Publication Brief

Arteriovenous Fistula, Blood Flow, Cardiac Output, and Left Ventricle Load in Hemodialysis Patients

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OBJECTIVE
To investigate an association between vascular access flow (QVA), cardiac output (CO), and load of left ventricle (LLV) using a simple physical model calculation based on real data, specifically in patients with high access blood flow arteriovenous fistula (AVF).

STUDY
• Group 1: 15 patients with high access blood flow (QVA >1,300 mL/min).
• Group 2: 40 unselected patients with access blood flow (QVA range 200-1,400 mL/min were added to evaluate association of LLV and QVA over a wider range of QVA magnitude.
• QVA, CO, and PR (Peripheral Resistance) were determined by ultrasound dilution technique (HD01) during the first hour of dialysis sessions.

RESULTS
• Differences in LLV, LLV_{AVF} (the part of the overall LLV used to run the flow QVA through the AVF), and LLV_{SYSTEMIC} (the flow through the entire remaining vascular system without the AVF) are highly statistically significant between Group 1 and Group 2. But when related to body surface area (BSA), only the LLV_{AVF}/BSA showed statistically significant difference between the two groups.
• Strong and nonlinear association between QVA and LLV_{AVF}.
• In Groups 1 and 2 taken together, significant correlation was found between QVA and Cardiac Index (CI) in data from the two groups together.

STUDY’S CONCLUSIONS
• Vascular access blood flow values in normal range do not seem clinically important and should not significantly affect the heart.
• An AVF with very high QVA consumes disproportionally high part of the LLV and may thus have negative effect on myocardium in the long-term perspective.

TAKE HOME POINTS
• Prolonged high access flow (>1,600~2,000 mL/min) can stress the heart causing cardiomegaly (especially left ventricle hypertrophy) and heart failure.
• Transonic® Flow-QC® Cardiac Output Program automatically calculates Cardiac Index (CI) using a patient’s weight and height and identifies dramatic decrease in CI to a dangerous level which indicates potential cardiac problems, inappropriate dry weight estimation, and/or inadequate medication.

REFERENCE