

## HIGH-FLOW AVF AND HEART FAILURE: COULD THE INDEXATION OF BLOOD FLOW RATE HAVE A ROLE IN THE IDENTIFICATION OF PATIENTS AT HIGHER RISK?

Vascular access surveillance

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### Introduction and Objectives

High-output cardiac failure (HOCF) secondary to an AVF is a well-described phenomenon in HD. Although it is suggested that only high-flow AVFs cause HOCF, there are no accepted criteria defining a high-flow AVF because data describing HOCF in ESRD are limited to case reports. One study has indicated that patients at greater risk for the development of HOCF are those with vascular access blood flow (Qa)  $\geq 2.000$  mL/min.

Purpose of this study was to evaluate, in patients bearing a fistula with Qa  $\geq 2.000$  mL/min, the presence of symptoms of heart failure, the relationship between Qa and cardiac output (CO), and the presence of echocardiographic alterations. Finally, our aim was to draw an identikit of the patient at higher risk for HOCF.

### Material and Methods

We selected 29 incident ESRD or transplanted patients bearing an AVF with a Qa  $\geq 2.000$  mL/min who were evaluated at our institutions between May 2012 and April 2014. All patients were assessed for the presence of heart failures' symptoms (NYHA Classification). AVFs were studied with colour-duplex ultrasound and Qa was measured. Transthoracic echocardiography was also effected and CO was calculated. Qa and CO were assessed in mL/min and then indexed for height<sup>2.7</sup> (mL/min/m<sup>2.7</sup>).

### Results

Characteristics of patients are reported in Table 1. The relationship between Qa and CO was not linear when both variables were assessed in mL/min (Figure 1A), but it became linear when they were indexed for height<sup>2.7</sup> (mL/min/m<sup>2.7</sup>) (Figure 1B). ROC curve analysis showed that when Qa was indexed for height<sup>2.7</sup>, Qa values  $\geq 603$  mL/min/m<sup>2.7</sup> predicted the occurrence of HOCF with good accuracy (sensitivity 100%, specificity 60%, area under curve 0.75, efficiency 86%). At the echocardiography, pts with Qa  $\geq 603$  mL/min/m<sup>2.7</sup> were characterized by a more severe increase of LV mass (LVM), LV diastolic volume (LVDV), LA volume (LAV) and by a higher incidence of grade II-III of diastolic dysfunction than other patients (Table 2).

### Conclusion

In the attempt to give a definition of high flow fistula, Qa should not be evaluated in mL/min but the relation between flow rate and body size should be thoroughly considered; in fact, the effect of Qa may differ in individuals with different body size. In our patients, a Qa value  $\geq 603$  mL/min/m<sup>2.7</sup> was able to predict the occurrence of heart failures' symptoms. The association of such Qa value with some echocardiographic alterations (severe increase of LVM, LVDV, LAV and diastolic dysfunction grade II-III) could allow us to identify patients at higher risk for HOCF.

**Table 1 Demographic and clinical characteristics**

	n=29
Age ( <i>years</i> )	50.9±10.9
Male Gender (%)	69
HD vs Transpl (n)	22 vs 7
Dialysis Vintage ( <i>months</i> )	66 (33-143)
BMI	24.3±4.5
Diabetes (%)	0
Cardiovascular Disease (%):	
Myocardial Infarct	3
Stroke	10
Periph Vascular Dis	7
Distal/Proximal AVF (%)	28/72
Qa ( <i>mL/min</i> )	3068 (2319-3752)
CO ( <i>mL/min</i> )	7457±1644
Symptoms of HF ( <i>n</i> ):	
NYHA I	10
NYHA II	14
NYHA III	5

**Table 2 Echocardiographic parameters**

AVF Blood Flow ( <i>mL/min/m<sup>2.7</sup></i> )	< 603 (n=6)	≥ 603 (n=23)	P
LV Mass ( <i>gr/m<sup>2.7</sup></i> )	47±7	63±18	0.003
LV Diast Vol ( <i>ml</i> )	109±14	140±42	0.007
LA Volume ( <i>mL/m<sup>2</sup></i> )	39±5	53±23	0.015
EF (%)	58±10	57±11	NS
Diastolic Dysfunction (%)	17	70	0.019

