




Can we make a fistula last forever

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Functional AV access characteristics in long term ESKD survivors

Patents with >10 years of follow up

Total patients (n=25), AVA (n=26)	AA = 18 (69.7%), C = 8 (30.7%)
Male : Female	15 (57.6%) -11(42.3%)
BMI (Median-range)	29 (19.5 – 45.22)
Follow up years (median; range)	18.7 (8.8 – 26.1)
AVG (3.8 %) : AVF (96.1 %)	1 : 25 (FA 16, 7 UA, 2 thigh)
Total functional follow-up	450.6 yrs.
Need for procedures for maintenance	0.29 /yr.
Procedure in regulars (N=22)	0.17/yr. (1 procedure in 6 yrs.)
Procedures in outliers (n=4)	1.01/yr.
Flow volume mean (range) mL/min	FA AVF 662 (240-946) mL/min
	UA AVF 864 (520-1641) mL/min


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How to make the fistula that lasts forever?.....

Characteristics of AV Access functioning long term

- All most all are AV fistulae
- Majority were forearm AVF
- Forearm AVF lower flow providing adequate dialysis
- Forearm AVF had slightly lower complication rates
- Forearm AVF when failed had option for UA AVF

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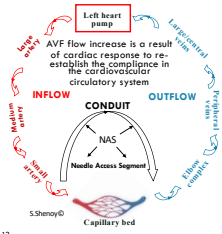


Physiologic basis for AVF maturation and function

AVF creation results in an immediate 10-20 folds increase in brachial artery flow


Outflow vein ~ 40-80 fold increase


- Shear stress based on its nature and magnitude can induce vasodilation (optimal 2.5- 7.5 Pas) or vasoconstriction
- Venous Intimal Hyperplasia (VNH) is the injury response of the blood vessel



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Qiu Y. J Vasc Res 2000; 27:1-47-57; Bengtin JJ NEJM 2006; 488-498; Morioka K. JVS 1985; 430-3; Takada K et al. Am J Pathol 1992; 132:519-26; Wang et al. BJ Vasc Endov Surg 1996; 11: 207-13

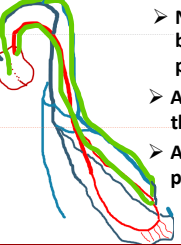
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How to make the fistula that lasts forever?.....

Access maturation and dysfunction

- Normal Shear stress from acute increase in the blood flow caused by AV communication within physiologic limits dilates the outflow vein.
- Abnormal Shear Stress that exceeds physiological threshold invokes VNH an injury response
- Abnormal shear stress zones exist in predictable areas of vascular access circuit



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Vulnerable sites for shear stress injury

- Area of acute pressure dissipation
 - Juxta anastomotic area
 - Graft vein post anastomotic area
 - Site beyond a stenosis in access circuit
- Curves & angulations: Juxta anastomotic site
 - Juxta anastomotic site in a conventional AVF
 - Swing point in basilic transposition
 - Cephalic arch
- Sites of venous valves
- Areas around tributary entry points

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How to make a fistula that lasts forever?.....

AVF creation

- Aim for low flow = distal AVF
- Smaller anastomosis = $\leq 4\text{mm}$
- Avoid angulation
- Intra operative evaluation

Consistent outflow and anastomotic size

p SLOT

Brescia MJ et al NEJM 1966; 1089
 Rohl I et al. Sc J Uro Neph 1968; 2:191-195
 Shenoy S. JVA 2007; 3: 152-54
 Hull J. JVS 2013; 58:187-93
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Factors influencing maturation beyond JAS

- Preexisting outflow vein issue - Needle stick injuries - Central venous stenosis
- Swing points - Elbow complex - Cephalic arch
- Extrinsic compression - Deep fascia defects - Elbow - Thoracic inlet - Clavipectoral fascia
- Intraluminal issues - Venous valves - Tributary entry points

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How to make the fistula that lasts forever?.....

Post operative follow up

Beyond JAS

Pre existing outflow vein lesions
 Intra luminal Valves

1st post op visit

- 8-14 days follow up
- Evaluate progression of maturation
- Clinical exam \pm duplex evaluation
- Early intervention when necessary

2nd post operative visit

- 3-5 weeks follow up
- Clinical exam and duplex maturation evaluation
- Progression of maturation
- Intervene if there is no progression or regression

Targeted early intervention

AVF should be mature by 4-6 weeks or should have a plan for maturation

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How to make the fistula that lasts forever?.....

Maturation evaluation and cannulation

Outflow ←

venous stenosis

dissection ?

"corkscrew"

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How to make the fistula that lasts forever?.....

Targeted intervention

Operative findings

Valve stenosis

Venous stenosis

"Corkscrew"

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How to make the fistula that lasts forever?.....

Targeted intervention long term results

3-10-2008 10-3-2019



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How to make the fistula that lasts forever?.....

Summary

- Low flow fistulae have better longevity and less complications
- Fistulae with distal arterial inflow tend to have lower flows
- Avoiding swing points reduces juxta anastomotic stenotic problem
- Close follow up post creation helps identify issues beyond JAS
- Early targeted intervention helps fistula maturation
- FA fistulae with distal radial inflow tend to last forever

One access; One site; One limb, One ESRD life !!

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