

Endovascular Preservation of Immature and Dysfunctional AVFs

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Objectives

- Identify causes of “failure to mature”
- Understand PE of immature/dysfunctional AVFs
- Develop awareness of endovascular methods to promote maturation and resolve dysfunction
- Understand the outcomes benefit to patients from aggressive fistula preservation

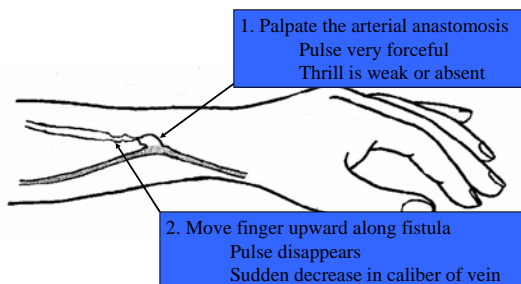
Complications of AV Fistulae

- Poor maturation (angio/PTA)
- Repeated infiltration (angio and road-map)
- Aneurysms (rotate sites, “button-hole”)
- Stenosis (PTA or surgical revision)
- Thrombosis (de clot early – 1-14 days)
- Infection – rare
- Steal syndrome or nerve damage - unusual

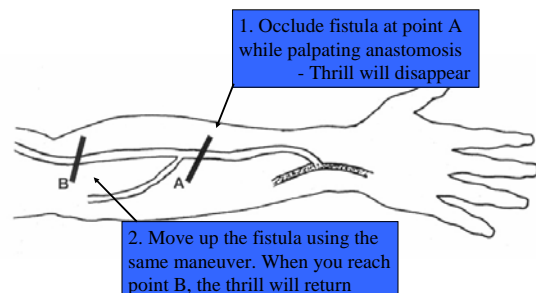
Evaluation of Early Fistula Failure

- **Inadequate arterial flow**
- **Juxta-Anastomotic stenosis**
- **Accessory veins**
 - Above the anastomosis (antegrade flow)
 - Distal to the anastomosis (retrograde flow)

Detection of Juxta-Anastomotic Stenosis



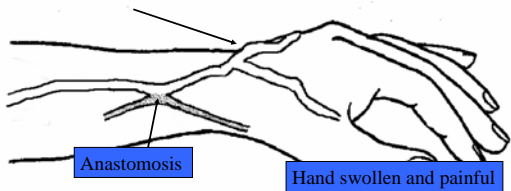
Detection of Accessory Veins



Detection of Venous Hypertension of Hand

Physical examination

- Large vein(s) on back of hand
- May be pulsatile



Traditional Treatment for Immature Fistulae

Bourquelot: VAS Newsletter April 2001

- Thorough evaluation: clinical, US, angio
- Surgical revision of anastomotic and juxta-anastomotic stenosis and deep veins
- Abandon and create a new access for long or multiple stenoses
- Endovascular treatment for short segment main vein stenosis

Principles to Achieve Maturation

- Adequate cardiac output
- Arterial inflow must be of adequate size
- Draining veins must be of adequate size
- A single large vein is preferable to several small veins for dialysis: ease of cannulation and volume of flow (ideal size is 7-8 mm)
- The juxta-anastomotic vein and "swing site" must be free of stenoses
- No significant stenoses of the entire access circuit to impede flow

Techniques to Promote Maturity

- Anastomotic and juxta-anastomotic PTA
- Draining vein (peripheral and central) PTA
- Long segment PTA
- Serial (increasing caliber) PTA
- Occlusion of stealing veins and PTA
- Resolution of resistant stenosis
 - Ultra-high-pressure PTA (Conquest)
 - Refer to surgery

Maturation Outcomes

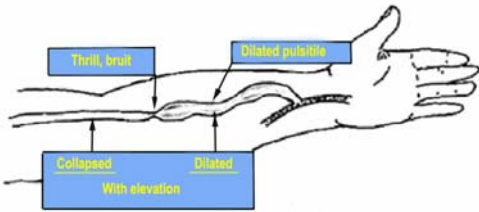
- | French Experience | Baltimore Experience |
|-----------------------|-----------------------|
| • 69 procedures | • 108 procedures |
| • 97% initial success | • 96% initial success |
| • 39% 1 yr Prim. Pat | • 48% 1 yr Prim. Pat |
| • 79% 1 yr Sec. Pat | • 84% 1 yr Sec. Pat |

Baltimore secondary patency at 38 months is 80%

Fistula Pulse

- **Normal fistula**
 - Very soft
 - Easily compressible
 - When arm is raised - collapses, becomes flat
- **Stenosis**
 - Increased pulse
 - Distended toward anastomosis
 - When arm is raised
 - Distal to lesion - distended
 - Proximal to lesion - collapsed

Fistula Stenosis



Principles

- Any fistula that can be needle cannulated without application of a tourniquet is associated with either a significant venous stenosis or high volume flow
- Poor response to fistula compression indicates either inflow stenosis or stealing side veins
- Aneurysms arise as the result of wall injury/thinning and increased fistula pressure

AVF PTA Outcomes

- | | |
|--|--|
| <p>French Experience</p> <ul style="list-style-type: none"> • 726 Procedures • 98% Initial Success • 45% 1 yr. Prim. Pat • 80% 1 yr Sec. Pat | <p>Baltimore Experience</p> <ul style="list-style-type: none"> • 902 Procedures • 98% Initial Success • 48% 1 yr. Prim. Pat • 84% 1 yr. Sec. Pat |
|--|--|

Literature Experience

Turmel-Rodrigues L. *Nephrol Dial Transplant* (2000) 15: 2029-2036

- | | |
|---|---|
| <p>AVF Declot</p> <ul style="list-style-type: none"> • 93 procedures • 93% initial success • 50% 1 yr Prim. Pat • 80% 1 yr Sec. Pat | <p>AVF PTA</p> <ul style="list-style-type: none"> • 726 procedures • 98% initial success • 45% 1 yr Prim. Pat • 80% 1 yr Sec. Pat |
|---|---|

Baltimore Experience

- | | |
|--|---|
| <p>AVF Declots ^{10/6/97 – 6/25/03}</p> <ul style="list-style-type: none"> • 239 procedures • 91% Initial success • 48% 1 yr Prim. Pat • 74% 1 yr Sec. Pat | <p>AVF PTA</p> <ul style="list-style-type: none"> • 902 procedures • 98% Initial success • 48% 1 yr Prim. Pat • 84% 1 yr Sec. Pat |
|--|---|

Overall success with AVF preservation is 96.8%
38 month secondary cumulative patency is 80%

Graft vs AVF Primary Patency

• Graft	3 mo	6 mo	12 mo	Median
Declot	50%	31%	16%	3 m
PTA	79%	57%	38%	7.5 m
• AVF	3 mo	6 mo	12 mo	Median
Declot	60%	52%	44%	8.5 m
PTA	92%	77%	69%	15.2 m

Conclusions

- NKF-DOQI has generally increased # of AVFs
- Maturation of native AVFs can be improved by aggressive endovascular interventions; may require serial dilatations for adequate size
- Early intervention (beginning at 2 months) can achieve useable fistulae within 4-6 weeks
- With aggressive intervention, the overall failure rate of newly created fistulae is about 7%; this can be decreased to about 3% by appropriate pre op venous mapping

Conclusions

- Poor AVF function is improved by PTA (sometimes serial and repeated) and occlusion of stealing veins if they are persistent after adequate PTA; resistant stenoses must be resolved.
- Long term patency of native AVFs is superior to access grafts, but requires patience, practice and persistence.
- AVFs are superior to grafts as long term dialysis accesses

Acknowledgement

Thanks to Gerald Beathard, M.D. for use of some of his slides illustrating principles of physical examination.