Strategies to Reduce Catheter Use in 2014

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(I have no commercial affiliations or conflicts of interest to report)
Fibrin Sheathing
Central Venous Stenosis
Arm Edema

Image Courtesy of Tom Vesely, MD
Infection
Fistula First ... Catheter Last
Catheter Reduction Strategies

• Catheter avoidance
  – Timely placement of the “best” access
  – Urgent start PD
  – Early cannulation grafts
    • Atrium Flixene™
    • Gore Acuseal™

• Catheter removal
  – Timely removal of the “worst” access
  – HeRO graft
Decision points

• **Fistula First** *unless a graft is better*
  – Are we early enough to mature an avf?
  – Will the patient live long enough to benefit from an avf?

• **Disciplined follow-up**
  – Intervene when failing to mature *(6-8wks)*
  – Decide when enough is enough
  – Remove catheter after 3 successful cannulations
Timeline (Best case scenarios)

- AVF matures without assistance (40%)
  - Placement $\rightarrow$ Use (2 months)

- AVF matures with assistance (60%)
  - Placement $\rightarrow$ Proc1 $\rightarrow$ Use (3 months)
  - Placement $\rightarrow$ Proc1 $\rightarrow$ Proc2 $\rightarrow$ Use (4 months)

- AVF fails after salvage attempts (20%)
  - Placement $\rightarrow$ Proc1 $\rightarrow$ Proc2 $\rightarrow$ Fail $\rightarrow$ Avg $\rightarrow$ Use
    - 8wks  4  4  4  3 (6 months)

- AVG
  - Placement $\rightarrow$ Use (3 weeks)
Urgent Start PD

Useful for patients who crash into dialysis without prior access planning (80%?)

• Place PD catheter instead of TDC
• Initiate low volume/supine PD in hospital
• Continue this in home dialysis unit
• Educate on treatment options
  – Continue PD (complete training)
  – Change to HD (avf/avg then transfer to in-center)
Benefits of urgent start PD

- **TDC avoidance**
  - Lower infection, hospitalization, mortality
- **Immediate Medicare enrollment**
  - Payment
    - Hospital, access surgeon, dialysis facility, nephrologist
  - PD training payment
- **Effective way to grow home therapies**
Early Cannulation Graft

• Patients with urgent dialysis need
  – No fistula option (or graft is felt to be best)
  – Very borderline upper arm fistula option
• Patients with failing fistula or graft
• Graft options/details
FLIXENE™ Vascular Graft (Atrium product)

Durable Cannulation Zone:

- **Wall Construction**
  - Tri-laminate (3 layers)
  - 100% PTFE (no additional material added or needed)

- **Shown To Reduce Common Graft Related Complications**
  - Reduce Pseudoaneurysms¹
  - Reduce Seromas¹
  - Higher Rate of Complication Free Patients compared to standard PTFE group⁴

FLIXENE™ Vascular Graft (Atrium product)

Key Features and Benefits:

- **Durable Cannulation Zone:**
  - Reduce Pseudoaneurysms¹ (?)
  - Reduce Seromas¹

- **Is Safe to Cannulate Within 24-72 hrs¹**
  - Shown to Reduce Catheter Rates compared to standard PTFE³

- **No Additional Steps Required for Early or Standard Cannulation**
  - Follow KDOQI guidelines

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Acuseal™ Vascular Graft (Gore Product)

- **Outer Graft Layer**
  - Expanded polytetrafluoroethylene

- **Middle Graft Layer**
  - Elastomeric membrane

- **Inner Graft Layer**
  - Expanded polytetrafluoroethylene
    - CBAS® Heparin Surface

Tri-Layer Design
Hinders Cannulation Needle Hole Bleeding

Low Bleed  versus  Bleed

16 gauge cannulation needle hole through GORE® ACUSEAL Vascular Graft luminal surface (left)
Standard ePTFE graft luminal surface (right)
Summary
ACUSEAL Vascular Graft Clinical Study*

Primary Efficacy Endpoint: Cumulative Patency

<table>
<thead>
<tr>
<th>Cumulative Patency</th>
<th>GORE® ACUSEAL Vascular Graft</th>
<th>Historical Control</th>
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<tbody>
<tr>
<td>6 month follow-up</td>
<td><strong>84%</strong></td>
<td>75%</td>
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<tr>
<td>12 month follow-up</td>
<td><strong>78%</strong></td>
<td>66%</td>
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No difference in hematoma, infections or steal syndrome from standard PTFE graft

Within 28 days of graft implantation, 75.6% of the implanted grafts had been successfully cannulated 3 consecutive times allowing the potential for the CVC to be removed.

* Data on file
Early Cannulation Grafts

• Safe to use within 24 hours of placement
• Similar patency to typical PTFE grafts
• No difference in complications
  – Infection, hematoma, pseudoaneurysm*, steal
• Useful for...
  – Avoiding catheter in urgent situations
  – Faster removal of catheters
  – Revising failing graft/fistula

* Might be improved?
Early cannulation guidelines
(When used in first 2 weeks)

• Strict aseptic technique
  – Mask, sterile gloves, prep

• Small needles
  – 17g

• Lower blood flow rate
  – 200-300ml/min

• Hold pressure 10-15 minutes

• Lower or no heparin if immediately postop
Differences in clinical use

• Physical exam
  – Markedly reduced thrill
  – Difficult to hear bruit

• Cannulation
  – Firmer “feel” so greater pressure required at entry
  – Enhanced “pop” into graft
Catheter Reduction Strategies

• Catheter avoidance
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  – Urgent start PD
  – Early cannulation grafts
    • Gore accuseal
    • Atrium Flixene

• Catheter removal
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  – HeRO graft
Removing Catheters

- Three
- Successful
- Treatments

Removed within 1 week of referral
HeRO™ Graft

Hemodialysis Reliable Outflow
Treatment Algorithm

Failing AVF or AVG due to central venous stenosis

- Failing fistulas or grafts due to central venous stenosis
- Catheter-dependent or approaching catheter-dependency

HeRO Graft Candidates

- Not for patients with low cardiac output/low BP

Catheter-dependent patients

Fistula

Graft

HeRO Graft

Catheter
for Fistula or Graft Salvage

**Fistula Salvage**

- AVF to HeRO Graft anastomosis
- Cannulation Area Immediately After AVF Salvage
- HeRO Graft Arterial Graft Component
- HeRO Graft Venous Outflow Component
- Stenosed & Ligated AVF Venous Outflow
- Radiopaque Marker Band

**AV Graft Salvage**

- AVG to HeRO Graft anastomosis
- Cannulation Area Immediately After AVG Salvage
- HeRO Graft Arterial Graft Component
- HeRO Graft Venous Outflow Component
- Stenosed & Ligated AVG Venous Outflow
- Radiopaque Marker Band

*If AVF is matured or AVG is incorporated. Follow your dialysis facility protocol for care and cannulation.

1) HeRO Graft IFU, L7163
## Clinical Outcomes

<table>
<thead>
<tr>
<th></th>
<th>HeRO Graft Gage, et al. EJVES(^1)</th>
<th>HeRO Graft Patency Study(^2)</th>
<th>HeRO Graft Katzman, et al. JVS(^2)</th>
<th>Catheter Literature(^2)</th>
<th>AV Graft Literature(^2)</th>
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<tbody>
<tr>
<td><strong>Bacteremia Rates</strong></td>
<td>0.14</td>
<td>0.18</td>
<td>0.70</td>
<td>2.3</td>
<td>0.11</td>
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<tr>
<td>(Infections/1,000 days)</td>
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<tr>
<td><strong>Adequacy of Dialysis</strong></td>
<td>NA</td>
<td>NA</td>
<td>1.7</td>
<td>1.29 - 1.46</td>
<td>1.37 - 1.62</td>
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<td>(mean Kt/V)(^\beta)</td>
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<tr>
<td><strong>Cumulative Patency</strong></td>
<td>91%</td>
<td>88%</td>
<td>72%(^\phi)</td>
<td>37%</td>
<td>65%</td>
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<td>at 1 Year</td>
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<td><strong>Intervention Rate</strong></td>
<td>1.5</td>
<td>1.7</td>
<td>2.5</td>
<td>5.8</td>
<td>1.6 - 2.4</td>
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<td>(per year)</td>
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Case Report
From Catheter to HeRO Graft

• A 50 year old African-American male with HIV and renal failure, and deemed “catheter-dependent.”
• He has been on hemodialysis for over 10 years, and has had 3 failed fistulas and 3 failed AV grafts.
• Both arms have been deemed “exhausted” for use.
• He had 4 tunneled dialysis catheters (TDCs) total (2 on each side).
Case Report: Riley (part 2)
From Catheter to HeRO Graft

- His central venous system had occluded bilaterally.
- A left-sided brachiocephalic vein stent was placed 2 years ago to try to salvage a poorly functioning left upper extremity AVG.
- When that access failed, a TDC was placed through the stenotic stent.

Fluoroscopic image of central venous occlusion, a central venous stent, and a TDC
Case Report: Riley (part 3)
From Catheter to HeRO Graft

- A HeRO Graft was placed via the existing TDC.

- He is now using the HeRO Graft without difficulty, and his bridging femoral TDC was removed.
Summary

• Catheter use can be reduced drastically by utilizing several old and new strategies
  – Early referral for avf
  – Individualized selection of preferred access type
  – Efficient processes for following new accesses and removing catheters
  – Considering PD first
  – Utilizing early cannulation grafts, and HeRO graft when indicated