The Phenotype of Polycythemia and Hypervolemia in Hospitalized Heart Failure Patients

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ABSTRACT

Heart failure patients have wide variations in intravascular volumes which form the basis for disease initiation and progression and contribute to confusion in treatment strategies. Blood volume ratios (BVR) is a bedside blood test that measures with BVR acccesses inaccuracies of intravascular volume measurements, including plasma and red blood cell volume (RBCV). Accurate measurement of intravascular blood volume allows for more precise individualized treatment and patient care. Here we present new data on the presence and prevalence of polycythemia and the relationship of RBCV in hospitalized heart failure patients. In the current study, 245 hospitalized heart failure patients (142 men and 103 women) were included with 123 of the patients having a LVEF <40% and 122 with a LVEF >40%. 25 patients had P/Hypervol and 3 patients had P/Hypovol with normal or low total blood volume. The presence of this phenotype was seen equally in patients with HFpEF and HFrEF (62%/48%).

METHODS

245 consecutively admitted patients with heart failure underwent blood volume analysis (BVA, Daxor, Corp., Oak Ridge, TN) to guide hospital care. The report provided personalized measurements of total blood volume, red blood cell volume and plasma volume, as well as percentage of excess or deficit according to patient specific norms. Also, the result included the patient’s peripheral hematocrit (pHct). P was an excess of > 10% of the predicted RBCV/hypervolemia (Hypervol) was an excess of ≥ 10% of total blood volume (TBV).

RESULTS

The 245 consecutively admitted HF patients included 142 men and 103 women and included 123 pts with a LVEF <40% and 122 with a LVEF >40%. 25 patients had P/Hypervol and 3 patients had P/Hypovol with normal or low total blood volume. The presence of this phenotype was seen equally in patients with HFpEF and HFrEF (62%/48%).

P/Hypervol pts tended to be younger, and all had a BMI of 35 or less. When compared to measured RBCV, the pts with P/Hypervol had a peripheral Hct that was normal 57.1% of the time, or >10% below normal 39.3% of the time (p=0.0015). Conversely, the BVA provided normalized Hct was > 45 in 93% of patients with the phenotype. In terms of outcomes at 30 days post discharge 12% of the phenotype were readmitted, similar to other BVA phenotypes; no deaths occurred in the P/Hypervol phenotype within 30 days. Further, there were no deaths in the phenotype in the first year following discharge however readmissions did occur (56%) in the phenotype but similar to those with other BVA phenotypes (62.3%).

CONCLUSIONS

P in heart failure has been thought to occur in 1.2-5.9% of heart failure patients, but has been suspected to be underestimated. Using precision BVA measurement of RBCV in patients admitted for heart failure the following guidance has emerged:

• P was present in 11.4% of the admitted patients; equally across LVEFs.
• HYPERvolemia commonly is associated with P with increased risk of expansion of 2 intravascular volumes.
• Patients with P did not have the usual linkages to secondary P risk factors such as older age or an increased BMI.
• Peripheral Hct measurement grossly underestimates the prevalence of P. In 2012 Maurer and colleagues, using BVA, identified “masked polycythemia” in heart failure. This has been also been reported by Miller (2016) and unexpected excesses of RBCV can approach + 100% of patient norms.
• Support and evidence is emerging to measure RBCV when possible rather they rely on a peripheral hematocrit which often over- and under-estimates RBCV.
• While in this cohort managed from the time of admission using BVA guidance did not have increased 30-day readmissions or mortality at one year compared with the rest of the cohort, the discrepancy with the peripheral hematocrit might confound clinicians into thinking the patients with a lower peripheral hematocrit were dilutional low, and use diuretics with further hemocoencentration risking increased blood viscosity and thrombotic events.
• Without recognizing the P and considering therapeutic phlebotomy, euvelomia cannot be achieved.
• Further attention to the presence of P in heart failure patients and to consider novel and older approaches to attain euvelomia-normalization of all intravascular volumes.

REFERENCES


Disclosures: Dr. Silver is a medical advisor to Daxor. Dr. Strobeck is a consultant to Daxor. J. Feldschuh is Chief Scientific Officer for Daxor.