RECIRCULATION STUDIES

Bottomline:

Recirculation is often a sign of fistula stenosis or a sign of inadequate access flow rates (Mohan et al., 2010:1). Arteriovenous fistulae and grafts develop stenoses over time and if detected and corrected early can help to prevent inadequate dialysis and other complications related to access dysfunction (Mohan et al., 2010:4)

Any one of the following criteria should warrant undertaking recirculation studies to confirm whether or not recirculation of blood is taking place within a patient’s fistula or graft (Ball, 2005:612)

- A progressive decrease in adequacy from month to month
- Inability of achieve normal blood pump speeds
- An progressive increase in venous pressures
- Difficulty advancing the needles
- Blood squirting out around needles during cannulation
- Increased bleeding post cannula removal

It should be understood that if the blood flow through the fistula or graft (Qa) is less than the compensated blood pump speed, there is an increased risk for recirculation to take place (Mohan et al., 2010:4)

An access blood flow (Qa) through a native fistula of less than 500ml/min and through a graft of less than 600ml/min have the potential to cause recirculation, and can be an indication that a stenosis is forming (KDOQI, 2006).

Significant access recirculation can occur in the low-pressure system of an AVF without an associated increase in venous pressure making early detection difficult. Recirculation can also take place due to inappropriately close positioning of needles, inadvertent reversal of lines, and fistulae with branches and collaterals (Mohan et al., 2010:4)

What other guidelines say:

Cari:

- No data available

KDOQI:

- An organized monitoring and surveillance approach for assessment of a haemodialysis access has been shown to be beneficial and is therefore recommended (Mohan et al., 2010:1)
Procedure for undertaking recirculation studies:

Method 1:

Three sample technique using a low blood flow protocol:

1. Prepare three yellow top blood tubes, with patient labels attached, and marked ‘Arterial’, ‘Venous’ and ‘Systemic’ samples respectively
2. Perform the test 30 minutes into dialysis
3. Seek the assistance of a second person
4. At 30 minutes into the dialysis session, turn off the UF
5. Simultaneously, draw the Arterial (A) and Venous (V) samples from the Arterial and Venous line ports respectively
6. Reduce the BFR to 50mls/min for 10 seconds
7. Draw Systemic (S) sample from the Arterial line port between the 10 and 30 seconds
8. Return the blood pump to the normal BFR and turn on the UF
9. Request a urea content for each of the above samples. Place the results into the equation below and note the percentage of recirculation
10. Values >10%, particularly in conjunction with any of the above physical signs, must be brought to the attention of the VAN for further investigation, such as a bedside and/or formal ultrasound to confirm any stenoses, a reduction in access blood flow (Qa) or possible narrowing of vessel walls

Calculation:

\[
(A) = \underline{\text{_______}} \\
(B) = \underline{\text{_______}} \\
(S) = \underline{\text{_______}}
\]

\[
\text{Recirculation} = \left[ \frac{(S - A)}{(S - V)} \right] \times 100\%
\]

Result: \underline{\text{_______}}

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Method 2:

Effective Ionic Dialysance (EID)/Blood Flow Rate Ratio (Qb):

EID is measured by the Diascan at regular 30 minute intervals.

Using EID corrected for the blood flow (EID/Qb) as an indicator for AR during HD.

NaCl diffusivity approximates urea diffusivity across the dialyzer membrane (Mohan et al., 2010:1).

NaCl clearance can be calculated from dialysate conductivity measurements.

Dialysis adequacy and effective urea clearance is adversely affected by recirculation and is reflected in a lower EID (Mohan et al., 2010: 5).

The presence of ≥5% access recirculation during dialysis is considered significant and lowers EID at a given Qb, thereby lowering EID/Qb (Mohan et al., 2010:2).

A EID/Qb ratio of ≤50% is a marker for potential recirculation and needs to be investigated further. NB: A 50% cutoff point represents a higher diagnostic accuracy, sensitivity and specificity (Mohan et al., 2010:3).

Compensated blood flow rate (Qb) is an estimate of the actual blood flow rate through the dialyzer determined by the operator-set blood pump speed and the negative arterial pressure.

Calculation:

1. Note the EID measured by the Diascan (taken at regular 30 minute intervals).
2. Note the corresponding compensated BFR.
3. Calculate EID/Qb for 3 consecutive measurements.
4. EID/Qb of ≤50% requires further investigation by VAN.

References:


Berkoben, M and Blankestijn, P. 2009 *Arteriovenous fistula recirculation in haemodialysis UpToDate*.

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http://uptodateonline.com/online/content/search.do?search=vascular+access+recirculation
<Accessed 2009, June 1>


