PROBING THE DRY WEIGHT BY BIOIMPEDANCE: THE REST/COLLABORATIVE STUDY INITIATIVE

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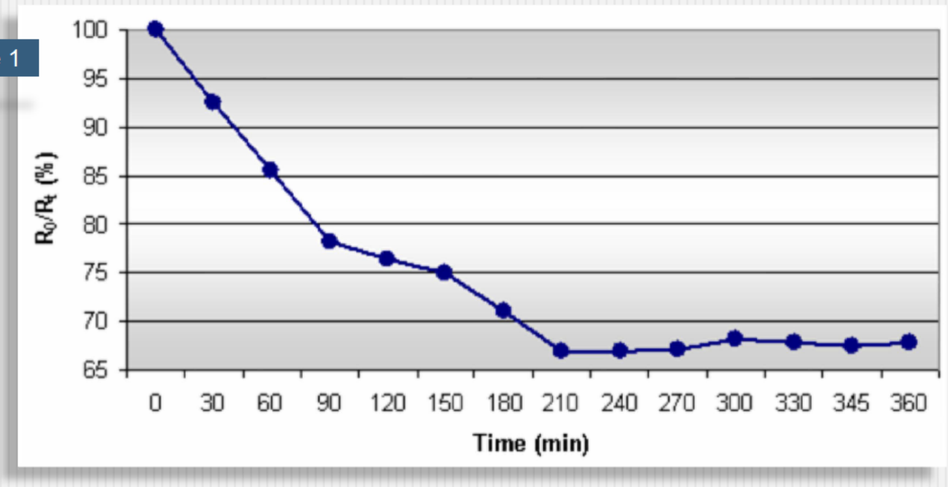
Background

Probing the dry weight (DW) was largely dependent on clinical subjective estimates until recently. New bedside non-invasive tools have been developed with the aim of providing more objective information on volume status and guiding physicians in the quest for DW. Among them, bioimpedance (BIA) appears to be very promising in the achievement of this goal. Resistance (R) and capacitance of tissues are the two basic properties in BIA. However, although impedance is an electrical property of tissues that can be directly used in body composition analysis, it is commonly embedded in predictive equations that are derived by correlation with criterion measures of body compartments.

Very recently, a test aimed at assessing DW in hemodialysis (HD) patients has been developed, the "RE.sistance S.tabilization T.est" (REST), by Basile et al (1). It is based on the following four items:

1. one or more daily and/or alternate day HD sessions lasting 6 hours with ultrafiltration (UF) rate ≤ 0.5 kg/hour are planned;
2. BIA measurements are determined injecting 800 μA at 50 kHz alternating sinusoidal current with a standard tetrapolar technique (BIA 101 Impedance Analyzer; Akern, Florence, Italy). Resistance (R) is recorded starting at the beginning of the HD session (R_0) and then, continuously, until the end of the 6-hour session;
3. DW is defined as the weight achieved after flattening of the curve of the ratio R_0/R_t (R_0 is R at time 0 and R_t is R at a given time t during the HD session) of less than ± 1% over 20 minutes in the presence of ongoing UF, indicating no further decline in extracellular volume;
4. if at the end of the 6-hour HD session R stabilization is not attained, a new 6-hour HD treatment with UF rate ≤ 0.5 kg/h is planned until a **BIA DW** (according to the item 3) is obtained (Figure 1).

Figure 1



Protocol of the study

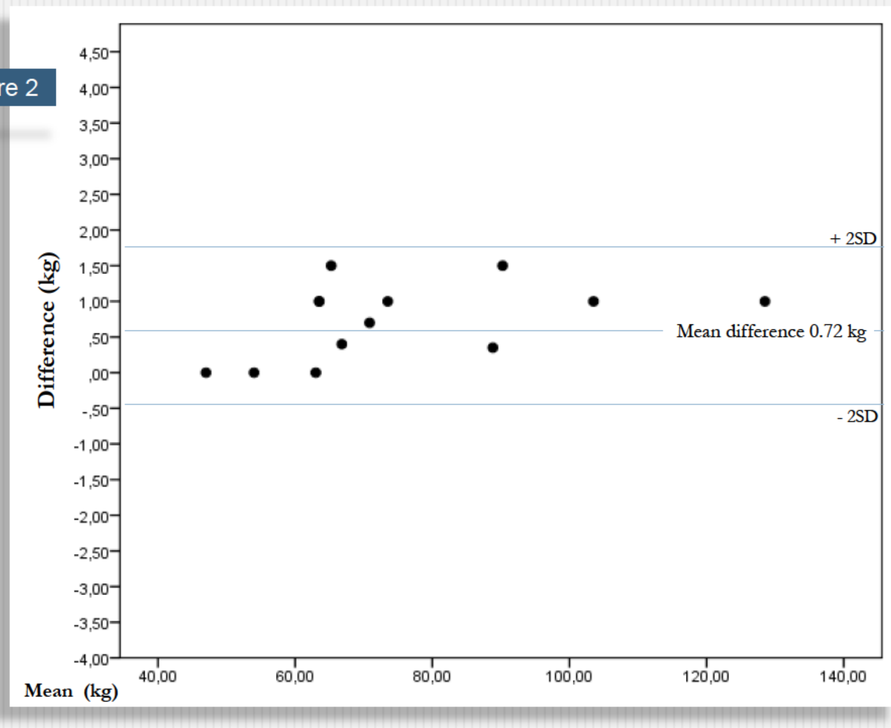
A study group is being created (REST/Collaborative Study Initiative, ClinicalTrials.gov; study number NCT02446535) with the aim of providing more objective information on volume status and guiding physicians in the quest for DW.

The DW determined with clinical methods (**Clinical DW**) is the gold standard by definition: **Clinical DW** is determined under strict clinical surveillance by the same attending physician. She/he will be helped by a clinical score of volume state about symptoms and signs of hypo- or hypervolemia, as described in Table 2 of the article by Kraemer et al (2). The physician is asked to adjust the DW of the candidates until their clinical score reaches zero after a given number of HD sessions before the BIA measurement. This **Clinical DW** will be compared with **BIA DW**, as obtained after performing REST, as described by Basile et al (1).

The protocol study includes two phases:

1. as already mentioned, the **Clinical DW** is the gold standard by definition. Items of form B (which reproduces in full Table 2 of the study by Kraemer et al) (2) must be strictly applied. Form B must be filled in session after session, until score = 0, index of euvolemia, is achieved;
2. REST, as described by Basile et al (1), is performed the following dialysis session. As per protocol, these dialysis sessions may be one or more than one, until flattening of the curve of the ratio R_0/R_t (R_0 is R at time 0 and R_t is R at a given time t during the HD session) of less than ± 1% over 20 minutes in the presence of ongoing UF, is obtained.

Figure 2



Preliminary analysis

The preliminary analysis of the first 13 consecutive patients who finished the study is reported in Figure 2. A good agreement between **Clinical** and **BIA DW** is shown at the Bland-Altman plot, thus allowing a reciprocal validation of the two methods.

Conclusions

Clinical methods are fundamental in probing the DW. They must be supported by strict BIA protocols. REST appears to be a (the) brilliant solution in solving the old problem of DW in HD patients.

References

1) Basile C et al. Probing the dry weight by bioimpedance: the resistance stabilization test. J Nephrol DOI 10.1007/s40620-014-0159-8, 2014
2) Kraemer M et al. Detection limit of methods to assess fluid status changes in dialysis patients. Kidney Int 69: 1609 – 20, 2006

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