Anesthesia for Hemodialysis Access Operations

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<table>
<thead>
<tr>
<th>U-OR 17</th>
<th>Left arm AVF creation vs revision, ultrasound, choice anesthesia</th>
<th>53 yo F w/ ckd, Chronic kidney disease, stage 4 (severe)</th>
</tr>
</thead>
<tbody>
<tr>
<td>U-OR 17</td>
<td>LEFT BRACH_AX ARTERIO-VENOUS GRAFT PLACEMENT</td>
<td>73 yo F w/ esrd, End stage renal disease, Dependence on renal dial</td>
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<tr>
<td>U-OR 17</td>
<td>LEFT RADIO-CEPHALIC ARTERIO-VENOUS FISTULA</td>
<td>53 yo F w/ esrd, End stage renal disease, Dependence on renal dial</td>
</tr>
<tr>
<td>U-OR 17</td>
<td>ARTERIO-VENOUS GRAFT PLACEMENT - LEFT FOREARM OR POSSIBLE UPPER ARM FIRST STAGE BVT</td>
<td>68 yo F w/ esrd, End stage renal disease, Dependence on renal dial</td>
</tr>
<tr>
<td>U-OR 17</td>
<td>INCISIONAL HERNIA REPAIR</td>
<td>45 yo M w/ Incisional hernia, Incisional hernia without obstructio</td>
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<tr>
<td>U-OR 17</td>
<td></td>
<td>End stage renal disease</td>
</tr>
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Outline

- Background
- Vascular anatomy
- Regional nerve blocks of the upper extremity
- The operations
- Putting it all together
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• Background
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There is an epidemic of end-stage renal disease in the USA

>600,000 patients on hemodialysis
- ~100,000 added in 2013 alone*
  
  Most start out with a temporary tunneled catheter

*US renal data system 2015 annual data report
Terminology

- Graft
- Fistula
- Forearm-antebrachial
- Arm-brachial
- Artery
- Vein
Figure 4.7  Vascular access use during the first year of hemodialysis by time since initiation of ESRD treatment, among patients new to hemodialysis in 2013, from the ESRD Medical Evidence form (CMS 2728) and CROWNWeb data, 2013-2014

Data Source: Special analyses, USRDS ESRD Database. Medical Evidence form (CMS 2728) at initiation and CROWNWeb for subsequent time periods. Abbreviations: CMS, Centers for Medicare & Medicaid; ESRD, end-stage renal disease.
Figure 4.6  Trends in vascular access type use among ESRD prevalent patients, 2003-2014

Data Source: Special analyses, USRDS ESRD Database, and Fistula First data. Fistula First data reported from July 2003 through April 2012, CROWNWeb data are reported from June 2012 through December 2013. Abbreviations: AV, arteriovenous; ESRD, end-stage renal disease.
Fistula First Catheter Last – FFCL

Home → Fistula First Catheter Last – FFCL

- What is Fistula’s First?
- Lifeline For a Lifetime
- Surgeon Training Resources

The Fistula First Catheter Last Workgroup Coalition focuses on increasing the use of AV fistulas and decreasing the use of tunneled dialysis catheters.

About FFCL

The work of the Fistula First Catheter Last Workgroup Coalition is focused on supporting the renal community, the ESRD Networks, patients, and the CMS in efforts to improve vascular access outcomes.

- About Fistula First Catheter Last
- FFCL Dashboard
- Speakers Bureau

For Patients

For patients on dialysis, your vascular access is your Lifeline for a Lifetime. Resources to help you plan for your access, check it to make sure it’s healthy, and more.

- Lifeline for a Lifetime
- Planning For Your Vascular Access
- Monitoring Your Vascular Access
- Patient Educational Materials

For Professionals

Resources for surgeon training on arteriovenous fistulas (AVFs), cannulation, access planning, access monitoring, and more.

- Surgeon Training Videos & Presentations
- Cannulation Videos
- Vascular Access Atlas
- Lifeline for a Lifetime for Professionals
- Achieving Hemodialysis Catheter Freedom: A Team Approach
Figure 4.5  Geographic variation in percentage AV fistula use among prevalent hemodialysis patients by Health Service Area, from CROWNWeb data, December 2013

Data Source: Special analyses, USRDS ESRD Database. Abbreviations: AV, arteriovenous; ESRD, end-stage renal disease.
Figure 4.4 Geographic variation in percentage catheter use among prevalent hemodialysis patients by Health Service Area, from CROWNWeb data, December 2013

Data Source: Special analyses, USRDS ESRD Database. Abbreviation: ESRD, end-stage renal disease.
These are not easy patients

- Hypertension, coronary artery disease, congestive heart failure, arrhythmias, volume status disturbances, electrolyte imbalances, brittle diabetes, obesity, anticoagulation, and polypharmacy
- Immunosuppression, neuropathy and platelet dysfunction
Why consider regional anesthesia?

- A primary fistula will fail 25-30% of the time, secondary to inadequate blood flow
  - cephalic vein diameter <2mm
  - radial artery diameter <1.6 mm
  - immediate post-anastomosis blood flow <160 mL/min
  - postoperative blood flow <350 mL/min two weeks after surgery

Goal: maintain high blood flow during and after the surgery
Does the sympathectomy of regional anesthesia help?

- Increased venodilation (Hingorani Vascular 2006)
  - by 42% distal cephalic vein, 19% midcephalic, 26% midbasilic
- Increased venodilation (Reynolds J Vasc Access 2011)
  - 34% in the lower cephalic vein, 24.2% in the upper cephalic vein and by 31.3% in the basilic vein
    - Changed the planned surgery 14% of the time!
- More distal site 34% of the time (Laskowski Ann Vasc Surg 2007)
- No change in primary patency if surgery was changed after regional block (Schenk Am Surg 2010)
Summary of benefits - regional anesthesia

- Improved success of vascular access procedures
  - profound vasodilation
  - higher fistula flow rates
  - improved site and vessel selection

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Upper extremity vascular anatomy

- radial artery
- cephalic vein
- brachial artery
- ulnar artery
- median cubital vein
- basilic vein
- axillary vein
Superficial throughout its course
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Coverage territory for brachial plexus blocks

Supraclavicular, infraclavicular, or axillary

Interscalene

Not well covered (medial brachial cutaneous and intercostal brachial cutaneous nerves)
Not covered (medial brachial cutaneous and intercostal brachial cutaneous nerves)
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• Radiocephalic (Brescia-Cimino)
• Forearm loop graft
• Brachiocephalic fistula (name alert!)
• Basilic vein transposition
  – One or two stages
• Brachial-axillary (“brach-ax”) graft
• HeRO catheter
Radiocephalic fistula

Radial a.
Cephalic v.
Forearm loop graft

Cephalic v.

Brachial a.

graft
Brachiocephalic fistula

- Brachial a.
- Radial a.
- Median cubital v.
Basilic Vein Transposition (BVT)

- Brachial-basilic fistula with subsequent transposition of the basilic vein
  - 1st stage: create fistula between the brachial artery and the basilic vein
  - 2nd stage: transpose (move) the basilic vein into a superficial/subcutaneous pocket
Brachial-axillary graft
HeRO catheter

- Hemodialysis with Reliable Outflow
  - Proximal/arterial blood source is brachial artery at elbow
  - Distal/venous blood outflow is the superior vena cava

## Putting it all together

<table>
<thead>
<tr>
<th></th>
<th>Local</th>
<th>Brachial Plexus Block</th>
<th>Brachial Plexus + Field Block</th>
<th>General</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brescia-Cimino fistula</strong></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td><strong>Forearm Loop graft</strong></td>
<td></td>
<td>✓</td>
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<tr>
<td><strong>BVT Stage I</strong></td>
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<td>✓</td>
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<tr>
<td><strong>BVT Stage II or combined-thin arm</strong></td>
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<tr>
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### Procedures

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**ARTERIOVENOUS GRAFT PLACEMENT**
- LEFT FOREARM OR POSSIBLE UPPER ARM
- FIRST STAGE BVT
- INCISIONAL HERNIA REPAIR
  - 68 y/o, End stage renal disease, dependence on renal dial
  - 45 y/o, Incisional hernia, Incisional hernia repair

**RIGHT BRACHIO_CEPHALIC ARTERIO-VENOUS FISTULA**
- 77 y/o, End stage renal disease
“Give me the luxuries, and I can do without the necessities.” - Oscar Wilde