SURVEILLANCE OF HEMODIALYSIS VASCULAR ACCESS WITH BIOSENSORS COMBINED WITH DOPPLER-ULTRASOUND TO PREVENT VASCULAR FAILURE

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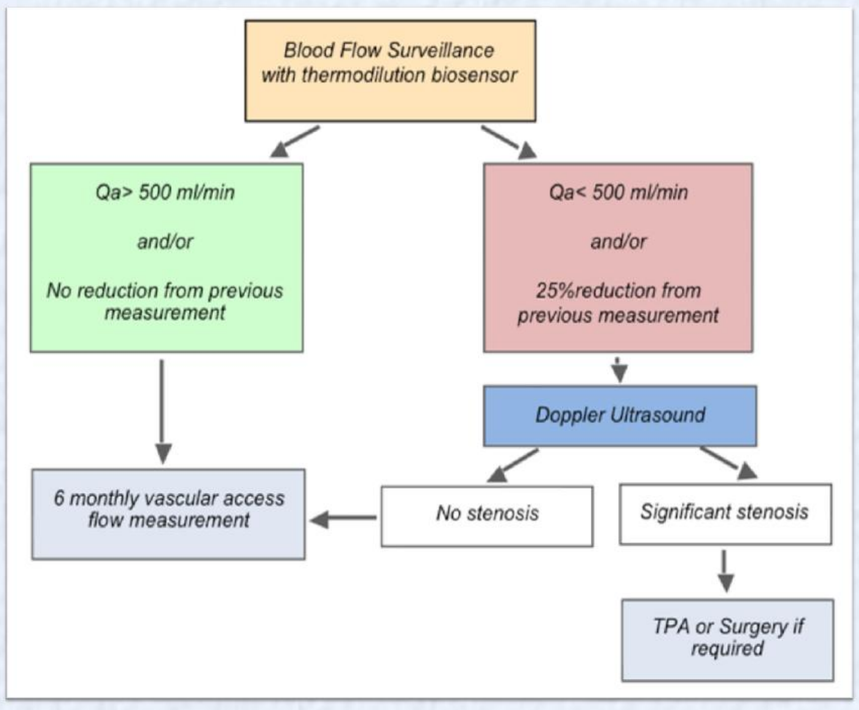
Introduction

- Regular surveillance and pre-emptive correction of subclinical stenosis have been shown to be useful procedures for reducing the rate of vascular access (VA) failure.
- Blood flow (Qa) below 500 ml/min or reductions over 25% from preceding Qa measurements are predictors of VA thrombosis.

- This study shows our experience in monitoring vascular access and preventing its failure by Qa measurements with biosensors and doppler-ultrasound (DUS) in hemodialysis patients.

Patients and Methods



- Single-center observational cohort study which included stable patients on chronic hemodialysis who were being dialyzed through a native arteriovenous fistula (AVF) in our Dialysis Unit from January to December 2014. Patients with AV graft or central venous catheter were excluded.

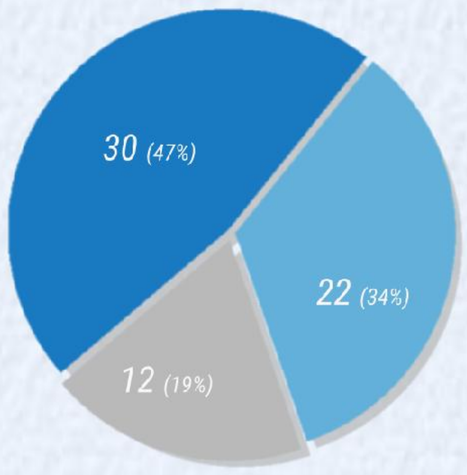
- At the time of the study entry, demographic, comorbidity, diabetes mellitus, therapy with antiplatelets or anticoagulants, type and vintage of AVF, and time on dialysis treatment were recorded.

- Blood temperature monitor (BTM®) was used to measure Qa (Fresenius machines, 5008). Qa was measured in each patient every 6 months, and if a reduction of Qa was detected, a Doppler ultrasound was performed in order to either rule out a significant VA dysfunction or to indicate its repair (surgery or percutaneous transluminal angioplasty-PTA).

- Results are expressed as the arithmetic mean ± standard deviation, or median and interquartile range [IQR], as appropriate.

Results

Type of AVF



Characteristics of study patients

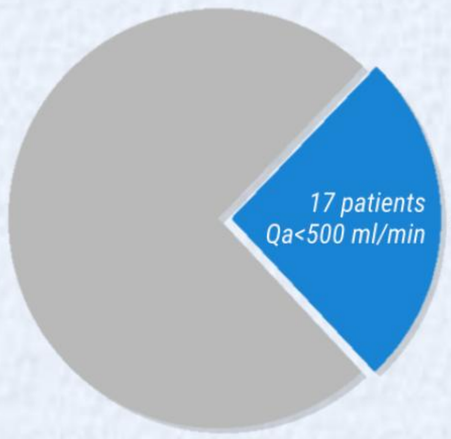
Patients, n	64
Gender, male (%)	42 (66)
Age, years	66 ± 16
Charlson Comorbidity Index*	6,6 [2 - 9]
Diabetes, %	23 (29)
On antiplatelet therapy, (%)	23 (36)
On anticoagulant therapy,(%)	8 (12)
Time on dialysis, months	49 ± 35
Type of AVF, n (%)	
Radiocephalic	30 (47)
Brachiocephalic	22 (34)
Brachiobasilic	12 (19)
AVF Qa, ml/min (at start of study)	
Radiocephalic **	790 ± 515
Brachiocephalic **	1239 ± 933
Brachiobasilic **	1452 ± 1109

** Median and interquartile range,*
*** radiocephalic vs brachiocephalic p= 0,13*
*** brachiocephalic vs brachiobasilic p= 0,43*
*** radiocephalic vs brachiobasilic p= 0,02*

Patients with AVF Qa lower than 500 ml/min, procedures and clinical outcomes.

Patient	AVF-Qa 1	DUS	Procedure	AVF-Qa 2	AVF-Patency	Thrombosis
1	189	Stenosis	Surgery	NA	1	Yes
2	226	Stenosis	PTA	NA	1	Yes
3	230	Stenosis	PTA	1061	6	No
4	249	Arterial poor flow	None	284	8	No
5	259	Stenosis	PTA	480	8	Yes
6	269	Arterial poor flow	None	279	7	No
7	277	Stenosis	PTA	711	11,5	No
8	310	Stenosis	PTA	340	3	Yes
9	324	Arterial poor flow	None	327	8	No
10	352	Stenosis	PTA	550	3	No
11	410	Arterial poor flow	None	480	10	No
12	426	Stenosis	PTA	826	10	No
13	439	Stenosis	PTA	560	1	No
14	458	Stenosis	PTA	NA	4	Yes
15	468	Arterial poor flow	None	470	6	No
16	480	Arterial poor flow	None	468	8	No
17	490	Stenosis	Surgery	1500	6	No

AVF-Qa 1: AVF Qa at the start of the study; AVF-Qa 2: AVF-Qa after PTA/surgery or 6 months later if a procedure was not required; AVF- patency: AVF-patency follow-up (months).



- ***Poor arterial blood flow in 6 cases (35%), that were not treated, and none of them developed AVF thrombosis.***

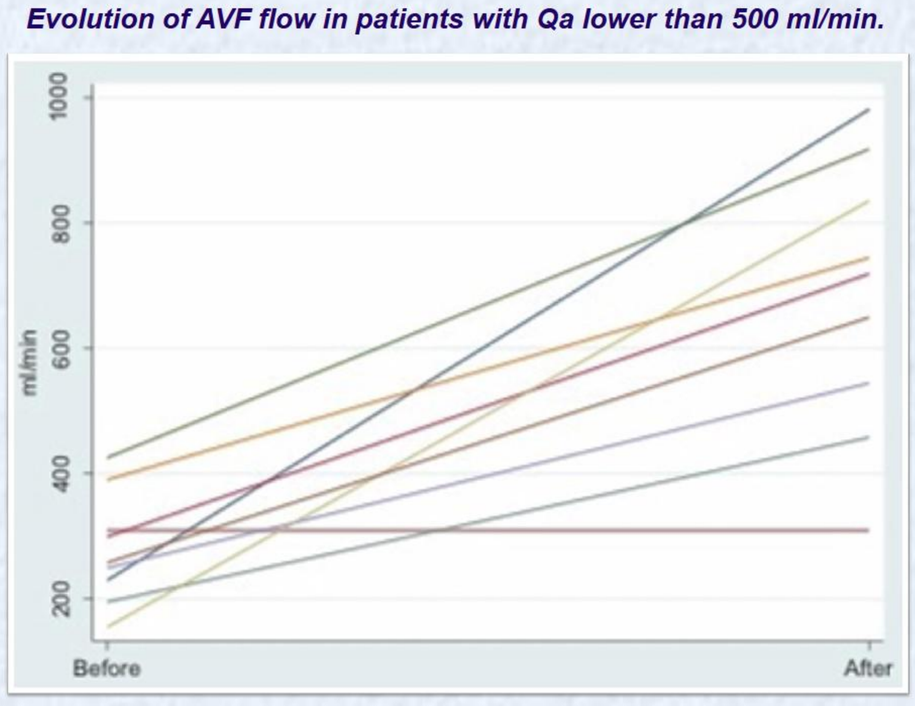
Doppler-Ultrasound

- ***Significant stenosis in 11 cases (65%): 9 (14%) were treated with balloon-catheter angioplasty and 2 (3%) patients with surgery.***

- In 6 patients AVF Qa increased significantly after the procedure and no further complication was found.
- In 5 patients AVF thrombosis eventually developed 1, 3, 4 and 8 months after the procedure, respectively.
- No relationship was found between thrombosis rate and anticoagulant or antiplatelet therapy.

- AVF thrombosis rate in patients with basal Qa > 500 ml/min was 4% (2/47) and was associated with hypercoagulable states.

Evolution of AVF flow in patients with Qa lower than 500 ml/min.



Conclusions

- Vascular access surveillance using Qa measurement combined with Doppler-ultrasound is an effective procedure for early detection of AVF dysfunction, which in turn allows successful AVF repair in a high percentage of cases.

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