

Conceptual Approach to Body Fluids and Edema, Education Determines Clinical Outcomes in Heart Failure

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In this brief communication, we reemphasize the importance of critical thinking in clinical practice using the example of edema. The common practice of thinking and inquiry by practicing clinicians has beneficial implications for healthcare by improving outcomes and patient care while alleviating the burden of misconceptions in practice. We provide an in-depth and interactive investigation of physiological concepts as a foundation for understanding body fluid dynamics. Finally, we offer a new classification of symptoms of heart failure.

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INTRODUCTION

Heart failure is a prevalent condition worldwide, with data indicating a consistent rise in both incidence and prevalence. The causes of heart failure vary by location, including hypertension and rheumatic heart disease in underdeveloped countries to degenerative valvular and myocardial disorders resulting from aging populations in Europe and North America. Heart failure is ubiquitously present around the world, and its burden on global health is compounded by its significant adverse outcomes, which are independent of age, etiology, and region. The global community must invest in tackling this growing epidemic as a major priority, with a focus on a few key areas.¹

One of these critical areas of focus is the link between heart failure and the development of edema which further complicate its diagnosis and management.² We define edema simply as the clinically identifiable accumulation of interstitial fluid. Such an accumulation occurs whenever asymmetric starling forces favor fluid filtration over absorption (including lymphatic drainage). Edema could occur from either localized or widespread systemic factors, as shown in cases of congestive heart failure.² Due to the intrinsic complexities of edema in heart failure

and often other concurrent comorbidities associated with these patients, choosing the right approach to classify, diagnose, and manage edema is a particular challenge. Hence, we revisit previous approaches and make comparisons to more current guidelines. Such critical assessment and analysis of “old” and “recent advances” in the approach to edema in heart failure will enable more comprehensive, logical, and evidence-based patient treatment options that can yield optimum clinical outcomes and improve patient quality of life. In addition to the above objective, we hope that the contents of this report guide the thought process of future clinicians in the field to integrate critical thinking with evidence-based medicine into their optimal practice.

Imagine a clinical scenario where a young patient with heart failure complains of extreme fatigue and dizziness during activity with minimal congestive signs. She dies, and her cause of death is attributed to severe hypoperfusion of vital organs. Another patient is similarly diagnosed with heart failure, but unlike the former, presents with significant generalized edema and is able to meet tissue perfusion demands. Why does this same disease have different clinical presentations and outcomes?

A classic definition of heart failure is the inability

because the heart beats faster to compensate for less blood being sent to the body.⁴

LEFT SIDE BACKWARD FAILURE AND EDEMA

In the early stages of congestive heart failure, insufficient cardiac output during stressful situations leads to periods of reduced kidney perfusion, RAAS activation and salt and water retention. The latter would increase tissue hydrostatic pressure and lower oncotic pressure, causing mild edema.⁵ In more advanced stages, fluid back-up behind the failing ventricle causes left atrium and lung congestion. This will, by extension raise the pressure in the pulmonary venous system and increase hydrostatic capillary pressure, leading to pulmonary edema, shortness of breath, and pulmonary hypertension (Figure).⁵ Eventually, this causes right-sided heart failure with obvious systemic congestive symptoms (see below).⁵

RIGHT SIDE BACKWARD FAILURE AND EDEMA

The most common cause of right-sided heart failure is left-sided backward heart failure, and they typically exist together. Similar to left-sided backward failure, in right-sided backward failure, there is a backup of blood into the venous circulation which goes to the right ventricle. This leads to vascular congestion in the vena cava with elevated ventricular filling pressures. As a result, jugular venous distension appears. The buildup of pressure causes an increase in the hydrostatic capillary pressure and finally results in fluid accumulation in the lower extremities, congestive hepatomegaly, and development of ascites.⁶

The initial retention of salt and water is an adaptive mechanism to maintain tissue perfusion and increase preload. However, the continued retention of salt and water gradually results in a substantial systemic congestion of fluid, eventually lowering tissue perfusion and even hindering a patient's mobility due to increased weight.⁷

CONCLUSION

Many clinical challenges in the management of edema could be due to insufficiencies of classical medical education. The reclassification of edema can be used practically to identify its manifestation in various diseases. We defined and classified edema as the clinically identifiable accumulation

of interstitial fluid, either a generalized systemic process, with redistributable fluid accumulation, or localized, which does not redistribute. Medical resources, mainly textbooks commonly used in education, are not a proactive source of updating information, especially in areas that would cause clinical management difficulties. The questioning and learning of fundamental theory by healthcare professionals, as presented here, prevents the preservation of popular misconceptions in practice and has beneficial implications for healthcare by improving care and patient outcomes.

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