How to Incorporate Remote Dielectric Sensing System and Lung Ultrasound in Patients with Acute Congestive Heart Failure

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To Editor

Accurate assessment of pulmonary congestion is pivotal for the optimal management of congestive heart failure. The remote dielectric sensing (ReDS) system represents a recently developed non-invasive technology designed to quantify lung fluid volume without requiring specialized expertise. Kobalava et al. demonstrated a moderate correlation between the ReDS system and lung ultrasound.[1] However, several concerns warrant further discussion.

In the current study, certain patients exhibited higher lung ultrasound findings (as indicated by the sum of B-lines) despite lower ReDS (%) values.[1] Could the authors provide an explanation for this observed discordance? It is worth noting that various confounding factors may influence ReDS (%) measurements. For example, ReDS (%) tends to be underestimated in individuals with chronic obstructive pulmonary disease or low body mass index.[2]

Given the inter-individual variability in ReDS (%) measurements, direct comparisons of absolute ReDS (%) values across patients may pose significant challenges. As an alternative, the ratio of ReDS (%) between hospital admission and discharge could serve as a valuable metric to evaluate the improvement of pulmonary congestion during the index hospitalization.[3]

The definition of significant pulmonary congestion is generally based on a sum of B-lines equal to or exceeding three rather than five.[4] How would the concordance between the ReDS system and lung ultrasound be affected if this revised threshold for pulmonary congestion were applied?

Building upon their findings, how might the ReDS system and lung ultrasound be optimally integrated into clinical practice? For instance, we suggest utilizing the ReDS system for less critically ill patient cohorts, as it is particularly effective in identifying subclinical pulmonary congestion.[4] Conversely, lung ultrasound may be more appropriate for critically ill patients, as these individuals often face challenges in assuming a seated position with natural breathing, which is required for proper ReDS device application and measurement.[2] The lung ultrasound can be applied without patients' cooperation.

Keywords

Heart Failure; Hemodynamics; Lung

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Reply

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A significant proportion of patients had an unfavorable result in the severity of congestion when using lung ultrasound and ReDS. Congestion was more often detected by ReDS than by ultrasound, however, there were isolated observations with opposite results. Unfortunately, given the limitations of our sample, we will not be able to

provide statistically confirmed differences between groups of patients with a discounted outcome and groups with matching outcomes. However, based on literature data and our own clinical experience, we can say that some characteristics of patients may have the opposite effect on the obtained ReDS and ultrasound data. Thus, obesity will underestimate the number of B-lines[1] and overestimate the value of ReDS[2] and vice versa with a lower body weight. In patients with COPD/BA, the number of B-lines may also be paradoxically high even in the absence of heart failure,[3] and according to ReDS, congestion in such patients may be not marked.[4] Although it is more often represented by individual observations, in our work we also noted a statistically significantly lower congestion in patients with concomitant COPD. We also noted a negative correlation of ReDS with age, in the absence of a relationship between age and the number of B-lines. Interestingly, the greatest number of discordant results was at discharge, which probably reflects the different rate of elimination of congestion in different compartments (vascular, interstitial, etc.).

The dynamics of ReDS during hospitalization can be assessed by different methods, and the ratio of the ReDS value at discharge and admission[5] may have a prognostic value greater than the presence/absence of congestion at discharge, determined by standard values. However, the predictive value of ReDS was not evaluated in the framework of the published work. It should be noted that the proposed ratio value of >100% only reflects the absence of positive dynamics (or negative dynamics). It should be noted that most patients will have positive dynamics, for them the conclusion about the ratio <100% is meaningless, it is the presence of residual congestion at discharge that requires assessment in such patients to understand further tactics and risks. In addition, this ratio may be misinterpreted in patients with right ventricular failure.

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