhancement, 100–150 mL of iopromide (Ultravist 370 or Ultravist 300; Bayer Schering Pharma, Berlin, Germany) was intravenously administered using an automatic power injector at a speed of 2.5–3 ml/sec. A fixed scan delay of 70 seconds after contrast agent injection was used for CT acquisition.

Statistical analysis

Continuous variables with normal distributions are expressed as the mean±SD, and those with skewed distributions are expressed as medians (interquartile ranges). Categorical variables are expressed as percentages. Differences between two groups were compared using an independent *t*-test or the Mann–Whitney U-test for continuous variables and the chi-squared test for categorical variables. Odds ratios (ORs) with 95% confidence intervals (CIs) were calculated using multivariate logistic regression analysis. A regression analysis for non-alcoholic fatty liver disease (NAFLD), defined by the fatty liver index (FLI), and adjusted for myosteatosis only. Sarcopenia, defined by the BMI-adjusted skeletal muscle area (SMA), was not used as a correction variable because BMI is already included in the calculation of the FLI. All statistical analyses were performed using SPSS version 21.0 for Windows (IBM Inc., Chicago, IL, USA).

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