HEMODIALYSIS VASCULAR ACCESS, HOW TO IMPROVE IT?

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INTRODUCTION

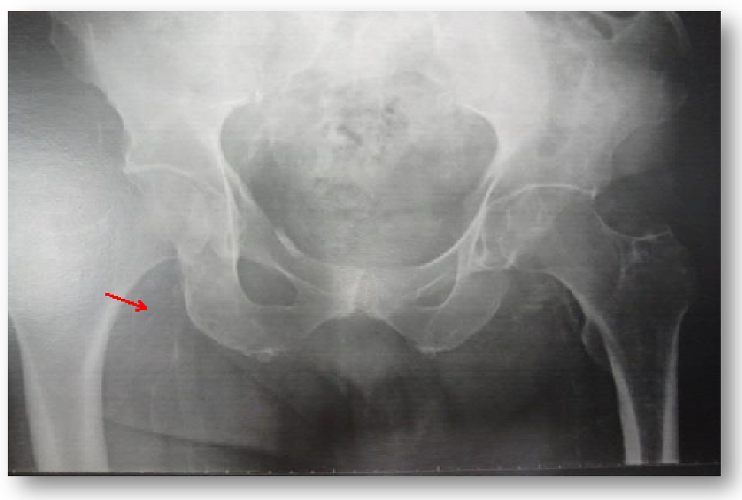
- The most common cause of VA failure is thrombosis, due flow limiting to stenosis resulting from neointimal hyperplasia (NH).
- NH is a histopathological lesion in venous stenosis - Hemodynamic alterations after the VA creation,
  - Systemic factors: inflammation, oxidation and mineralization of vascular cells.
- Proper monitoring and surveillance improve overall success of VA care, and access blodd flow (Qa) is one of the most powerful predictors of VA failure
- NKF-K/DOQI Guidelines:
  - VA should be monitored regularly for stenosis detection, and if detected, it should be treated with elective angioplasty or surgery prior to thrombosis.
  - DU as the preferred method for Qa surveillance (evidence A).
- Teresa Adragão et al, developed a simple vascular calcification score (SVCS) associated with higher vascular calcification, arterial stiffness and mortality.
- Because not all access with stenosis are at risk for thrombosis , as well as, some access with high blood flow can suddenly stop, investigation of the more accurate technique of surveillance and more determinants of dysfunction is essential and will have direct implications for patient care.

OBJECTIVES

- Evaluate the efficiency of Qa measurement with DU method in comparison to the TD and find which other parameters affect Qa values as a way to improve VA patency.

PATIENTS AND METHODS

- Transversal study in 40 patients under regular program of pos dilutional online hemodiafiltration with 5008S Fresenius Medical Care® monitors.
- Patients selection based on different criteria as part of a surveillance program: Qa reduction, difficult puncture, analitical and clinical abnormalities.
- Siemens Acuson X150 Ultrasound machine
  - Morphologic
  - Hemodynamic exam
    - Humeral artery Qa → Qa (ml/min) = TAV (cm/s) x D (cm) x 60
- TD-Qa → blood temperature sensor BTM® (Blood Temperature Monitor)
- Demographic, clinical, lab variables and X-Ray of hands and pelvis were recorded.



STATISTICAL ANALYSIS

SPSS 20.0 software for Windows (SPSS, Inc., Chicago, IL). Qas comparison and correlation with paired t-test and Pearson . Non parametric tests to analyze if Qa values varied significantly with other factors. Rejected null hypotheses if p-values < 0.05.

RESULTS

Table 1: Categorical variables

		Frequency (%)
Race	Caucasian	100,0
Gender	Masculin	72,5
	Feminin	27,5
Diabetes status	Diabetic	35,0
	No diabetic	65,0
Hypertensive status	Hypertensive	57,5
	No hypertensive	42,5
First VA status	First VA	67,5
	Not first VA	32,5
Previous interventions	Yes	20,0
	No	80,0
Type of VA	Radiocephalic fistula	32,5
	Humerocephalic fistula	40,0
	Humerobasilic fistula	10,0
	Humerobasilic prothesis	7,5
	Proximal radiocephalic fistula	7,5
	Humerocommunicant fistula	2,5

Table 2: Continuous variables

	Mean	Median	Std. Dev.	Min	Max
Age (years)	64,50	65,00	13,68	32,00	84,00
Time of dialysis (months)	51,35	33,00	47,30	0,00	155,00
Time of vascular access (months)	47,60	34,00	42,11	2,00	154,00
Thermodilution Qa (ml/min)	1012,00	885,00	492,97	270,00	2000,00
Doppler Qa (ml/min)	1032,55	997,00	468,75	297,00	2230,00
Average venous pressure (mmHg)	208,50	200,00	31,64	139,00	272,00
Average arterial pressure (mmHg)	-182,20	-189,50	31,53	-226,00	-98,00
Recirculation (%)	11,65	11,00	3,12	6,00	20,00
On-line clearance monitor (OCM)	1,63	1,60	,33	1,00	2,23
Paratiroid hormone (ng/L)	355,29	269,45	252,57	38,50	1102,00
Serum calcium (mg/dl)	8,72	8,75	,49	7,40	10,00
Serum phosphate (mg/dl)	4,313	4,26	1,03	1,99	6,83
Venous bicarbonate (mEq/L)	23,46	23,90	2,53	17,70	26,60
Serum magnesium (mg/dl)	2,30	2,30	,32	1,70	3,00
Simple cardiovascular score (SCVS)	3,28	2,50	2,77	0,00	8,00

Table 3: Kruskal Wallis and Mann-Whitney Test

	P-value	
	TD Qa (ml/min)	DU Qa (ml/min)
Gender	0,262	0,575
Age (thershold 65 years)	0,017	0,012
Diabetes	0,027	0,100
Hypertension	0,989	0,924
First VA	0,036	0,199
Previous endovascular procedure	0,509	0,478
SCVS (0-8 score)	0,173	0,030
SCVS (≤4 vs >4)	0,007	0,001
Venous pressure (threshold 200 mmHg)	0,203	0,155
Arterial pressure (threshold -185 mmHg)	0,028	0,015
OCM (threshold 1,4)	0,868	0,892
PTH (threshold 400 pg/ml)	0,257	0,239
Calcium (threshold 8 mg/dl)	0,777	0,918
Phosphate (threshold 4 mg/dl)	0,138	0,402
Bicarbonate (threshold 22 mEq/L)	0,615	0,859
Magnesium (threshold 2,3 mEq/L)	0,234	0,389
Recirculation (threshold 10%)	0,145	0,266
Time of hemodialysis (threshold 48 months)	0,001	0,002
Time of VA (threshold 48 months)	0,112	0,049
VA type	0,079	0,021

Table 4: Comparation and correlation of TD and DU methods

	Mean	Median	Std. Dev.	Min	Max		Mean	P-value	Pearson	P-value
TD-Qa (ml/min)	1012	885	493	270	2000	Paired T Test	-20,5	,624	0,851	,000
DU-Qa (ml/min)	1033	997	469	297	2230					

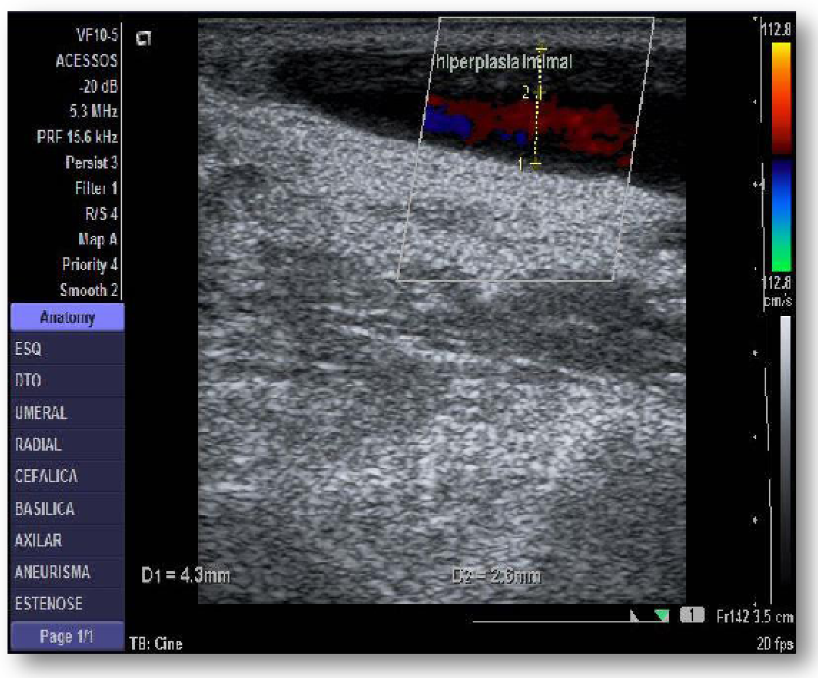
DISCUSSION

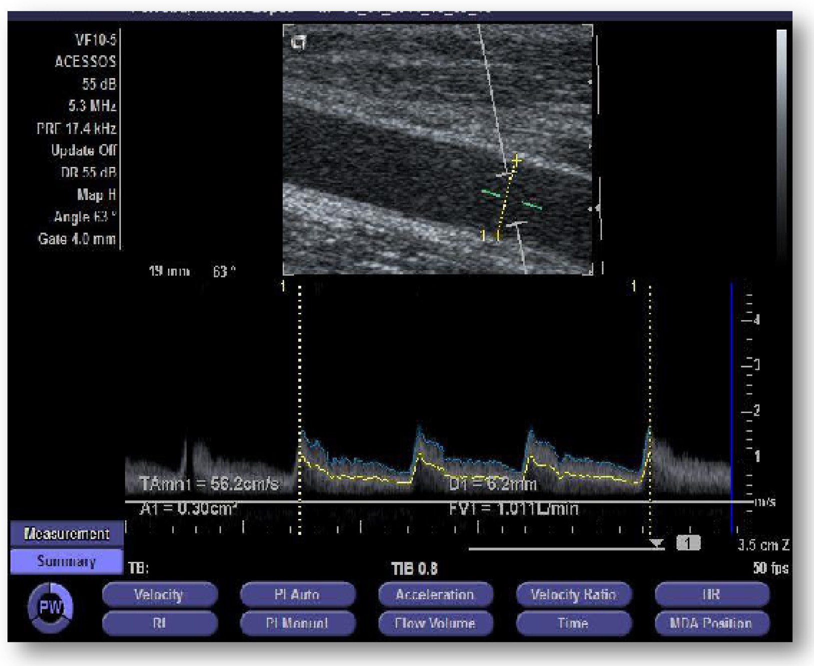
DU-Qa varied significantly:
- ↓ in distal AVF,
- ↓ with time of VA > 48 months,
- ↓ with higher score SCVS (all categories).

TD-Qa varied significantly:
- ↓ in diabetic patients,
- ↑ in first VA,
- ↓ with score SCVS > 4.

Both methods NOT varied significantly
- gender,
- hypertensive status,
- MBD analitical parameters.

Both methods varied significantly:
- ↓ with time on dialysis (> 48 months),
- ↓ with age > 65 years,
- ↓ with IA arterial pressure <-185 mmHg.





CONCLUSION

- ✓ TD represented a good indirect method of DU-Qa measurement but their elative accuracy vary differently with several factors.
- ✓ Regular VA monitoring by DU provides a sensitive, non invasive tool, because it provides both morphologic and hemodynamic data.
- ✓ Higher SVCS was associated with lower DU-Qa, reinforcing the linkage between atherosclerotic, inflammation and calcification mechanisms as determinant factors for VA patency.
- ✓ DU was more sensitive to changes in SCVS (varied with all categories) giving this method an advantage towards the indirect one (TD).
- ✓ A simple and inexpensive method such as SVCS may be used to increase important information that may be relevant for new surveillance recommendations helping guiding therapeutic interventions, improving overall success of VA care and resulting in cost savings for the healthcare system.
- ✓ Finally, when we evaluate VA, we should take into account all of the patient risk factors to decide whether an invasive interventional procedure, a standard or an intensified monitoring is needed minimizing failure, as well as, premature procedures that can trigger restenosis in intimal hyperplasia areas.

51ERA-EDTA
552--SP
M) Dialysis. M4) Vascular access in dialysis.
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