Introduction of Blood Volume Analysis to Guide Ambulatory Advanced Heart Failure Care

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Material & Methods

Methods: Between January 2023, and September 2023 83 patients (18 men and 11 women) aged 19-81 years (mean 62) attending the Banner University Medical Center Advanced Heart Failure Clinic underwent BVA as part of a quality improvement process. The results were integrated with other imaging, laboratory and clinical assessments to guide and inform treatment decisions. To understand the added value we and our patients derived from integrating BVA as a diagnostic tool, we queried the database to help answer 2 key initial questions: 1) Does the ability to measure and know patient intervascular volume expand clinical and laboratory assessments provide incremental and actionable knowledge beyond our initial assessments, 2) does knowing the relative contributions of TBV and RBCV aid in understanding disease severity and identifying priority therapeutic targets, and 3) how does measuring RBCV as an individual treatment link to potential blood therapeutics and clinical outcomes? All measurements were performed with a Decay (Oak Ridge, TN) Blood Volume Analyser (BVA-100). These results are below, and in the central panel.

Results: As is well established in heart failure there were wide variances and deviation from normal in the all volumes. TBV expressed as % of normal ranged from -27.9% (deficit) to +59.7% (excess); RBCV similarly ranged from -48.4% (deficit) to +66.1% (excess).

Table 1. Distribution of TBV and RBVC Volumes by Zones of Derangement Severity (N=83) (see text)

<table>
<thead>
<tr>
<th>Zone</th>
<th>&lt;0 to</th>
<th>10% deviation</th>
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<tbody>
<tr>
<td>Zone 0</td>
<td>11</td>
<td>20%</td>
</tr>
<tr>
<td>Zone 1</td>
<td>21</td>
<td>30%</td>
</tr>
<tr>
<td>Zone 2</td>
<td>31</td>
<td>40%</td>
</tr>
<tr>
<td>Zone 3</td>
<td>&gt;40</td>
<td>%</td>
</tr>
</tbody>
</table>

Each zone can be expressed as a negative (-) % (deficit) or positive (+) % (excess).

Figure 1. Distribution of TBV and RBVC Volumes by Zones of Derangement Severity (N=83) (see text)

SUMMARY / CONCLUSION

BVA in our patients provided previously unknown and otherwise un-measurable information on their individual derangements of their intravascular blood volumes.

Both TBV and RBCV became targets for adjustment in therapeutics and helped guide an improved understanding of intravascular circulatory physiology not otherwise available without quantitative analyses. A significant proportion of patients had variances with more severe variances in RBCV being observed.

While 41% of patients had "normal" TBV, only 29% had "normal" RBCV.

Conclusions:

1. In an Outpatient Advanced Heart Failure Clinic incorporating BVA allowed diagnosis of common, often severe, and clinically unsuspected variances in TBV and RBCV.
2. The frequency of the variances in RBCV tended to be greater and more severe that those found in TBV.
3. Identifying variances in RBCV provide an opportunity to evaluate and treat these patients with RBC therapies.
4. Our patients in general appear to have benefited from treatment of both TBV and RBCV which we plan to study in more detail.

References:


The authors kindly thank Dr. Wayne Miller for critical review and suggestions.