Dialysis Access Review: Understanding the Access Options our Patients Face
Disclosures
Outline

• Dialysis Background
  – Why is it important?

• National Kidney Foundation (NKF)
  – Kidney Disease Outcome Quality Initiative (KDOQI)

• AV Access Options
Dialysis Background

• More than 661,000 Americans have ESRD
  – 468,000 individuals are on dialysis
  – 193,000 live with a functioning kidney transplant

• Incidence (newly reported cases) of ESRD in US is approximately 117,000 per year

• Hemodialysis treatment costs an average of $89,000 per patient annually in the United States

• Math: 468,000 x $89,000 = $41,652,000,000.00
Dialysis Background

• Total annual hemodialysis cost in the United States is **$42 Billion**
  – Porn industry in US is only 10 billion

• **$34 Billion** of this is absorbed through the Medicare budget
  – Who pays the difference?
Dialysis Background

• Life expectancy on dialysis can vary depending on your other medical conditions
  – *Average life expectancy on dialysis is 5-10 years*
  – In the past average life expectancy was only 2 years
  – Patients have lived well on dialysis for 20 or even 30 years.
Dialysis Background

• There are 6,479 dialysis facilities in the U.S.
  – Only 617 are hospital based (inpatient dialysis units)
  – There are 5,604 Taco Bell restaurants in the United States

• Compared to Caucasians, ESRD prevalence is
  – 3.7 times greater in African Americans
  – 1.4 times greater in Native Americans
  – 1.5 times greater in Asian Americans
Dialysis Background

• Primary cause of ESRD
  – 37.4% Diabetes
  – 25.1% Hypertension

• As of December 31\textsuperscript{st} 2013
  – 63.7% were receiving hemodialysis therapy
  – 6.8% were receiving peritoneal dialysis
  – 29.2% had a functioning kidney transplant
Outline

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- AV Access Options
National Kidney Foundation (NKF)

- The National Kidney Foundation is the leading organization in the U.S. dedicated to the awareness, prevention and treatment of kidney disease
- Initially started as a committee in November 1950
  - Harry and Ada Debold formed committee for nephrosis research in a desperate attempt to save their child
- Founded in 1964
- [https://www.kidney.org](https://www.kidney.org)
National Kidney Foundation (NKF)

- Contributions
  - 1997 published the Kidney Disease Outcome Quality Initiative (KOQI) Practice Guidelines
  - 1997 Kidney Early Evaluation Program (KEEP)
  - 2002 CKD Practice Guidelines
  - 2003 Kidney Disease Improving Global Outcomes (KDIGO)
  - 2007 Take Action Network
• What is KDOQI?
• Clinical practice guidelines are intended to assist practitioners caring for patients in preparation for and during hemodialysis
  – First established in 1997
  – Latest update in 2015
  – 12 practice guidelines
  – 47 page document (Yes, I read all 47 pages!)
• Guideline 1: Timing of Dialysis Initiation
  – Patients who reach CKD stage 4 (GFR < 30 mL/min/1.73 m²), should receive education about kidney failure and options for its treatment - kidney transplantation, PD, HD in the home or in-center

<table>
<thead>
<tr>
<th>Stage</th>
<th>Qualitative Description</th>
<th>Renal Function (mL/min/1.73 m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kidney damage-normal GFR</td>
<td>≥90</td>
</tr>
<tr>
<td>2</td>
<td>Kidney damage-mild ↓ GFR</td>
<td>60-89</td>
</tr>
<tr>
<td>3</td>
<td>Moderate ↓ GFR</td>
<td>30-59</td>
</tr>
<tr>
<td>4</td>
<td>Severe ↓ GFR</td>
<td>15-29</td>
</tr>
<tr>
<td>5</td>
<td>End-stage renal disease</td>
<td>&lt;15 (or dialysis)</td>
</tr>
</tbody>
</table>
• **Guideline 2: Initiating Maintenance Dialysis**
  – The decision to initiate maintenance dialysis should be based primarily upon an assessment of signs/symptoms
    • Uremia
      – Loss of appetite, fatigue, nausea, vomiting, AMS
    • Protein-energy wasting
      – Proteinuria
    • Metabolic abnormalities (Hyperkalemia)
    • Volume overload (leg edema, CHF)
KDOQI

• Guideline 3: Selection and Placement of Hemodialysis Access
  – Access should be placed distally and in the upper extremities when possible
  – Options for fistula placement should be considered first, followed by prosthetic grafts if fistula placement is not possible
  – Catheters should be avoided and used only when other options are not available
• Guideline 4: Fistula First Initiative
  – In 2003 the CMS and NKF jointly formed and implemented a National Vascular Access Improvement Initiative called the Fistula First Initiative (FFI)
  – The primary goal of this continuous quality improvement (CQI) project was to increase the appropriate use of AVF for HD access
  – The current goal is to have 65% of patients using an AVF for hemodialysis
  • Sentara Vascular Specialists - 84% using AVF
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• AV Access Options
AV Access Options

What are the options for Hemodialysis?

- AVF
- AVG
- Catheter
AV Access Options

- ArterioVenous Fistula (AVF)
  - Surgically created **Direct Connection** of an artery to a vein
AV Access Options

• ArterioVenous Fistula (AVF)
  – Fistulas are the **GOLD STANDARD** for AV access
    • It has a lower risk of infection
    • It has a lower tendency to thrombose
    • It allows for greater blood flow and reduces treatment time
    • It stays functional longer than other access types
    • It’s usually less expensive to maintain
  – Disadvantage
    • Lengthy maturation time (8-12 weeks) or never maturing at all
AV Access Options

- ArterioVenous Fistula (AVF)
  - Maturation rate – 70%
    - 50% will need assistance to mature - BAM, surgical revision, branch ligation or embolization, superficialization
  - Failure rate – 30%
  - Important to find a good caliber vein (≥ 3mm) and a good caliber artery (noncalcified)
  - Vein mapping is typically used to identify the arm vessels
AV Access Options

- ArterioVenous Fistula (AVF)
  - When is an AVF considered mature – Rule of 6’s

  **Fistula maturation**
  - Rule of 6's
    - 6 weeks old
    - 6 mm deep
    - 6 mm fistula diameter
    - 600 mL per min flow
AV Access Options

- ArterioVenous Fistula (AVF)
  - Different Types of fistula
    - Radiocephalic (Brescia-Cimino)
    - Radiobasilic
    - Brachiocephalic (Kaufman)
    - Brachiobasilic (BVT)
AV Access Options

- Radiocephalic AVF (Cimino)
AV Access Options

- Brachiocephalic AVF (Kaufman)
AV Access Options

- Brachiobasilic AVF (BVT)
AV Access Options

• General Principles when creating dialysis access
  – Fistula over Graft
    • Only if good caliber arteries and veins
  – Arm access rather than leg access
  – Nondominant arm is preferable
  – Start distally then move proximally
AV Access Options

- Hemodialysis
  - AVF
  - AVG
  - Catheter
AV Access Options

- ArterioVenous Graft (AVG)
  - Surgically inserted **Indirect Connection** between a vein and an artery using a soft plastic tube
AV Access Options
AV Access Options

• ArterioVenous Graft (AVG)
  – Advantages
    • AV graft provides a solution for patients with poor caliber veins
    • AV graft can be used as soon as 4 weeks after placement
  – Disadvantages
    • Increased risk of infection
    • Higher risk of thrombosis
    • Requires secondary procedures to maintain patency
    • Poor longevity
AV Access Options

• ArterioVenous Graft (AVG)
  – Different types of AVG
    • Radiobasilic
    • Forearm loop graft (Brachiobasilic or Brachiocephalic)
    • Brachial artery to Axillary vein
    • Axillary loop graft
    • Axillary artery to Axillary vein graft (Necklace)
    • Axillary artery to Femoral vein
AV Access Options

- ArterioVenous Graft (AVG)
AV Access Options

• Radiobasilic AVG
AV Access Options

• Forearm Loop AVG
AV Access Options

- Chest Wall Loop Graft
AV Access Options

- Necklace Graft
AV Access Options

- Rt Axillary artery to Femoral Vein
AV Access Options

• If patient has exhausted all arm options ONLY then investigate legs
  – Leg Fistula
    • Femoral Vein Transposition
  – Leg Graft
    • Thigh loop Graft
AV Access Options

Hemodialysis

- AVF
- AVG
- Catheter
AV Access Options

• Tunneled Dialysis Catheter (TDC)
  – What is it?
    • Dual lumen cuffed tunneled catheter with an arterial port for blood flow out of the body and a venous port for blood return
  – How long can a TDC stay in?
    • > 3 weeks (NKF answer)
    • Until the arm access is ready (My answer)
AV Access Options

- Tunneled Dialysis Catheter (TDC)
  - What vessel is it placed in?
    - Internal Jugular vein
    - Femoral vein
    - Subclavian vein
AV Access Options

• Tunneled Dialysis Catheter (TDC)
AV Access Options

• Tunneled Dialysis Catheter (TDC)
  – Advantages
    • Can be used immediately
  – Disadvantages
    • High infection rate - bacteremia
    • Cannot shower with catheter in place
    • Risk of causing central vein stenosis/thrombosis
    • Poor longevity
AV Access Options

Hemodialysis

AVF

AVG

Catheter
Hemodialysis Vascular Access

Hemodialysis cleans your blood through a fistula, graft or catheter. If you have kidney failure, one of these will be your LIFELINE! Talk with your doctor to decide which type of vascular access is best for you.

Fistula

A fistula directly connects an artery to a vein. The vein stretches over time, allowing needles to be put in it. Fistulas are the gold standard for hemodialysis. 

Advantages
✓ Permanent
✓ Beneath the skin
✓ Lasts longest, up to 20 years
✓ Provides greater blood flow for better treatment
✓ Fewer infections & other complications
✓ Fewer hospitalizations
✓ Better survival (lower risk of dying than patients with catheters)

Disadvantages
✗ May not mature/develop
✗ Not possible for all patients
✗ Usually cannot be used for at least 6–8 weeks

Graft

A graft is a tube, usually made of plastic, that connects an artery to a vein, allowing needles to be put in it. Grafts are the second best way to get access to the bloodstream for hemodialysis.

Advantages
✓ Permanent
✓ Beneath the skin
✓ May be used after 2 weeks, in some cases
✓ May work in patients with poor veins

Disadvantages
✗ Increased hospitalizations
✗ Increased risk for clotting
✗ Increased risk for serious infections
✗ Increased risk for other complications and repair procedures
✗ Does not last as long as a fistula

Catheter

A catheter is a tube inserted into a vein in the neck or chest to provide vascular access for hemodialysis. The tip rests in your heart. It is usually temporary access. It is the third choice for getting access to the bloodstream for hemodialysis. For some patients it is the only choice and it will need to be used as a permanent access.

Advantages
✓ Can be used immediately after placement

Disadvantages
✗ Higher infection rates, which can be very serious or fatal
✗ Increased hospitalizations
✗ Does not last long, usually less than one year
✗ May require longer treatment times
✗ Prolonged use may lead to inadequate dialysis
✗ Cannot shower without special appliance
✗ High rate of clotting requiring frequent procedures
✗ Risk of destroying important vein
AV Access Case

- 63 year old African American male referred to vascular surgery office for AV access
- NOT on dialysis
- Nephrologist told him he has CKD 4
- Right hand dominant
AV Access Case

- On Focused examination
  - 2+ pulses bilaterally
  - No visible veins noted in upper extremities

- Bilateral upper extremity vein mapping demonstrates
  - Left arm – Good caliber (> 3mm) cephalic vein (starting at elbow) and axillary vein patent
  - Right arm – All veins are small (< 2mm) and sclerotic, axillary vein patent
AV Access Case

- What are the options?
  - Right arm AVG
    - Brachial artery to Axillary vein
  - Left arm AVF
    - Brachiocephalic (Kaufman)

- KDOQI Guidelines
  - Fistula over Graft
  - Non dominant arm
AV Access Case

• Surgery
  – Patient undergoes Left arm Kaufman AVF creation

• Post op AVF duplex shows that AVF is maturing nicely – Rule of 6’s
  – Permission to use AVF

• 1 month later patient gets admitted for uremic symptoms

• Nephrologist wants to initiate maintenance HD
AV Access Case

- Vascular Surgery
  - Evaluate AVF and give permission to access
- In patient Dialysis Unit
  - Unable to access AVF
- Vascular surgery called to dialysis unit
AV Access Case

- Vascular Surgery
  - TDC inserted to allow Lt arm infiltration to resolve

- Pt seen in office in 3 weeks
  - Infiltration resolved
  - AVF duplex is normal
  - Permission to use AVF again

- Outpatient dialysis unit successfully cannulated AVF

- TDC eventually removed
Take Home Points

• NKF – KDOQI guidelines
  – Fistula First Initiative
  – Upper extremity > Lower extremity
  – Work distal to proximal
  – Preferably non dominant arm
  – Graft only when AVF not possible/successful
Thank You