Preoperative Evaluation for Hemodialysis access

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Disclosure

- I have no financial relationships to disclose.
- I have no unlabeled or unapproved uses of drugs or devices in my presentation

Overview

- Introduction
- History
- Physical Examination
- Ultrasonography
- Vessel Selection

INTRODUCTION

Introduction

- There are over 355,000 patients on hemodialysis in the US
- Arteriovenous (AV)fistulae have a high failure rate approximately 0.2 events per year and low maturation rate
- AV grafts have a failure rate of 0.8-1 events per year.
- It is essential that we appropriately evaluate the patient prior to access creation to reduce failure rates

HISTORY
History

• Past Medical History:
  – Diabetes mellitus
  – Peripheral arterial disease
  – Coronary artery Disease
  – Severe congestive heart failure
  – Advanced age
  – Female gender
  – Hypercoagulable states (repeat thrombotic events)
  – BMI

  (All associated with difficulty establishing a functional AV access)

• Past Procedural and Surgical History:
  – Indwelling central lines
  – Prior central lines/ PICC lines
  – Pacemakers/defibrillators
  – All prior access procedures
  – Vascular trauma
  – Cardiac surgery
  – Previous non-access surgery to the extremity

  (increased risk of central venous stenosis)

• Miscellaneous considerations:
  – Dominant arm
  – Immobility of extremity (previous stroke)
  – Recurrent infections
  – Immunosuppression
  – Overall medical condition
  – Social support system
  – Skin integrity

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PHYSICAL EXAMINATION

Physical Exam

• General considerations:
  – Forearm eczema
  – Extensive solar keratosis
  – Thin skin
  – Motor or Sensory neuropathy
  – Sites of previous IV/PICC line access

• Assessment of Distal arterial pulses –
  – Brachial, radial and ulnar arteries should all be checked for compressibility and equality bilaterally
  – The Allen’s test confirms a patent palmar arch
  – Bilateral extremity blood pressures should be recorded and found to be equal
  – Note recent arterial puncture
Physical Exam

• Assessment of the Venous System
  – Evaluate for the presence, diameter and course of superficial forearm and arm veins
  – The superficial venous system should be examined with and without a tourniquet in place
  – Focus on distensibility and interruptions.
  – Prominent chest wall venous collaterals and edema are signs of central venous stenosis
  – Arm diameter in obese patients may be a factor

Ultrasonography

• It is utilized to evaluate:
  – arterial inflow
  – venous outflow
  – and the adequacy of the venous system to support an autogenous or prosthetic access in the extremity.
  – Venous component performed with and without tourniquet in place

Ultrasonography

• Venous component:
  – Duplex Cephalic vein from wrist to shoulder
  – Duplex Basilic vein from its origin to its confluence with the brachial vein near the axilla.
  – Document:
    • diameter
    • patency
    • Continuity
    • any anatomic anomalies and evidence of phlebosclerosis.
  – The vessel course should be mapped and marked

Ultrasonography

• Arterial Component
  – Obtain bilateral brachial pressures and brachial volumes
  – Duplex brachial artery, radial and ulnar artery documenting any evidence of atherosclerosis, calcification as well as abnormalities or anomalies, i.e. high bifurcation of the brachial, and any stenosis
Vessel Selection

- Artery selection:
  - RadioCephalic AVFs created with radial arteries, with a diameter >1.5 mm vs <1.5 mm. Immediate patency rate in the >1.5 mm group was 92 % vs 45% in the <1.5 mm group.
  - Patency rates after 12 weeks were 83% vs 36%, respectively.
  - Based on this 2mm artery is the commonly accepted limit for adults

Vessel Selection

- Vein selection:
  - Cephalic vein at the wrist >2mm -2.6mm
  - Cephalic vein at the upper arm >3mm
  - Increased diameter of the cephalic vein with tourniquet application is a predictor of successful maturation of AVF
  - Evaluation and assessment of Basilic vein as well to determine size, course and patency

Surgical Selection

- Evaluation of the non invasive data will help one determine the plan for the patient.
  - Inadequate cephalic veins often results in planning for basilic vein transpositions, either one stage or two stage

Summary

- History focused on risk factors for AVF failure and risk factors for central venous stenosis
- Physical exam focused on adequacy of arterial inflow and venous outflow
- Ultrasound identifying arterial diameter >1.5mm and venous diameter >2mm with good distensibility.
  - These help to maximize successful primary function of hemodialysis access

Thank you