Angiography

The radiographic demonstration of the vascular anatomy

ANGIOGRAPHY

The typical procedure can be divided into four phases:

– Phase 1 – patient preparation – the technologist assists with preparing the patient for the procedure:
  • Obtaining patient consent
  • Setting up tray
  • Set up injector & filming equipment
  • Establish patient monitoring
  • Shave & prepare the puncture site
  • Establish vascular access

The Seldinger technique

• Administer local
The Seldinger technique

- Access vessel

The Seldinger technique

- Thread guidewire & remove needle

The Seldinger technique

- Insert catheter
The Seldinger technique

- Remove guide

ANGIOGRAPHY
- Phase 2 – catheter placement
  - Technologist assists physician in proper placement of the catheter
  - Performed under fluoroscopic guidance
  - May be repeated after phase 3 for additional images as necessary

ANGIOGRAPHY
- Phase 3 – filming
  - Technologist operates injector & filming equipment to produce the desired radiographs
  - Processes the images or films
  - Prepare images for viewing by physician
  - If additional films are required with different catheter placement, return to phase 2
ANGIOGRAPHY
– Phase 4 – patient dismissal
  • Dress puncture site(s)
  • Assure that patient &/or nurse understand post-procedure orders

VISCERAL ANGIOGRAPHY
• Thorax
  – Cardiac
    • Purpose – to evaluate for:
      – Adults – coronary arterial disease & ventricular function
      – Children – congenital cardiac abnormalities
        • Patent ductus arteriosus
        • Septal defect
        • Tetralogy of Fallot & related placement disorders
    • Method – cinefluorography
      – RAO 30 – left coronary artery
      – LAO 30, 60 – both coronary arteries
      – Left lateral – left coronary artery & branches
    • Approach – femoral artery

VISCERAL ANGIOGRAPHY
– Thoracic aorta
  • Purpose
    – Trauma (MVA)– may cause dissection of aorta
    – Congenital defects – coarctation
  • Methods
    – Roll/cut film or digital
    – Arch injection
      • RPO – arch in profile, or
      • Biplane – RPO & LPO
  • Approach – femoral artery with pigtail catheter
VISCERAL ANGIOGRAPHY

– Pulmonary circulation
  • Purpose – pulmonary emboli
  • Methods
    – Roll/cut film, digital (?)
    – Bolus injection into affected lung with single-plane AP projection
  • Approach – femoral vein with pigtail catheter

VISCERAL ANGIOGRAPHY

– Abdomen
  – Abdominal aorta
    • Purpose – evaluate for:
      – Atherosclerotic disease
      – Aneurysms
      – Tumors
    • Methods
      – Roll/cut film, digital
      – Bolus injection with single-plane AP projection, occasionally biplane (AP & lat)
    • Approach
      – Femoral artery, alternate axillary
      – Translumbar Arteriography (TLA)

VISCERAL ANGIOGRAPHY

– Selective visceral angiography
  • Purpose – evaluate for:
    – Obstruction
    – Tumors
    – Arteriovenous malformations (AVM’s)
    – Gastrointestinal (GI) bleeding
  • Methods
    – Roll/cut film, digital
    – Selective catheterization of:
      • Celiac
      • Superior mesenteric artery (SMA)
      • Inferior mesenteric artery (IMA)
  • Approach - femoral
VISCERAL ANGIOGRAPHY

• Central venography
  • Purpose
    – Demonstrate inferior vena cava (IVC) &
      sometimes the superior vena cava (SVC)
    – Evaluate stenosis, encroachment by tumors,
      & emboli
    – Place IVC filters
  • Methods
    – Roll/cut film, digital
    – Usually single plane
    – Bolus injection via pigtail catheter
  • Approach – femoral vein

Peripheral Angiography

• Upper extremity arteriography
  • Purpose
    – Trauma
    – Tumors
    – Other vascular disorders
  • Methods
    – Roll/cut film, digital
    – Single-plane AP
    – Selective subclavian or axillary injection
  • Approach – femoral artery

• Upper extremity venography
  • Purpose – to evaluate for:
    – Thrombophlebitis
    – Venous obstruction (tumor encroachment, etc.)
  • Methods
    – Digital is superior, though film-screen may also
      be used
    – Single-plane, AP
  • Approach –
    – needle or dilator
      • Hand vein
      • Antecubital vein
Peripheral Angiography

- Lower extremity arteriography
  - Purpose – evaluation of:
    - Peripheral vascular disease
    - Atherosclerosis
    - Vascular insufficiency
    - Trauma
  - Methods:
    - Roll/cut film
    - Bolus injection:
      - Abdominal aorta with run-off filming (bilateral)
      - Selective injection of affected leg (unilateral)
  - Approach – femoral (ipsilateral or contralateral) or axillary or brachial

Cerebral Angiography

- Purpose – to evaluate the carotid &/or vertebral arteries for:
  - Atherosclerotic disease
  - Thrombotic disease
- Methods
  - Non-selective
    - Arch & carotids
      - Bolus injection of arch via pigtail catheter
      - RPO to profile the arch
      - Include the carotid bifurcation
      - LPO may be used to profile the bifurcation
      - Roll/cut film or digital
      - Approach from femoral artery
Cerebral Angiography

Methods

- Non-selective
  - Direct puncture
    - Direct needle stick into artery
    - Usually rt brachial with retrograde injection to visualize the rt carotid & vertebral arteries
    - Lt carotid artery
    - Utilizes biplane roll/cut film
    - Never was the preferred method & is rarely performed any more

- Selective cerebral angiography
  - Preferred method for evaluation of:
    - Intracranial structures, including tumors
    - Aneurysms
    - Arteriovenous malformations (AVM)
    - Cerebrovascular accidents (CVA)
  - Biplane roll/cut film, digital with three injections (both carotids & 1 vertebral)
  - Approach from femoral artery with selective catheterization.
Interventional Radiology

- Term first coined in 1976
- Definition
  - Any radiologic procedure using any selective catheter or needle technique for the diagnosis or treatment of disease
    - It may supplement surgery
    - It may replace surgery

Vascular interventional procedures

- Techniques to reduce blood flow
  - Electrocoagulation
    - Rarely used – considered experimental
    - Completely occludes blood flow to neoplasms
  - Vasoconstriction
    - Selective infusion of vessel constricting drugs to temporarily reduce blood flow
  - Transcatheter embolization
    - Indicated for trauma-induced bleeding, a highly vascular tumor, or to control bleeding before, during, or after surgery
    - Reduce blood flow without ischemia
    - Completely occlude flow with ischemia
Interventional Radiology

- Vascular interventional procedures (cont.)
  - Techniques used to increase blood flow
    - Thrombolysis – selective infusion of agents that dissolve (lyse) blood clots
      - Urokinase – enzymatic, derived from human kidney tissue
      - Streptokinase – non-enzymatic, derived from -hemolytic streptococci
      - Alteplase – a tissue plasminogen activator (TPA)

Interventional Radiology

- Vascular interventional procedures
  - Techniques used to increase blood flow (cont.)
    - Intra-arterial vasodilatation – used to counteract vasospasm through selective infusion of:
      - Sodium nitroprusside
      - Reserpine
      - Prostaglandin E
      - Papaverine
      - Prostacyclin
    - May be used in conjunction with other techniques to increase blood flow

Interventional Radiology

- Vascular interventional procedures
  - Techniques used to increase blood flow (cont.)
    - Percutaneous transluminal angioplasty (PTA)
      - Purpose
        - Dilation of stenotic vessels
        - Re-canalation of occluded vessels
      - Methods
        - Dilation catheters
        - Balloon catheters
        - Laser angioplasty
        - Excisional atherectomy
Interventional Radiology

- Vascular interventional procedures (cont.)
  - Other vascular procedures
    - Removal of intravascular foreign bodies
      - Catheter with guide snare
      - Catheter with helical loop basket
    - Embolectomy (rarely used anymore)
      - Suction
      - Balloon catheter

- Non-vascular interventional procedures
  - Needle biopsy
    - Fine needle aspiration – aspirate fluid from cysts
    - Large gauge core needle – cuts a “plug” of tissue
  - Percutaneous drainage
    - Internal
    - External
  - Percutaneous calculi removal