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

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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

Peripheral Angiography

- 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

Methods
- 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

Interventional Radiology
- 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

Interventional Radiology

- 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