Bioimpedance guided dry weight in hemodialysis patients – comparison of methods

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Background

Determination of dry weight in hemodialysis (HD) patients remains a substantial problem. Despite meticulous clinical assessment, overhydration is prevalent in a large proportion of HD patients, leading to volume overload and left ventricular hypertrophy. Several technical methods such as biochemical serum markers or inferior vena cava diameter sonography have not substantially improved accuracy. Several bioimpedance methods are used to assess nutritional and fluid status in this setting. We investigated the additional value of a widespread whole body bioimpedance technique, the so called vector bioimpedance (VB) for guidance of dry weight in addition to clinical assessment.

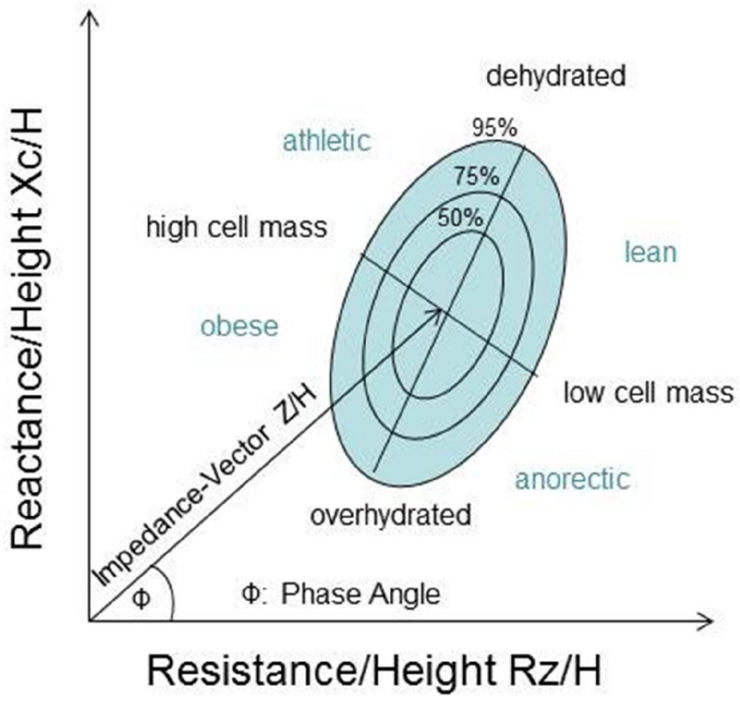


Figure 1: Interpretation of the R/X_C–Graph (modified from PICOLLI et al., Am J Clin Nutr 1995;61:269-70)

Methods

Vectors of Resistance (R) and Reactance (Xc) at 50kHz and normalized for body height were determined in 84 chronic HD patients before and after HD using standard bioimpedance analysis based on the Piccoli-Method ([1], STA/BIA Soft Tissue Analyzer, Akern Bioresearch; Nutrigard-MS, Data Input Pöcking). Positions of the R/Xc points were plotted over the reference sex-specific 50%, 75% and 95% tolerance ellipses (Fig. 1). In a subgroup of 15 patients, weight was then reduced from clinical dry weight by increased ultrafiltration using a previously described calf-bioimpedance (cBIS) guided method (Fig. 2, [2,3]). After achievement of cBIS dry weight, measurements of the R/Xc Vectors were repeated.

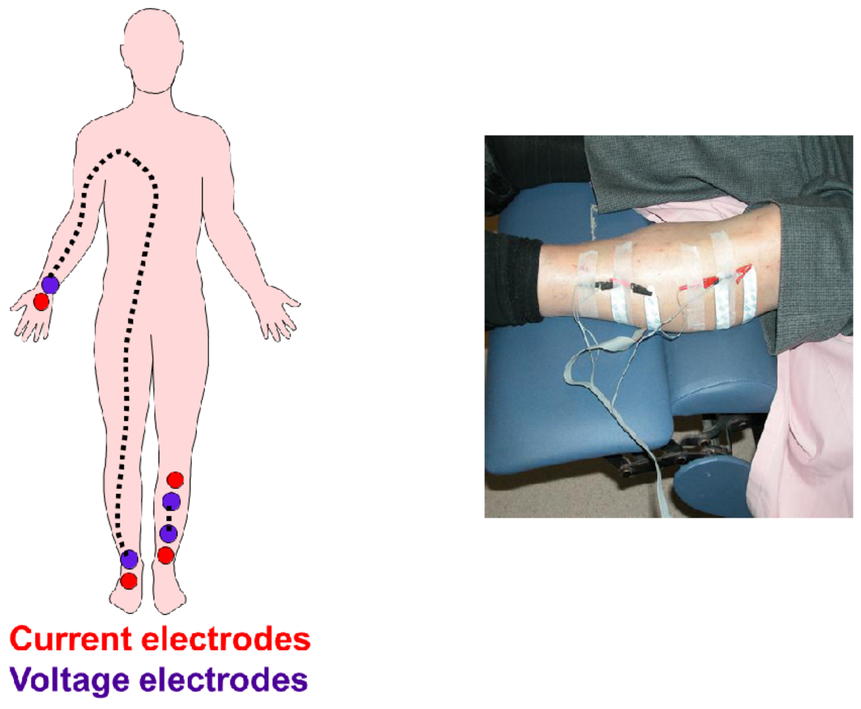
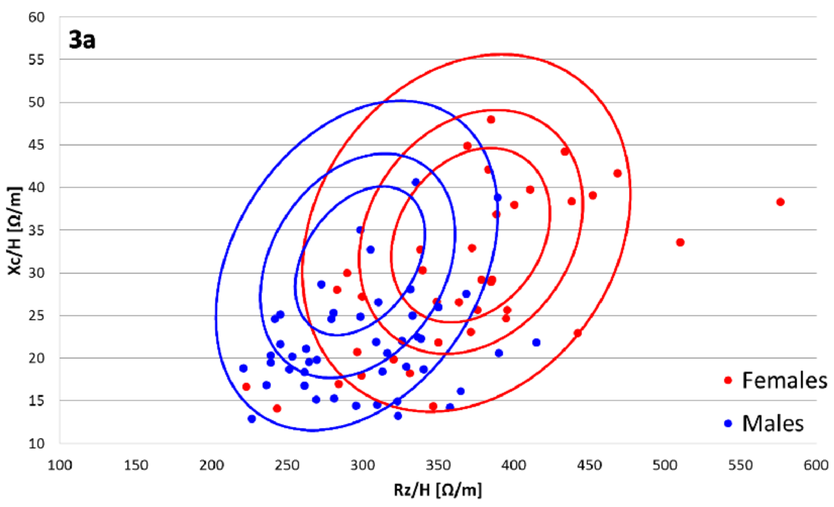


Figure 2: Electrode positions and current flow in vector bioimpedance and calf bioimpedance spectroscopy

Results

Only 66 out of 84 R/Xc points (79%) were located within the 95% reference range before HD (Fig. 3a). Astonishingly, after HD the number further decreased to 62 (74%; p=0,59, Fig. 3b). In most patients vectors moved within one or two reference quartiles (n=71/85%). After weight reduction to cBIS dry weight, vectors moved closer to the center of the reference area in only 2 out of 15 patients (13%) after HD (Fig. 4).



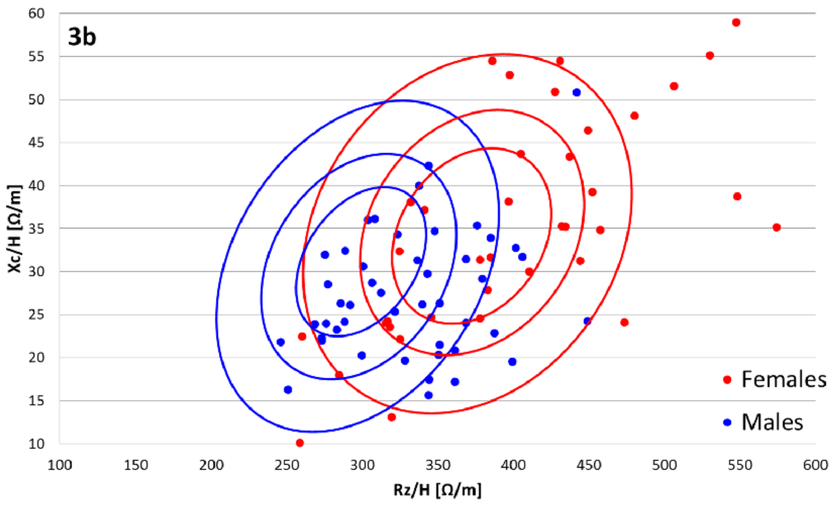
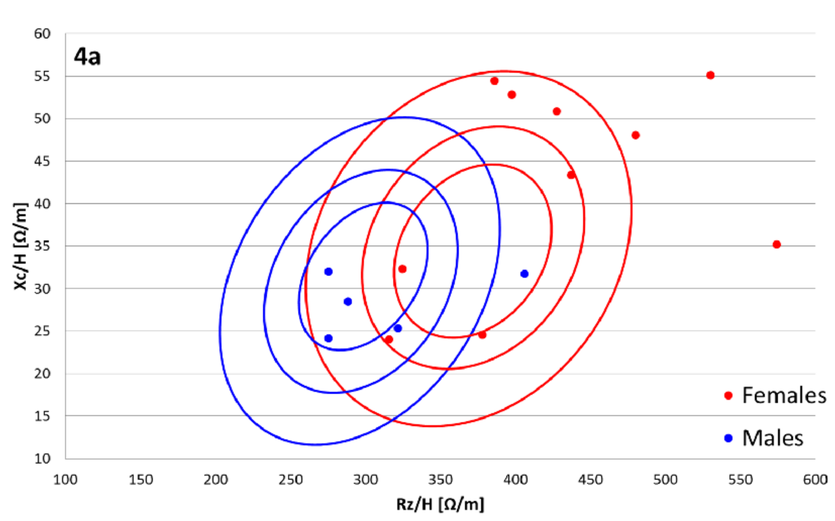


Figure 3: R/X_C–Plots before **(a)** and after **(b)** HD

Conclusions

R/Xc points did not differ significantly in patients before and after HD. Moreover, R/Xc points did not (as one would have expected) move closer to the reference areas after reduction of dry weight. Therefore, vector bioimpedance does not appear to add additional value to clinical assessment of dry weight. We speculate that sensitivity to fluid changes might be too low in order to detect clinically relevant changes.



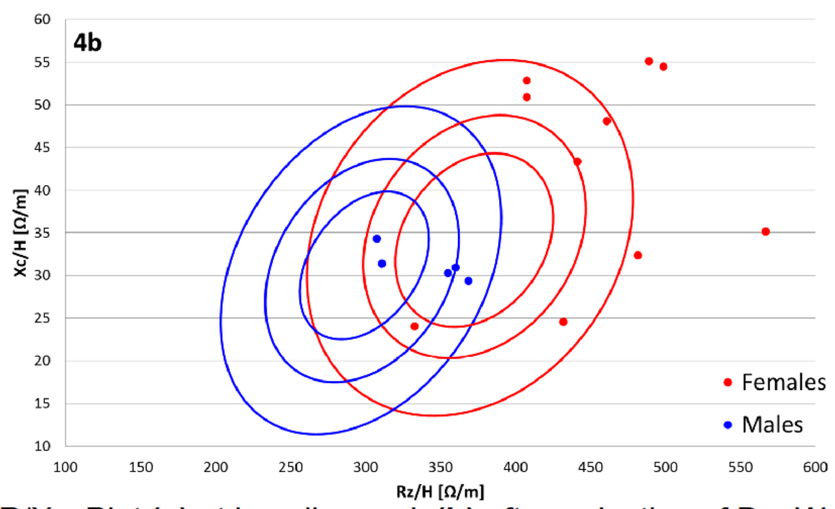


Figure 4: R/X_C–Plot **(a)** at baseline and **(b)** after reduction of Dry Weight (post HD)

References

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