COMPARISON OF UREA RECIRCULATION AND THERMODILUTION TO MONITOR VASCULAR ACCESS IN HEMODIALYSIS.

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INTRODUCTION:

Patients with stage 5 chronic kidney disease in hemodialysis need to maintain stable the vascular access (VA) to assess the efficacy of renal replacement therapy. During the last years, tools to measure vascular access flow have been developed and they are considered as the gold standard to VA surveillance. Recirculation is an old method to detect VA dysfunctions, but can be used as a complementary tool.

The objective of the present study is to compare urea recirculation with thermodilution method by blood temperature monitoring (BTM®) and their value to predict a vascular access dysfunction.

MATERIAL AND METHODS:

This is a descriptive study. Urea recirculation (UR) and recirculation with thermodilution (BTM) were measured baseline at the beginning of the study. A 6 months follow up was completed. We collected all events related to vascular access (VA).

Study population:

We selected all prevalent patients older than 18 years from our dialysis unit, with a functioning native arteriovenous fistula (AVF) or polytetrafluoroethylene (PTFE) graft. Inclusion criteria were a clinical and vascular access stability.

Recirculation measurement:

To calculate urea recirculation (UR) we performed three blood tests obtained from arterial line, venous line and peripheral line. We applied the equation:

$$UR\ (\%) = \left[\frac{\text{Peripheral urea} - \text{Arterial urea}}{\text{Peripheral urea} - \text{Venous urea}}\right] \times 100$$

Thermodilution recirculation (BTM®) was measured in 4008 and 5008 monitors (FMC Bad Homburg Germany®).

RESULTS:

UR= 9.5 ± 6.6 %
BTM= 12.9 ± 4.3 %
P: 0.001

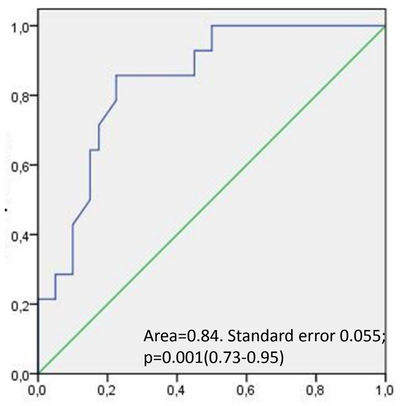
80% had BTM <15%
61% had UR < 10%

BASELINE CHARACTERISTICS	N:61
Age (years)	55±15
Sex (M/W) (%)	58/42
Diabetes (%)	25
Hypertension (%)	75
Dialysis vintage (months)*	75 (35-108)
OL-HDF (%)	85
Mean Kt/V per session	1,9 ± 0,6
Mean ionic dialisance per session (ml/min)	284 ± 40
Vascular access vintage (used) (months)*	28 (10-52)
Flow pump speed (Qb) (ml/min)	450 ± 51
Vascular access arterial pressure (mmHg)	-185± 33
Vascular access venous pressure (mmHg)	170± 29

	UR >10%	UR <10%	Total	BTM >15%	BTM <15%	Total
VA dysfunction yes	12	3	15	5	10	15
VA dysfunction no	10	36	46	7	39	46
Total	22	39	61	12	49	61

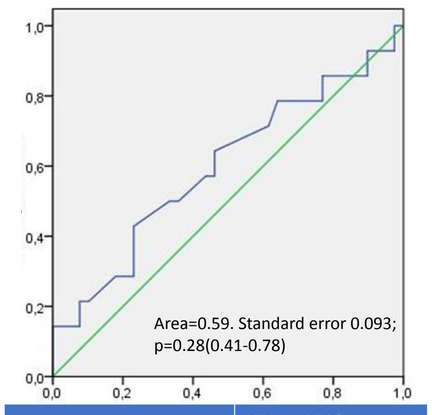
	VA dysfunction yes N: 15	VA dysfunction no N: 46	P (CI 95%)
Urea recirculation (%)	15.2 ± 8.2	7.6 ± 4.7	0.007 (-11.2; -3.8)
Thermodilution (%)	13.4 ± 5.8	12.6 ± 3.9	0.625 (-3.7; 2.3)
Age (years)	60 ± 15	53 ± 12	0.114 (-4.5; 2.5)
VA number	2.0 ± 1.0	1.5 ± 0.8	0.121 (-1.2; 3.2)
Qb (ml/min)	429 ± 49	454 ± 46	0.07 (-3.6; 64.5)
Part (mmHg)	-164 ± 25	-192 ± 39	0.029 (3.2; 53.7)
Pven (mmHg)	169 ± 26	170 ± 36	0.91 (-20.1; 18.4)
Ionic dialisance (ml/min)	271 ± 39	286 ± 34	0.23 (-10.4; 37.3)

ROC curve to vascular access dysfunction and urea recirculation



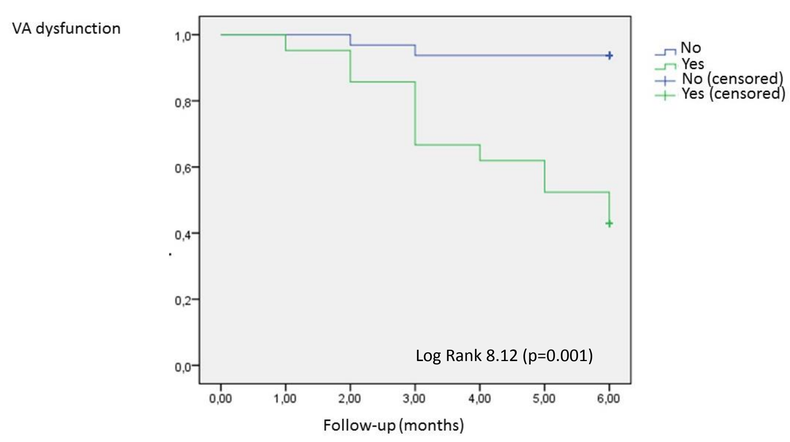
	UR>10% to detect VA dysfunction
Sensibility	80%
Specificity	78%
Positive predictive value	55%
Negative predictive value	92%

ROC curve to vascular access dysfunction and (BTM®)

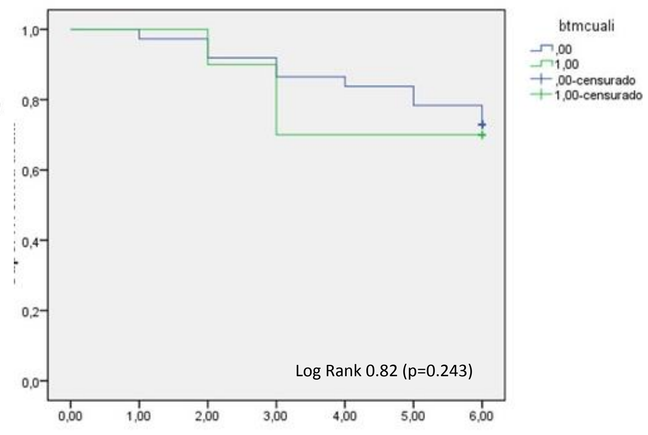


	BTM>15% to detect VA dysfunction
Sensibility	33%
Specificity	85%
Positive predictive value	42%
Negative predictive value	80%

KAPLAN MEIER SURVIVAL TO DETECT VA DYSFUNCTION WITH UREA RECIRCULATION



KAPLAN MEIER SURVIVAL TO DETECT VA DYSFUNCTION WITH THERMODILUTION



In **conclusion**, urea recirculation predicts better development of VA dysfunction. Thermodilution method overestimes recirculation compared to urea recirculation.

Thermodilution method has better specificity.

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