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Introduction and Aims

Classically it is accepted that fluid balance and body composition are maintained in patients with chronic kidney disease (CKD) until late stages.

The aim of this study was to evaluate whether body composition measured by bioimpedance spectroscopy differs in healthy subjects (eGFR ≥ 60 ml/min/1.73m²) from patients with early stages of CKD (59-45 ml/min/1.73 m²) (G3a).

Methods

All subjects were selected from the general healthy population aged over 40 years. Subjects with previous diagnoses of cardiovascular and chronic kidney disease were excluded.

Calf, segmental and whole body (wBIS) and segmental bioimpedance spectroscopy (sBIS) was performed using Hydra 4200, Xitron Technologies, CA. Extracellular (ECV), intracellular (ICV) fluid volume, total body water (ECV+ICV), and skeletal muscle (SM) (model to predict SMM by [Kaysen in Am J Clin Nutr 2005]) were calculated. Blood pressure, serum creatinine and albumin were measured, GFR was estimated using the CKD epidemiology collaboration equation (CKD-EPI).

Comparisons were made between groups categorized accordingly to the KDIGO revised CKD classification based on eGFR. (revised KDIGO classification based on eGFR [Levey in Kidney Int 2011])

Results

Seventy nine patients were studied, 16 were excluded because of missing data. Sixty three subjects (age 56 [47-64] years, 54% women, eGFR 82 ± 16.9 ml/min/1.73 m²), were divided into two groups according to eGFR: eGFR ≥ 60 ml/min/1.73 m² (n=56), and group 2 eGFR 59-45 ml/min/1.73 m² (n=7).

Table 1. Body composition of 63 subjects in general population accordingly to eGFR (ml/min/1.73m²)

	Total (n=63)	eGFR ≥ 60 (n=56)	eGFR 59-45 ml (n=7)	P value
eGFR (mL/min/1.73 m ²)	82 \pm 16.9	82.9 \pm 14.1	55 \pm 3	N/A
Urinary alb/cr ratio	7.72 (4.5-13.5)	6.3 (3.6-12.4)	8.2 (4.7-12.1)	0.47
Age (years)	56 (47-64)	55.5 (47-62.5)	69 (67-74)	0.04
BMI (kg/m ²)	27.8 \pm 4.5	27.3 \pm 4.4	23.5 \pm 3.5	0.03
Total body water (L)	38 \pm 8.4	37.7 \pm 8.2	37 \pm 6.9	0.82
wBIS ECV/TBW	0.43 \pm 0.03	0.43 \pm 0.03	0.46 \pm 0.02	0.008
wBIS ECV/ICV	0.82 \pm 0.10	0.76 \pm 0.08	0.85 \pm 0.08	0.007
Total-body SM (kg)	24.7 \pm 5.7	24.5 \pm 5.3	20 \pm 3.9	0.03
Leg ECV/TBW	0.42 \pm 0.04	0.41 \pm 0.03	0.45 \pm 0.02	0.002
Leg ECV/ICV	0.72 \pm 0.10	0.71 \pm 0.10	0.83 \pm 0.07	0.002
Leg SM(kg)	7.90 \pm 0.83	8.2 \pm 1.0	7.7 \pm 0.8	0.22

Table 1 shows significant differences in age and body mass index (BMI) between groups, being higher and lower respectively in the group of patients with eGFR 59-45 ml/min/1.73m² (G3a)

Fluid distribution (ECV/ICV) was different between the groups, the highest ECV/ICV in whole body and segmental bioimpedance techniques were observed in the G3a group.

Whole body SM and leg SM were lowest in the G3a group.

Serum albumin, systolic and diastolic blood pressure, whole body, segmental and calf ECV and ICV were similar between groups.

Conclusion

In subjects in early stage of chronic kidney disease fluid distribution and body composition are altered with a higher proportion of ECV using both methods and a lower whole body and leg skeletal muscle mass, which suggests that loss of skeletal muscle mass might be an early signal for indicating progress of CKD.

It is necessary to increase the sample size to confirm our findings and exclude the association described as being confounded by age.

