

How the HD03 Improves Your Patients' Outcomes



The Transonic® Gold Standard Hemodialysis Monitor Assures Flow-based Quality Assurance through:

- Dialysis Adequacy Optimization
- Vascular Access Trending
- Cardiac Function Assessment

HD03 Hemodialysis Monitor

Hemodialysis Adequacy Optimization

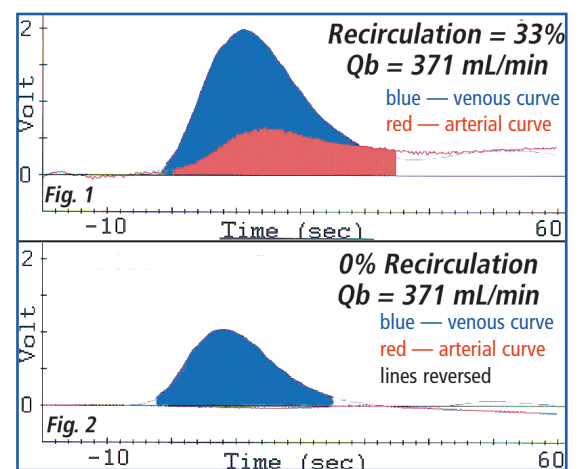
1. Identifies Discrepancy Between Pump Setting & Delivered Blood Flow As A Result of:

- Negative pressure effects of the roller pump
- Condition of access
- Needle size
- Needle placement
- Kinked or occluded tubing
- Calibration of dialysis machine
- Change in type of dialysis tubing
- Calibration of Transonic® Flow/dilution Sensors

2. Ensures Correct Needle Placement

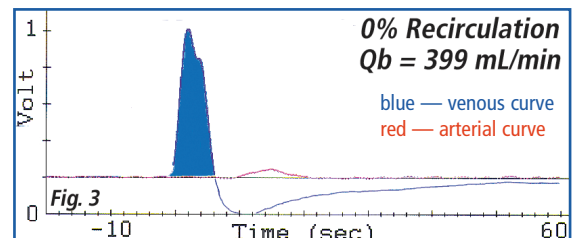
When Transonic® Hemodialysis Monitoring first shows vascular access recirculation (Fig. 1), which disappears after the blood lines are reversed and the recirculation measurement is repeated (Fig. 2), the hemodialysis lines have been inadvertently reversed.

Transonic® Hemodialysis Monitor screenings show that dialysis occurs with the needles inadvertently reversed in more than 4% of cases.



3. Confirms 0 % Recirculation

In contrast to measurement technologies that cannot separate vascular access recirculation from cardiopulmonary recirculation and, therefore, show false positives, Transonic® Hemodialysis Monitoring can separate access recirculation from the cardiopulmonary (the red curve in Fig. 3) and can report zero % recirculation.

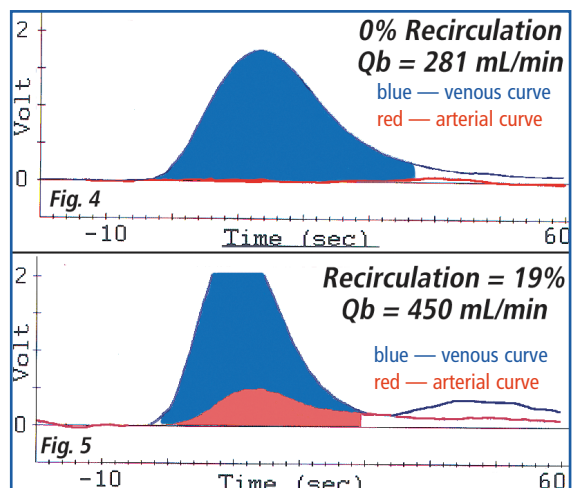


4. Optimizes Dialysis in Dual-lumen Catheters

Catheter recirculation is an early sign of catheter failure and usually depends on dialysis blood flow. The patient in Fig. 4 was dialysed at flows up to 300 mL/min without any recirculation. At flows higher than 300 mL/min, such as 450 mL/min shown in Fig. 5, 19% recirculation occurred.

Therefore, increasing delivered blood flow (Qb) did not proportionally increase the quality of dialysis.

Note: Discrepancies between pump flow and real delivered flow can also be more dramatic with catheters than with vascular accesses.



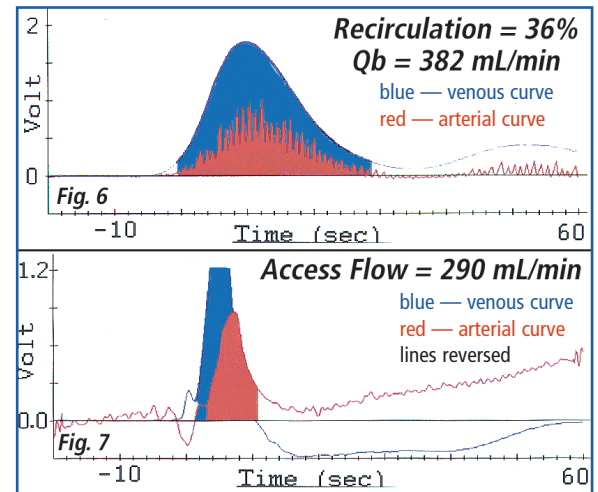
Hemodialysis Quality Assurance

Vascular Access Trending

5. Recirculation with Low Access Flow Detects Significant Inflow/Outflow Stenoses

Unlike other technologies that can only identify outflow stenoses in AV accesses, HD03 Monitor trending can detect a stenosis wherever it occurs within the vascular access circuit: inflow, outflow or between the needles in both fistulas or grafts.

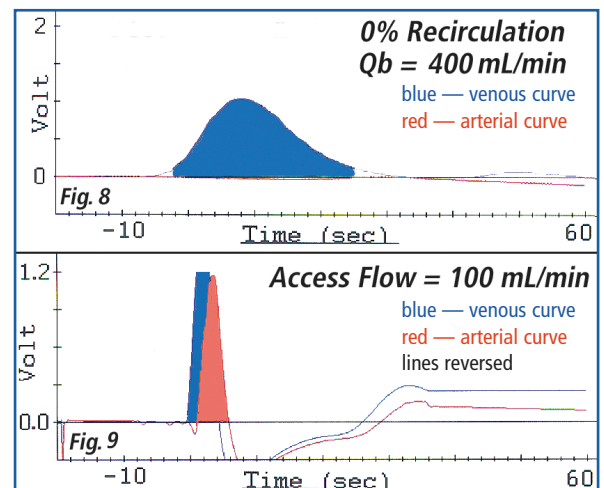
In the example on the right, access recirculation (Fig. 6), accompanied by low vascular access flow (Fig. 7), indicated the presence of a significant stenosis which was then confirmed by color Doppler and fistulogram.



6. 0% Recirculation & Low Access Flow Pinpoints Stenoses Between Needles

When a significant stenosis is located between the hemodialysis needles, hemodialysis pump flow simply bypasses the stenosis without producing any recirculation.

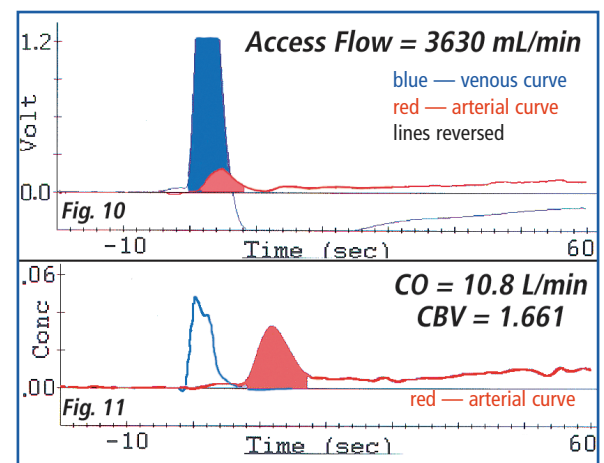
When low access flow (Fig. 9) is accompanied by 0% recirculation (Fig. 8), a stenosis between the dialysis needles can be suspected. A stenosis between the needles can be confirmed by a color Doppler image.



7. Cardiac Output Check Indicates Potential Cardiac Overload

In the case example on the right, vascular access flow measured more than 3 L/min (Fig. 10). Cardiac output exceeded 10 L/min (Fig. 11). When the vascular access was briefly occluded by the tip of the examiner's finger, the patient's pulse rate dropped from 112 to 88 per min. This patient had complained of chest pains and had been diagnosed with cardiomegaly.

The access was surgically revised by banding. Following the revision, access flow then measured 1700 mL/min. Cardiac output dropped to 7-8 L/min. The patient exhibited fewer post-dialysis hypotensive episodes, his dry weight decreased, his chest X-Ray cleared and he reported significant improvement in his previous symptoms.



Summary: Flow-based Quality Assurance

Hemodialysis Adequacy

- Tests calibration of the blood pump;
- Verifies true delivered blood flow and compares delivered blood flow to pump setting to identify flow disparity and avoid underdialysis. If disparity is significant, Flow-QC® assists in determining cause (blood pump calibration versus inflow restriction/excessive pre-pump negative arterial pressure);
- Detects and quantifies access recirculation in AV access and catheters;
- Identifies inadvertent reversal of dialysis lines to prevent recirculation and/or underdialysis;
- Determines proper needle placement;
- Identifies sources of large negative arterial blood line pressure (and its resulting underdialysis);
- Determines the most appropriate blood pump setting for a low flow access when it is not feasible to increase access flow;
- Provides delivered flow and recirculation measurements to maximize catheter function.

Vascular Access Measurements

- Tells actual function in AV grafts and fistulas in order to identify failing accesses and avert underdialysis and/or thrombosis;
- Indicates effectiveness of interventions (post-intervention surveillance) or limb ischemia;
- Excludes access dysfunction quickly as cause of underdialysis;
- Identifies a mid-access obstruction;
- Identifies high-flow versus low flow accesses to select ideal treatment plan for correction (flow-restricting versus re-vascularization procedure);
- Permits access trending to be performed by the clinic's staff who then can alert nephrologist to possible onset of access dysfunction & referral for early intervention
- Implements quality assurance measures for patient care with Gold Standard reference method.



Transonic Systems Inc. is a global manufacturer of innovative biomedical measurement equipment. Founded in 1983, Transonic sells "gold standard" transit-time ultrasound flowmeters and monitors for surgical, hemodialysis, pediatric critical care, perfusion, interventional radiology and research applications. In addition, Transonic provides pressure and pressure volume systems, laser Doppler flowmeters and telemetry systems.

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