Impact Of Normal Intravascular Blood Volumes In Patients With Heart Failure: A Biomarker For Short- And Medium-term Outcomes

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ASM 2025
HFSA ANNUAL SCIENTIFIC MEETING
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INTRODUCTION

Derangements of intravascular blood volumes (IBV) (total blood volume (TBV), Red blood volume (RBCV) and Plasma volume (PV)) are common and early biomarkers in patients with heart failure. Indeed, guideline recommendations and current therapies stress evaluation of these derangements and target normalization.

AIM

In an ambulatory cohort of HF patients who underwent measurement of IBVs as part of their advanced heart failure evaluation, we hypothesized that baseline normal IBV's would be beneficial, connote better patient outcomes including lower risk for hospitalization, improved NYHA, better ability to up titrate GDMT (GDMT score*) and better CPET metrics.

METHODS

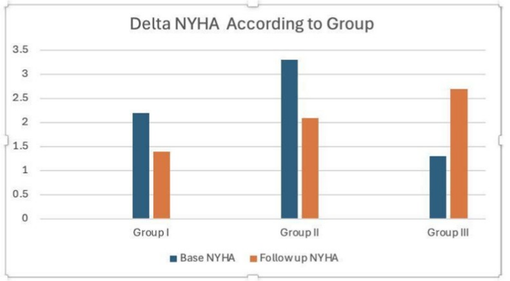
- N=202 patients
- Baseline BVA (Daxor, Oak Ridge, TN)
- 76 (37%) had a normal TBV (expressed as -10% to +10%).
- 48 of these patients had follow up data between 7-12 months
- 45 patients fell into 1 of 3 phenotypes:
  - Group I, normal TBV and normal RBCV and normal PV
  - Group II, normal TBV, increased or decreased RBCV and normal PV
  - Group III, normal TBV, decreased RBCV, and increased PV

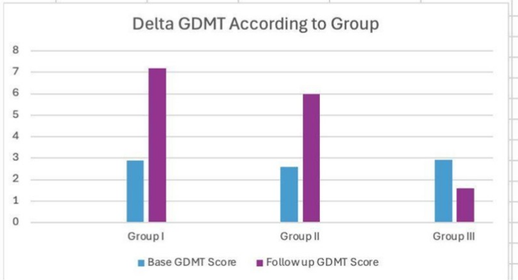
RESULTS

- Groups I and II had a 36% improvement in NYHA
- Group III had a 52% decline on follow up
- Groups I and I had an improvement in GDMT score on follow up
- Group III had a decline in GDMT score
- Baseline CPET variables (figure) Group I had the best peak exercise VO2/HR (surrogate for stroke volume.)
- Hospitalizations:
  - No hospital admissions for group I
  - 8 (57%) unplanned admissions for group II
  - 10 (77%) admissions for group III
    - Including 1 patient who underwent heart transplant
    - 1 LVAD
    - 3 (23%) deaths.

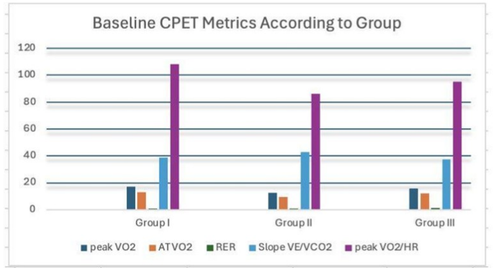
	Group I	Group II	Group III
Total Blood Volume*	-9.8 to +5.1	-8.5 to +9.7	-4.3 to +9.2
Plasma Blood Volume*	-9.9 to +8.9	-7.5 to +7.9	+12 to +40.7
Red Blood Cell Volume*	-9.8 to +6.3	-20.6 to 28.7	-10.5 to -47.4

- All values expressed as a percent predicted. (Normal -10% to + 10%)





GDMT Score: Fiuzat, et al. J Am Coll Cardiol 2022;79"504-510



CONCLUSIONS

These findings suggest *normal TBV* is critically important in guiding care for patients with heart failure as well as *normal individual TBV constituents* (red blood cell volume and plasma volume) which drive key HF targets including functional status, ability to tolerate GDMT up titration and exercise performance.

We are overdue for a re-calibration of the topic of "volume" in heart failure which needs to include IBV as well as measurement and treatment of the IBV components.

REFERENCES

Sauer, A. J., Beon, C., Cherkur, S., Mallas-Serdynski, L., Thomas, K., Spertus, J., Chahoud, G., Mody, K. P., Saltzberg, M. T., Goldberg, L. R., Lindenfeld, J., Sweitzer, N., Butler, J., Kittleson, M. M., Pina, I., Paul, S., Lewis, E. F., Wald, J., Allen, L. A., … Fonarow, G. C. (2025). Multiregional implementation initiative's impact on guideline-based performance measures for patients hospitalized with heart failure: Implement-HF. *Circulation: Heart Failure*, *18*(5). https://doi.org/10.1161/circheartfailure.124.012547

ACKNOWLEDGEMENTS

We thank all our Advanced Heart Failure team members, including our exercise physiologists for their support. We also thank the members of the Nuclear Medicine Department.

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