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Correlation of abdominal fat using bioimpedance analysis and 3D-CT volumetry

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Objectives: Bioimpedance analysis (BIA) provides parameters such as body water, skeletal muscle, and fat through measurement of the impedance and reactance, and also calculates an estimate of visceral fat using a regression equation with the measured value of the axial-section of CT at the umbilical level. In this study, the correlation between the BIA estimation formula and 3D-CT volumetry of fat was investigated in chronic kidney disease (CKD) patients including autosomal dominant polycystic kidney disease (ADPKD) patients.

Methods: The 3D-fat volume of the abdomen and the fat area of the axial section of CT was measured using the Synapse program (Fuji). Then, they were compared with the calculated visceral fat of BIA measured on the same day. Similarly, subcutaneous fat was measured on CT and compared with the value provided in BIA. The estimated value of the CT axial section at the umbilical level for abdomen circumference was compared with that of BIA. As a reference, the 3-D volume of CT was used for fat, and the value of the axial-sectional CT was used for abdominal circumference.

Results: Among the 166 CKD patients, 97 were non-ADPKD patients and 69 were ADPKD patients. Males were 55.4% (n=92), the mean age was 61 years, and the mean eGFR was 47.6 mL/min/1.73 m². The Pearson correlation coefficient of visceral fat volume compared to axial-sectional area and BIA estimate was 0.885 and 0.660, and 0.958 and 0.816 for subcutaneous fat, respectively. In the case of abdomen circumference, when the axial-sectional CT was used as a reference, the Pearson correlation coefficient of the measured area of the abdomen was 0.850 and the BIA estimate was 0.735. The correlation coefficients were similar between ADPKD and non-ADPKD.

Conclusions: Abdominal fat volume and circumference measured with a specific program were similar to CT cross-sections and BIA estimates among ADPKD or non-ADKPD CKD patients.

Figure 1. A example of 3D fat volumetry