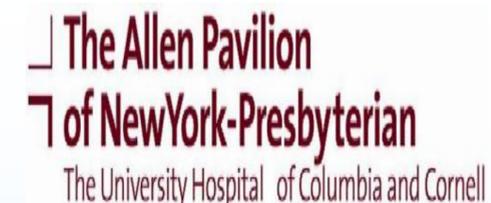




# Masked Polycythemia in Patients with Heart Failure and a Preserved Ejection Fraction: an underappreciated phenotype?

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## Background:

- Anemia is common in patients with heart failure and is diagnosed by low hemoglobin and hematocrit values measured by traditional methods. However, in heart failure, hemodilution as a result of expansion of plasma volume can confound these routine measurements.
- Indeed, previous data has suggested that almost half of all subjects with advanced heart failure have a hemodilutional basis of their anemia. (Circulation. 2003; 107: 226-229)
- It is also possible that polycythemia is masked by plasma volume expansion in subjects with heart failure, resulting in normal hemoglobin and hematocrit concentrations.
- We sought to evaluate the prevalence of masked polycythemia in heart failure and identify associated demographic and clinical features of subjects with this condition in order to facilitate identification of this cohort.

## Methods:

### Study Subjects:

- We studied 48 subjects with heart failure and a preserved ejection fraction.
- Average age of  $75.5 \pm 10.5$  years, 58% women, EF= $51 \pm 13\%$
- BNP of  $652 \pm 507.2$  pg/ml

### Blood volume analysis

- Performed with indicator dilution technique with radiolabeled albumin (Daxor Corp, NY, USA).
- Blood volume and red blood cell volume were calculated from the plasma volume measurement, the measured hematocrit corrected for trapped plasma, and mean body hematocrit.
- Blood volume components (plasma, red cell and total volume) were determined and compared to normal values adjusted for age, gender and weight on the basis of the ideal weight system to yield % deviations from normal.
- Normalized hematocrit (nHCT) is equal to the peripheral hematocrit (pHct) \* (total blood volume/ideal blood volume).

## Statistical Analysis

- Masked polycythemia was defined as normalized hematocrits of  $> 45\%$  in the presence of non-elevated routine peripheral hematocrits.
- We analyzed the data using paired t-test and the chi-squared method for comparison of subjects with masked polycythemia vs. no polycythemia.

## Results:

- Of the patients studied, 8 (17%) subjects had masked polycythemia with a normalized HCT of  $53 \pm 6\%$  compared with their peripheral hematocrit of  $39 \pm 3\%$ .
- Subjects with masked polycythemia did not differ from subjects without masked polycythemia in terms of age ( $71 \pm 9$  vs.  $77 \pm 11$  years,  $p=0.12$ ), gender (58% vs. 62%), EF ( $51 \pm 15$  vs.  $51 \pm 13$ ,  $p=0.96$ ) but did differ in terms of BMI ( $38 \pm 8$  vs.  $31 \pm 6$ ,  $p = 0.04$ ).

Table 1: Baseline Characteristics

Parameter	Overall (n=48)	Masked Polycythemia	No Polycythemia	P value
Age (years)	$76 \pm 11$	$71 \pm 9$	$77 \pm 11$	0.12
Gender (% female)	58	58	62	0.79
BMI (kg/m <sup>2</sup> )	32	$38 \pm 8$	$31 \pm 6$	0.04
Co-morbidities				
CAD (%)	88	10	90	0.84
HTN (%)	90	9	91	0.64
Peripheral Hct (%)	$33 \pm 4$	$39 \pm 3$	$32 \pm 3$	.00038
Normalized Hct (%)	31	$53 \pm 6$	$33 \pm 5$	.000014
GFR (ml/min)	44	$52 \pm 14$	$41 \pm 18$	0.24
EF (%)	$51 \pm 13$	$51 \pm 15$	$51 \pm 13$	0.96

## Blood Volume Characteristics

Blood Volume Parameter	Masked Polycythemia	No Polycythemia	P value
Total Blood Volume (ml)	$6832 \pm 943$	$4654 \pm 935$	0.0001
Plasma volume (ml)	$4466 \pm 785$	$3331 \pm 682$	0.0039
Red Cell volume (ml)	$2365 \pm 246$	$1323 \pm 296$	0.00000003
% Deviation of TBV	$37 \pm 19$	$6 \pm 13$	0.0021
% Deviation of PV	$43 \pm 21$	$23 \pm 18$	0.0052
% Deviation of RBC	$27 \pm 20$	$-21 \pm 11$	0.0002

As shown, the blood volume characteristics in those with and without masked polycythemia differed. Specifically, subjects with masked polycythemia had higher total blood volumes which was attributable to larger plasma and red cell volumes compared to subjects without polycythemia.

## Conclusions:

- A significant percentage of subjects with HFPEF have masked polycythemia (e.g. normal peripheral hematocrits) but elevated red cell volume and normalized hematocrits.
- Such subjects have higher BMIs suggesting that concomitant disorders such as sleep disordered breathing may be a contributing factor and future evaluation may be warranted.

## Disclosures:

None.