

# DIFFERENT BODY FLUID VOLUMES MEASURED BY SINGLE- AND MULTI-FREQUENCY BIOELECTRICAL IMPEDANCE ANALYZERS IN OVERWEIGHT/OBESE RENAL PATIENTS

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## Background

Bioelectrical impedance analysis (BIA) is an affordable, non-invasive and fast alternative method to assess body composition.

## Objectives

The purpose of this study was to compare two different tetrapolar bioimpedance (BIA) devices for estimating body fluid volumes and body cell mass (BCM) in clinical setting among patients with kidney failure.

## Patients

Thirty nine patients with chronic kidney disease (stage III-V; eGFR 50-8 ml/min/1,73m<sup>2</sup>) with mean age 45,8 ± 8 y, 21 men and 17 women, who had a wide range of BMI [17-34 kg/m<sup>2</sup> (mean 26,6 ± 5)] participated in this study.

## Methods

All double measurement were performed by multi-frequency and single-frequency BIA analyzers, a Body Composition Monitor-BCM (Fresenius Medical Care, Germany) and BIA-101 (Akern, Italy), respectively. All procedures were conducted according to manufacturers instructions (dedicated electrodes, measurements sites, positions etc). Total body water (TBW), extracellular water (ECW), intracellular water (ICW) and BCM were compared. All the measurement were conducted by single investigator.

## Results

In general measurement of ICW and BCM were similar (19 vs 18,7; p= 0,87; and 24,8 vs 20,7 kg; 0,08) in two devices. The Akern device gives higher mean estimates of TBW and ECW compared to the Fresenius device (tab.).

A comparison of results from patients with BMI <25 vs ≥25 revealed significant discrepancy measurement between both BIA devices. Namely in group with BMI <25 (n=16) acceptable correlations were obtained in TBW (r 0,99; p<0,01), ICW (0,92; p<0,01), BCM (0,89; p<0,01), ECW (0,96 p<0,05), but in group with BMI ≥25 (n=23) huge discrepancy (poorer correlations) in TBW (r 0,82; p<0,05), ICW (0,78; p=ns), BCM (0,25; p=ns), ECW (0,76; p<0,01) were found. In those patients (BMI≥25) the Akern device gives significantly higher mean estimates of TBW (45,9 vs 40,1; p=0,03), ECW (24 vs 19,2; p<0,01) and BCM (28,7 vs 23 ;p=0,05) than Fresenius device.

Figure 1. Compared BIA analyzers



Akern - BIA-101 (BIVA)

Body Composition Monitor (BCM) FMC

measurement at 0,8 mA, at one 50kHz measurement at 0,8 mA, range 1-200kHz, 50 different measurement at changing Hz

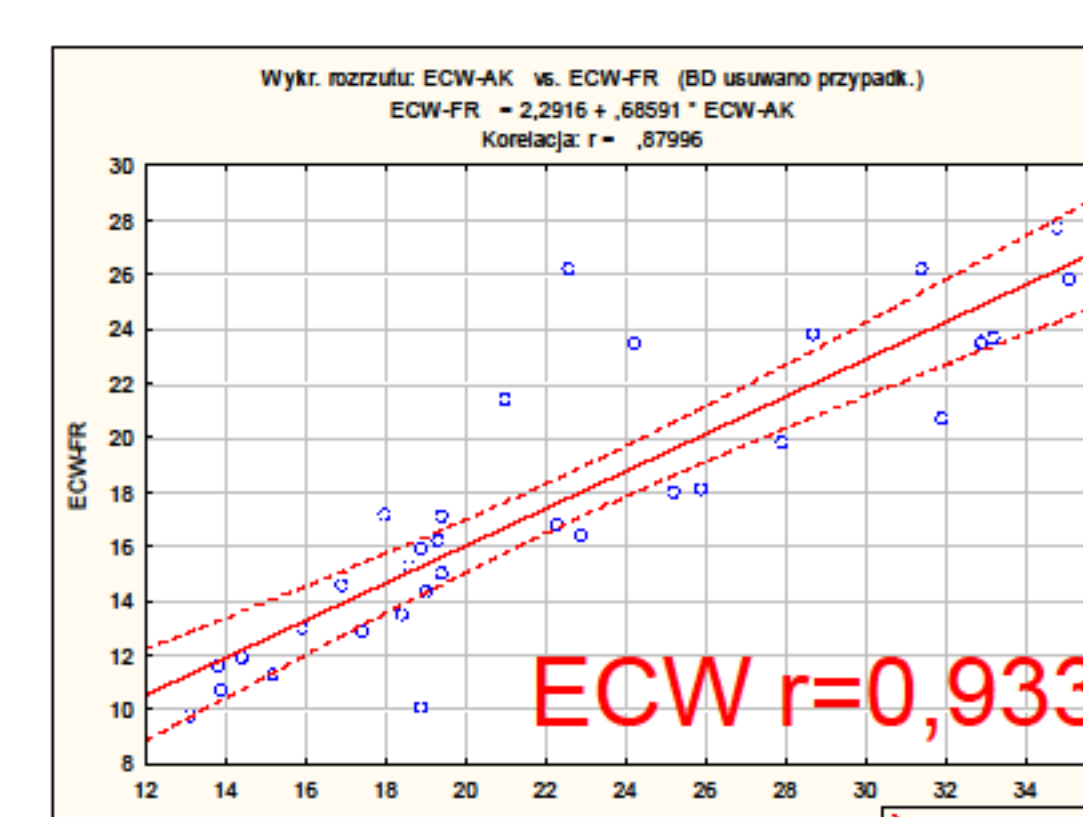
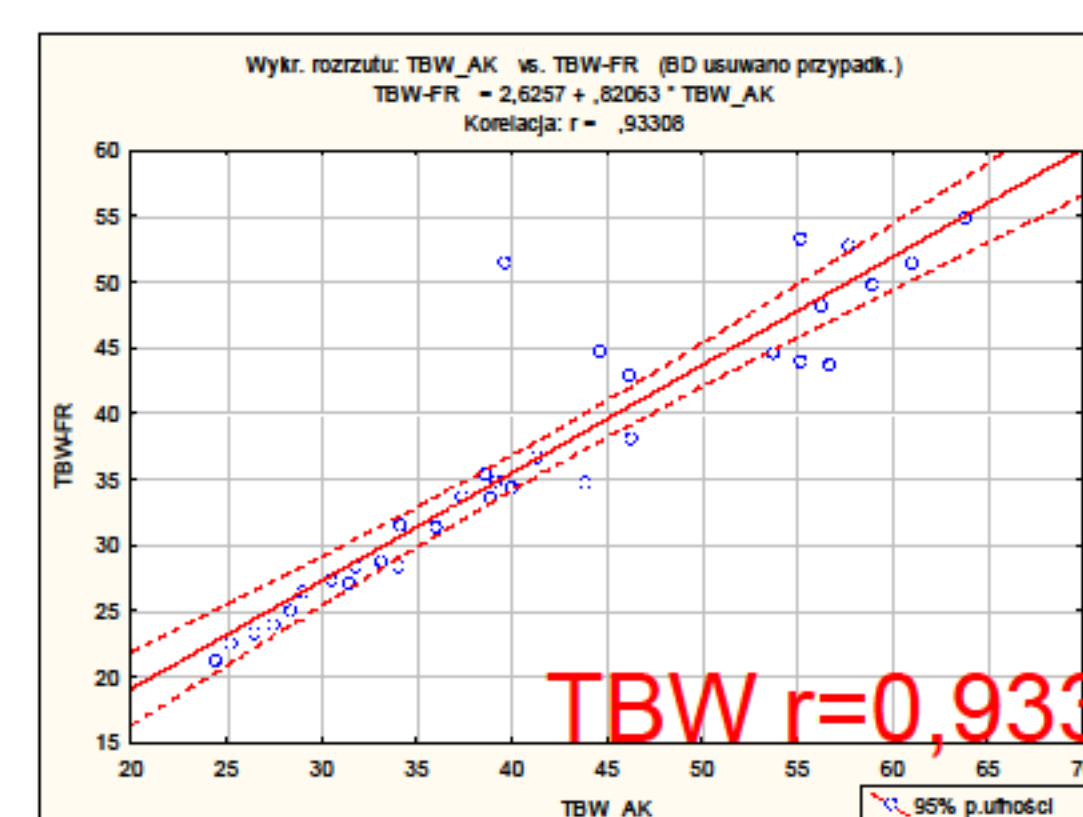
Tab.1 Mann-Whitney test

aparar \ parameter	TBW [kg]	ECW [kg]	ICW [kg]	BCM [kg]
1-frequency(Akern)	41	22	19	24,8
multifrequency (Fresenius)	35,8	17,2	18,7	20,7
Mean (n=36),	p=0,04	p=0,01	p=0,87	p=0,08

Tab.2 Wilcoxon test in pairs

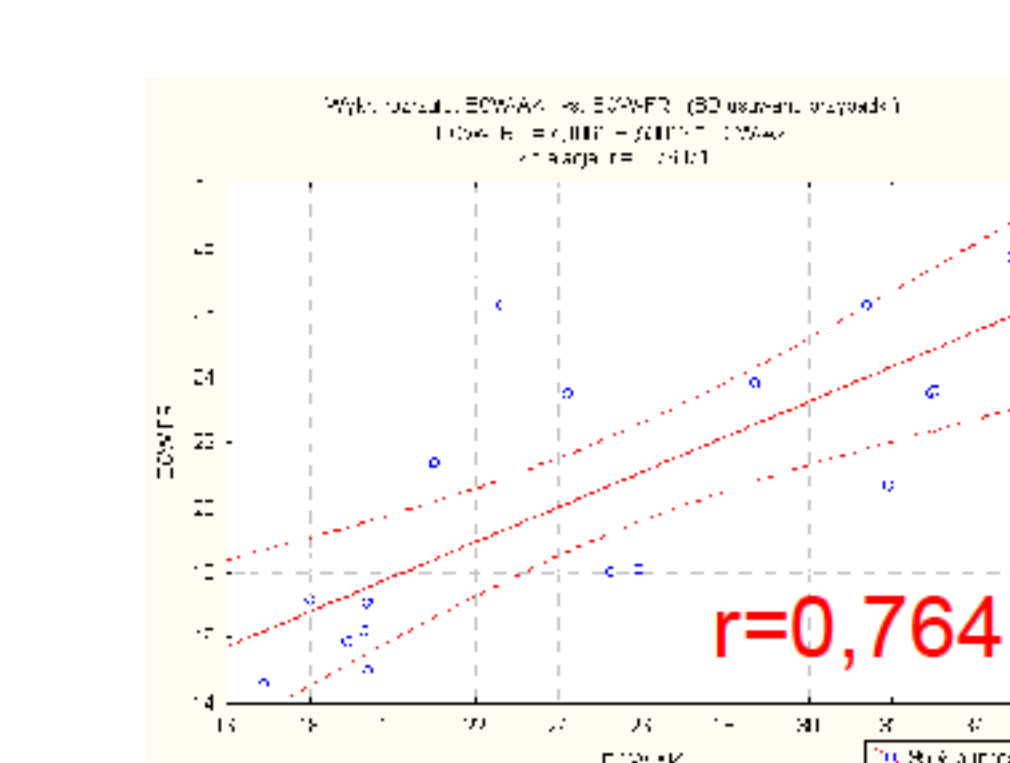
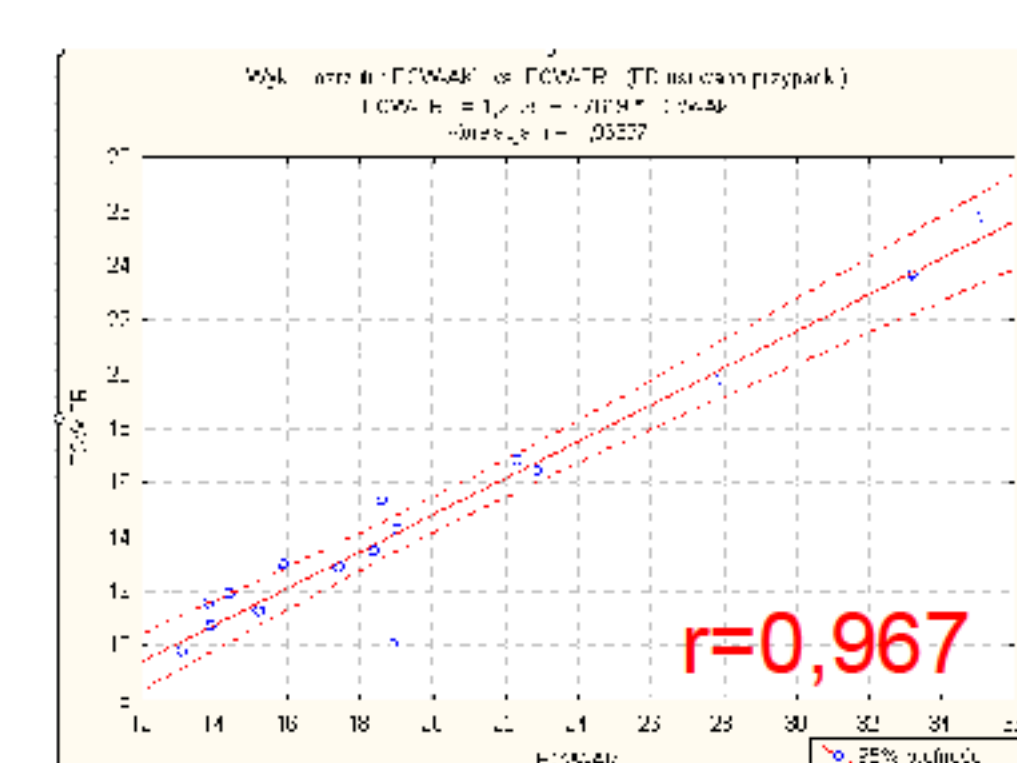
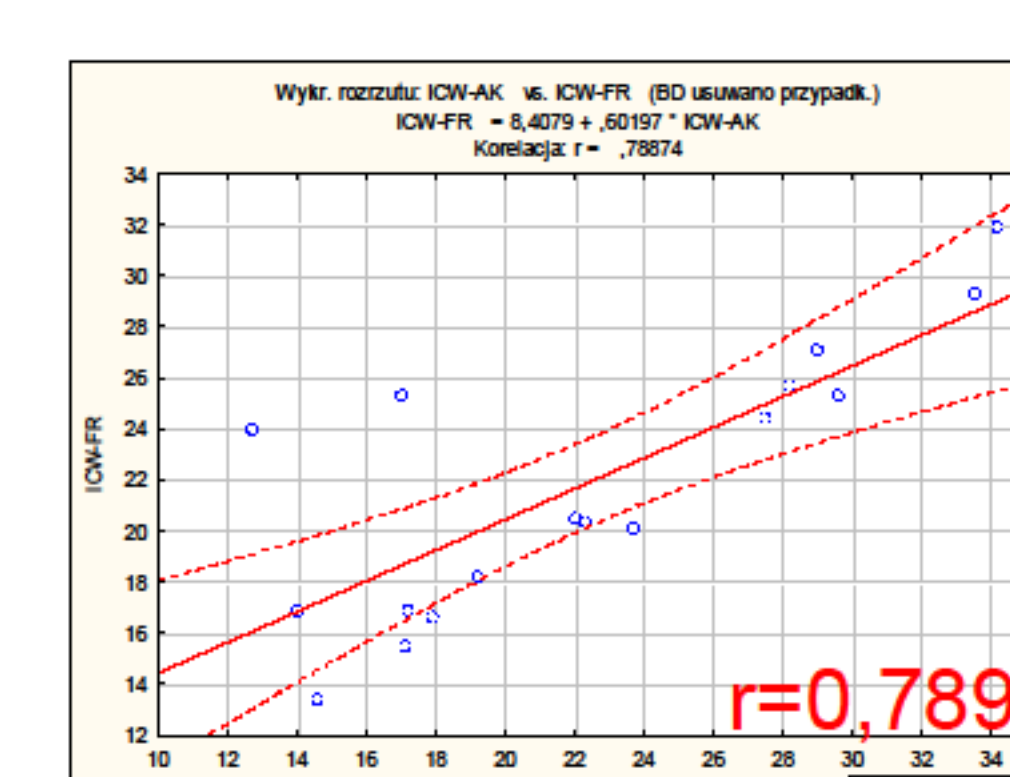
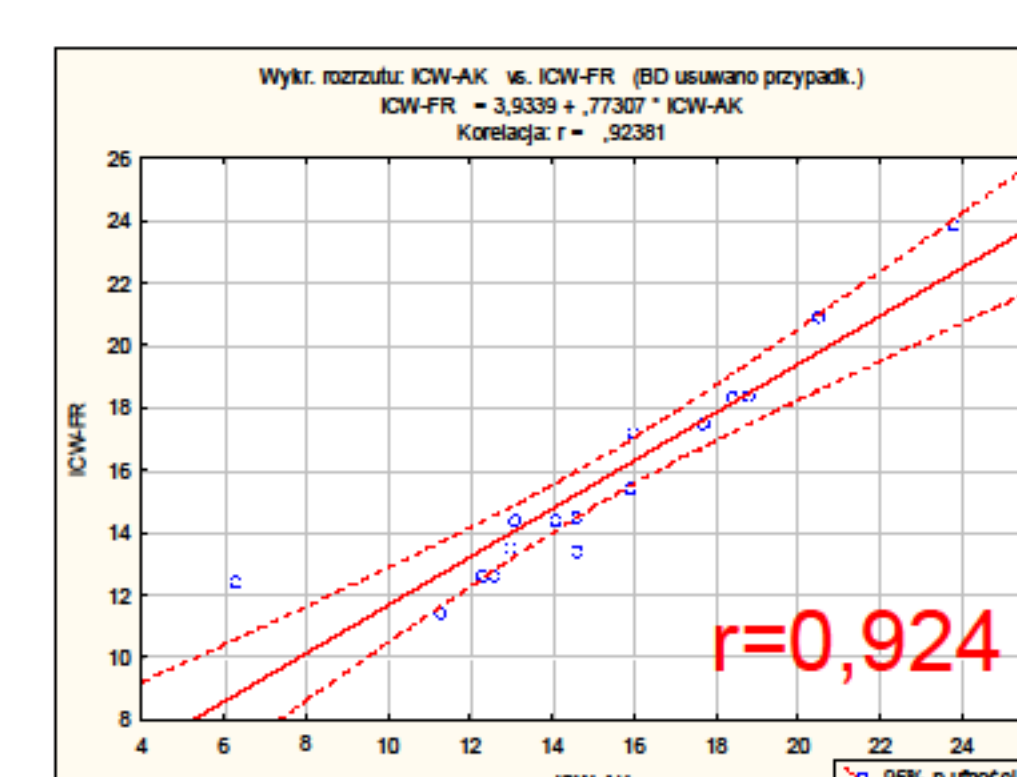
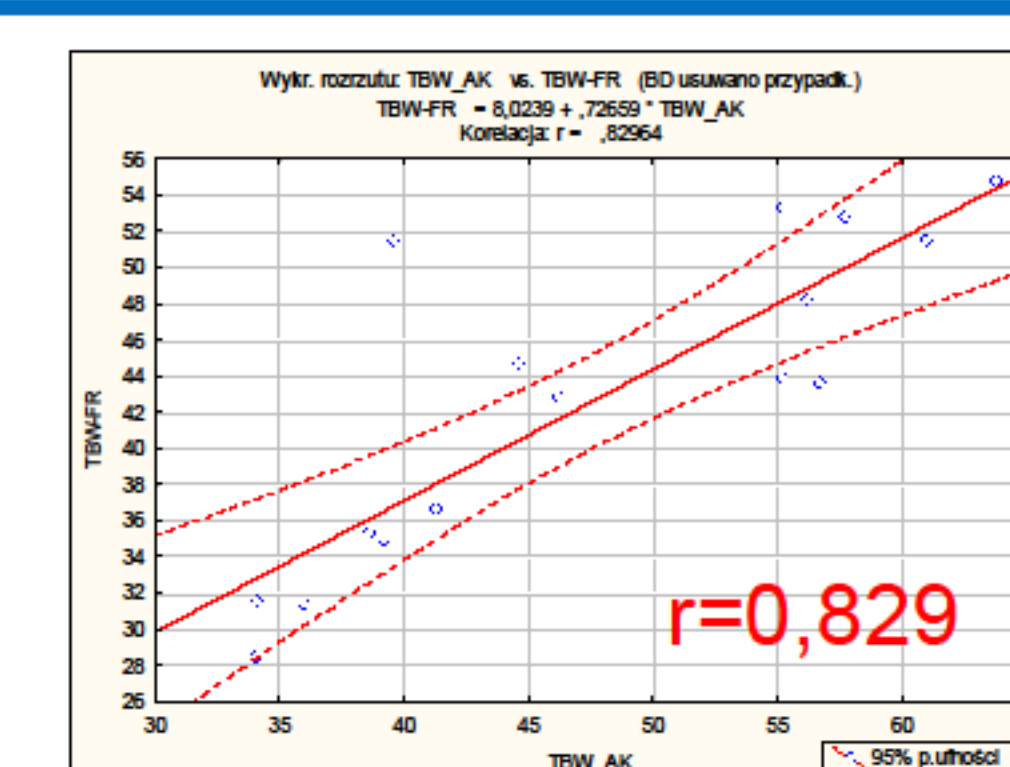
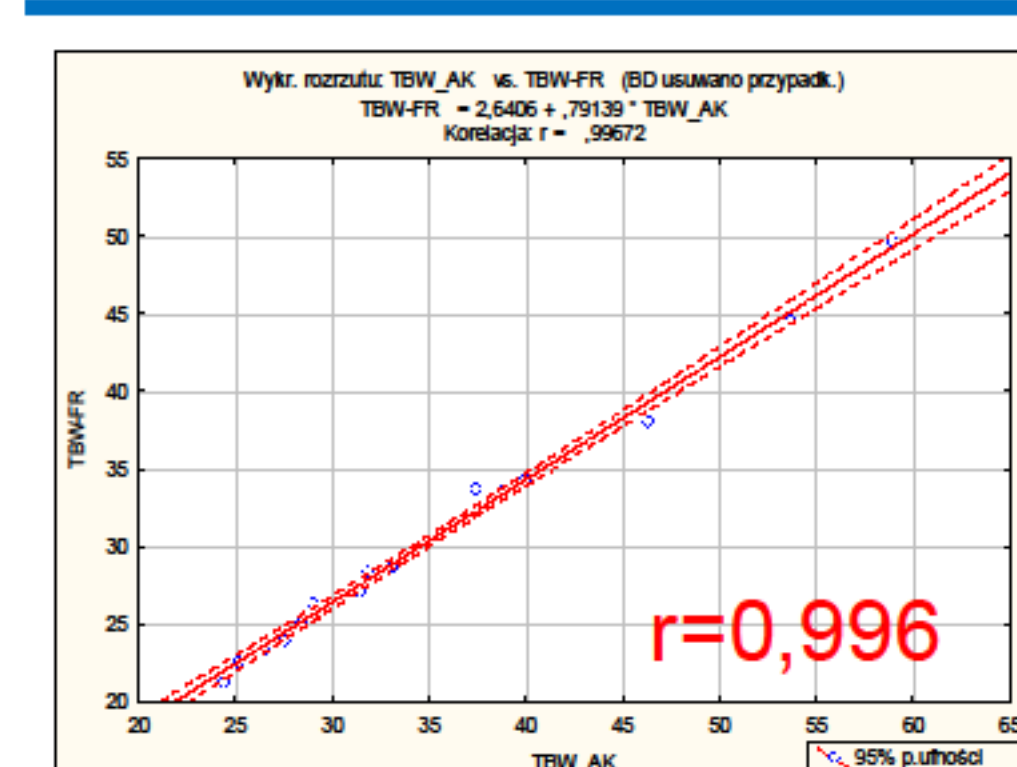
Wilcoxon test in pairs	N	poziom p
TBW- AK & TBW-FR	39	0,000001
ECW - AK & ECW-FR	39	0,000000
ICW - AK & ICW-FR	39	0,028014
FAT - AK & FAT-FR	38	0,000003
BCM - AK & BCM-FR	39	0,000354

Correlations in total n=39



BMI<25, n=16

BMI≥25, n=23



**Conclusion:** Since estimates of TBW, ICW BCM by the present BIA devices do not differ in patients with BMI <25, they might be interchangeable. This does not hold true for overweight/obese renal patients. Because both BIA devices could over/under estimate BCM in obese patients an effort to reduce the bias (electrodes repositioning?) and finally comparison to gold standard should be undertaken.

