



Blood Volume Analysis (BVA) Clinical Case Study

Congestive Heart Failure

History:

This seventy-nine year old, 69" in height, 182lbs. Caucasian male complains of shortness of breath and fatigue. The patient's medical history includes hypertension, congestive heart disease and hemorrhoids. The patient was recently hospitalized for a coronary artery bypass surgery. The patient's medications include aspirin one a day, potassium chloride 100mg one a day, furosemide 40mg one a day (Diuretic), Synthroid 0.1mg one a day, Pacerone 200mg two a day, Zocar 20mg one a day, Coreg 25mg two a day (β Blocker), Cozaar 50mg. His blood pressure today was 120/88. Patient referred to evaluate his hypertension and congestive heart failure therapy.

BVA Results:

Blood Vol.	6621cc	Ideal Blood Vol.	5091cc	Excess	1530cc	Devtn.	30.1%
Red Cell Vol.	1909cc	Ideal Red Cell Vol.	2064cc	Deficit	155cc	Devtn.	-7.5%
Plasma Vol.	4712cc	Ideal Plasma Vol.	3027cc	Excess	1685cc	Devtn.	55.7%

Normal
0 to 8%

Mild
8 to 16%

Moderate
16 to 24%

Severe
24 to 32%

Extreme
>32%

Hematocrit: 30%

Clinical Findings:

This patient has severe hypervolemia with a red cell volume at the lower limit of normal, and an extreme plasma volume excess. These results are consistent with congestive heart failure. The hypervolemia is caused exclusively by expansion of plasma volume. This patient's hypertension is partially caused by hypervolemia. This patient most likely has extensive vasodilatation to accommodate this amount of hypervolemia. It is suggested that the patient's Lasix be supplemented with Aldactone at 25mg 1-2 times a day. Aldactone, which blocks the aldosterone-sodium retention process, would allow water and sodium to be excreted but will preserve potassium. This patient's apparent anemia (hematocrit of 30%) is an artifact and is completely due to his hypervolemia. If his blood volume were normalized his hematocrit would be in the 42-44 range. This quantification of total volume, red cell and plasma volume component will permit the monitoring of the patient's response to Aldactone by serial hematocrits. When the patient's blood pressure falls, it may be necessary to reduce the vasodilator therapy to avoid a hypotensive episode.

Technical Analysis:

Technical analysis consists of an evaluation of five separate blood volume collection points with mathematical evaluation of consistency. Technical evaluation is reported as acceptable or unacceptable.

All five individual sampling points, tested in duplicate, were internally consistent with no significant deviations. The standard deviation was 2.69%. The slope was 0.00107 and is normal. Therefore, the results are technically acceptable.



Blood Volume Analysis (BVA) Clinical Case Study

Congestive Heart Failure - 2

History:

This forty-nine year old male, 64" height and 169lbs. complains of shortness of breath. His past medical history includes hypertension and heart disease (diagnosed about five months ago). The patient's medications include Lisinopril 40mg (ACE Inhibitor), Urinal-1, Ecotrin 325mg, Digoxin 0.2mg (Cardiac Glycoside), NTG-SL 0.4mg prn (Vasodialator), Coreg 6.25 mg B.I.D.(β-blocker) and Lasix 80mg (Diuretic). The patient's blood pressure today was 142/96. The patient was referred to evaluate his hypertension therapy.

BVA Results:

Blood Vol.	5652cc	Ideal Blood Vol.	4462cc	Excess	1190cc	Devtn.	26.7%
Red Cell Vol.	2393cc	Ideal Red Cell Vol.	1809cc	Excess	584cc	Devtn.	32.3%
Plasma Vol.	3259cc	Ideal Plasma Vol.	2653cc	Excess	606cc	Devtn.	22.8%

Normal
0 to 8%

Mild
8 to 16%

Moderate
16 to 24%

Severe
24 to 32%

Extreme
>32%

Hematocrit: 47%

Clinical Findings:

This patient has a severe blood volume expansion with an extreme red cell volume excess. The patient also has a moderate plasma volume excess. The results are consistent with congestive heart failure. Diuretic therapy in this patient may provide some relief, but will result in an increase in hemoconcentration. The patient would benefit from a therapeutic phlebotomy which would reduce both his red cell and plasma volumes. The patient's medications should be reduced just prior to the therapeutic phlebotomy. Therapeutic phlebotomy should be performed in increments to determine the patient's therapeutic response. Reducing the patient's blood volume toward normal can be expected to improve his blood pressure control with lower quantity of medication.

Technical Analysis:

Technical analysis consists of an evaluation of five separate blood volume collection points with mathematical evaluation of consistency. Technical evaluation is reported as acceptable or unacceptable.

All five individual sampling points, tested in duplicate, were internally consistent with no significant deviations. The standard deviation was 2.14%. The slope was 0.00314 and is normal. Therefore, the results are technically acceptable.