Technical Note

Comparing and Contrasting the Fresenius OLC and Transonic HD03

BACKGROUND

In dialysis, one of most critical quality-of-care issues is early identification of access dysfunction. Access dysfunction can cause a host of health problems for the patient, some of which can be life-threatening. Conscentious clinicians are always in search of better treatment methods, but treatment presupposes pathology. As always, the best patient care is prevention. Two major methods of detecting access dysfunction have come to market: the Fresenius OLC method, and the Transonic UD method, but these systems function in radically different ways, so this paper will detail the differences.

COMPARISON

OLC and UD measurements correlate reasonably well at low flows (less than 800ml/min) but that the correlation begins to drift as flows increase. So if the two methods produce different results, then only one question remains: which method is more accurate? To answer this question, we must first consider the technology behind each measurement.

FRESENIUS OLC

The Fresenius Online Clearance Methodology (OLC) uses a short-term increase of sodium in the dialysate inflow side. Conductivity sensors measure dialysate sodium concentration pre- and post-dialyzer to estimate the effective dialyzer urea clearance (Kecn). Change in sodium transfer is estimated in the normal line configuration, then the needles are reversed and the measurement is performed again. The two Kecn values are used to estimate the flow, but the range is limited to 2000ml/min. (Transonic's HD measures up to 4000mL/min to eliminate the manual conversion that follows). As frequently occurs for the OLC, a result >2000ml/min requires user calculation of a delta, followed by manual intpretation via a lengthy decision chart. This is required because, counterintuitively, results of >2000ml/min often indicate dangerously low flow. **Note that this is the only measurement offered by the Freseinus OLC, and the Freseinus device has no measurement capability at all in catheters. Additionally, this measurement requires a line reversal, which Transonic Delivered Flow and Recirculation do not.**

TRANSONIC HD03

For access surveillance, the Transonic HD03 takes not one, but three major flow measurements: Delivered Flow, Recirculation and Access Flow.

Delivered Flow is measured by Transit-Time Flow Measurement (TTFM). Unlike the OLC method, which takes multiple solute estimates from which it extrapolates an approximate flow rate, ultrasound dilution is a direct measurement of real-time flow. Two crystal transducers create full-window ultrasound illumination of the vessel cross-section. The ultrasound wave is reflected obliquely back and forth across the vessel, alternating with the blood flow and against it. This alternately phase-shifts the ultrasound wave forward and backward, and the difference between difference between the two allows the machine to give the user a precise measure of real-time volume flow. **Note that Fresenius OLC requires multiple measurements and a line reversal. Transonic Delivered Flow requires only a quick, single measurement with no line reversal. Additionally, unlike Fresenius, Transonic Delivered Flow measurements can be taken in grafts, fistulas, and catheters.**

Recirculation is measured via a saline indicator, which is injected into the venous bloodline. Recirculation returns the saline indicator to the arterial bloodline where the diluted blood is detected by the arterial sensor. On the HD03 screen, the first blue curve indicates the saline dilution as blood flows through the venous sensor. The second red curve represents saline dilution as flow passes through the arterial sensor. Recirculation is calculated as a ratio of the area under the arterial curve to the area under the venous curve. **Note that Fresenius OLC requires multiple measurements and a line reversal. Transonic Delivered Flow requires only a quick, single measurement with no line reversal. Additinally, unlike Fresenius, Transonic Recirculation measurements can be taken in grafts, fistulas, and catheters.**

Access Flow is based on the The Krivitski Method. This method calls for the temporary reversal of arterial and venous blood lines at their respective needle connections to create mixing conditions conducive to an indicator dilution flow measurement when a bolus of isotonic saline is injected into the blood circuit. Classic dilution equations are used to calculate vascular access flow. Unlike Fresenius technology, for which measurements above 2000mL/min can have variable (even opposite) meanings depending upon the user's interpretation, Transonic technology has a a greater upper limit (4000mL/min) meaning Transonic measurements above 2000mL/min are reliably indicative of potential Steal Syndrome, hand ischemia, or high-output cardiac failure. Therefor Transonic's HD03 allows for immediate, decisive patient-care action by the user. **Additionally, Transonic tech can take Access Flow measurements in grafts and fistulas.**

Clinical Application of the Transonic HD03 Measurements

Delivered Flow can differ from the dialysis pump setting. It is important to compare the pump setting to the actual circuit flow to optimize a dialysis patient's treatment on the spot.

The HD03 separates vascular access recirculation from cardiopulmonary recirculation (CPR). The HD03 measures the actual percentage of recirculation. The HD03 measures Access Flow up to 4000 mL/min. Changes in the Access Flow can indicate access dysfunction, including inflow stenosis and outflow stenosis. The Access Flow measurements are used to trend changes over time and to confirm other clinical indicators, including physical exam indications of dysfunction. In short, Transonic offers the user more measurements in a faster, more accessible manner.

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