Algorithms For Maturation of AV Fistulas

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The Ideal...

Autogenous A-V Fistula
Reality One...

Reality Two...

Color Assisted Duplex Ultrasound at 6 weeks Following Creation

Hemodialysis Arteriovenous Fistula Maturity: US Evaluation


Disclosures: Boston Scientific Corp. Advisory Board
Fistula Adequacy

- Doubled if minimum venous diameter was >0.4 cm.
- Nearly doubled if flow volume was >500 mL/min.
- No difference in blood flow or minimum venous diameter found during 2-4 months.
- Experienced dialysis nurses accuracy in predicting eventual fistula maturity was 80%.

Patients referred for intervention

- Acute loss of thrill
- Failure to meet the 6 months criteria

Background

- Early fistulography and repeated interventions results in prolonged functional patency.

BAM! BAM! BAM!

BAM Intra-operatively

- In patients with small Arteries (< 2mm) & Veins (< 1.5mm)
  - Stated sequential dilation
  - Control vein injury
  - Flow rerouting
  - Success rates of >95%
We have adopted a 3 stage process for most cases.

- **Aim is to address the “BIG 3”**
  - Stenosis (usually peri-anastomotic)
  - Small Caliber
  - Large Collateral channels

**Management:**

A retrospective analysis of 43 patients was performed in subjects with primary failure of upper extremity hemodialysis access fistulas. The majority of the patients were first evaluated within 2.5 months of fistula creation after clinical evaluation by attending nephrologists determined the fistula could not be cannulated, acute loss of thrill or failed 6 week ultrasound exam.

**Results:**

- 21 Fistulas were Radio-cephalic, 15 were brachio-cephalic, and the remaining 8 were brachio-basilic.
- 5 of the patients died prior to evaluation for maturity.
- 1 Fistula was abandoned due to infection and another was abandoned due to a large peri-fistulous hematoma.
- 7 Fistulas are awaiting evaluation for successful maturation or were lost to follow up.
- 30 out of the surviving 32 patients who returned for follow up reached a successful endpoint (93.8%).

**Why Three Stages:**

- Minimize fistula disruption with gradual increase of caliber over several weeks
- Allow time to evaluate progress
- Embolization if PTBA alone is not allowing fistula to progress
- Evaluate over time for the persistence of a thrill
- Sends a Message that we are involved in the care of these patients.

**Methodology:**

- Ultrasound Guidance is KEY!
- Small caliber sheath (4 Fr)
- 4 Fr Glide Berenstein and .014” microwire to cross difficult anastomoses.
- Cutting balloon for difficult stenoses rather than going to high pressures.

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Results: All Patients

- Primary Unassisted Patency at 6 mos.
  - 48% ± 6%
- Secondary Patency at 12 mos.
  - 70% ± 6%

Complications

- Major
  - Respiratory arrest-Oversedation
  - Paripuncture site hematoma-loss of fistula
  - Beware purse-string suture in immature fistula
  - Infected thrombus within fistula-loss of fistula
- Minor
  - None

Patient 2: First Intervention

Patient 2: Second Intervention

Patient 2: Third Intervention
When failure occurs

- 86% at the site of original intervention.

Using this three step process we safely achieved successful cannulation and subsequent successful hemodialysis in 93.8% of nonmature fistulas.

Endovascular salvage of immature fistulas should be a consideration prior to abandonment.

When these fistulas fail it is often at the site of original intervention.
Treating the anatomic issues is a reactive approach. Maturation depends upon multiple factors. Some but not all include: Arterial Inflow adequacy, nitrous oxide deficiency with low vascular elasticity, uremic vascular effect. Look towards investigations involving medical treatments to improve fistula maturation.