Publication Brief

Clinical measurement of blood flow in hemodialysis access fistulae and grafts by ultrasound dilution.

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BACKGROUND
Because blood flow is a fundamental property of hemodialysis, its periodic monitoring could be useful for detection of impending access failure and prevention of underdialysis. However, to date, simple measurements of access flow during hemodialysis are unavailable.

METHOD
• Flow in peripheral arteriovenous fistulas and grafts was measured using an indicator dilution technique that calls for reversal of the patient’s blood lines (Krivitski Method®).
• The indicator was a bolus of normal saline.
• The ultrasound sensor clamped onto the patient’s blood line measured blood flow in the dialysis tubing using established transit-time ultrasound methodology. The saline dilution of blood from changes in the average cross-sectional velocity of an ultrasound beam that illuminated the blood flowing through the tubing was simultaneously detected.
• Access flow was measured 110 times in 25 patients: 16 with loop grafts and 9 with native fistulas.
• Access flow was measured at three dialyzer blood flow rates to assess the adequacy of saline mixing with the blood,
• A comparison with access flow measured by a duplex color Doppler technique was performed in seven patients.

RESULTS
• Access flow measurements ranged from 125 to 2860 mL/min.
• The mean error of duplicate measurements within patients was 5.0 +/- 3.8%.
• In paired studies, no significant difference was found in access flow measured at two lower dialyzer blood flow rates when compared to flow measured at 350 mL/min.
• A paired comparison with access flow measured by a duplex color Doppler technique produced a mean error of 9.2 +/- 7.2%.

CONCLUSION
Data show that blood flow in peripheral arteriovenous grafts and fistulas can be accurately measured during hemodialysis using ultrasound velocity dilution.

REFERENCE
(Transonic Reference # HD7V)