

Vascular Hepatobiliary and Renal Intervention

Introduction

Why a Clinical Practice Guideline?

The practice of radiology has changed dramatically from being a specialty providing solely diagnostic information (Diagnostic Radiology) to one which is capable of providing minimally invasive treatment (Interventional Radiology).

Clinical practice guidelines are intended to assist healthcare providers in medical decision making minimizing variations in clinical practice between different institutions thereby aiming to achieve optimum level of patient care.

Who has developed these guidelines?

These guide lines have been developed by members of the Committee on Guidelines of the Sri Lanka College of Radiologists in consultation with other specialists like General Surgeons, Vascular Surgeons, Gastroenterologists, Urologists and Anaesthesiologists.

For whom is this guideline intended?

It is intended to guide all the health care providers in institutions where interventional radiological procedures are offered. Although it is targeted for the institutions under the Ministry of Health, guidelines are encouraged to be used in any private health care facility where adequate facilities are available to carry out interventional radiology procedures.

Objectives

Provide evidence based recommendations to clinicians and radiologists to decide on and selecting the appropriate radiological intervention and to provide best possible care before, during and after the procedure to ensure that the patient will have successful and safe treatment.

1. Interventional Radiology –

1.1 Introduction

Interventional radiology is a “minimally invasive” treatment strategy in which the interventional radiologist reaches the lesion percutaneous or through natural orifices in human body.

Practice of interventional radiology needs proper infrastructure facilities including appropriate equipment and sterile work environment, specially trained staff with full time dedication and adhering to standard precautions.

Radiological interventions are considered **safe, reliable and durable** and are **cost- effective** alternatives to conventional surgical methods in treating **carefully selected** lesions.

Radiological interventions are divided into two broad categories.

- Vascular interventions
- Non-vascular interventions

Some of the commonly performed vascular interventional procedures are

- Balloon angioplasty and stenting
- Embolizations
- Thrombolysis
- Venous interventions.

Some of the commonly performed non-vascular interventions are

- Biopsy and drainage procedures
- Biliary interventions (e.g. percutaneous biliary drainage, percutaneous cholecystostomy)
- Renal interventions (nephrostomy, percutaneous ureteral stent insertion)
- Gastrointestinal interventions (oesophageal stent insertion, percutaneous gastrostomy)
- Fallopian tube catheterization

1.1 Patient selection

An essential prerequisite for a successful radiological intervention is **close communication between radiologist and other clinicians** for patient selection, pre-procedure preparation, during the procedure and afterwards and in planning short-term and long-term follow up.

Course of action differs with

- condition of the patient
- available resources
- advances in knowledge and technology

1.1.1 Consent

For all procedures informed written consent has to be obtained from patient or guardian where applicable.

1.1.2 Patient preparation

- Good clinical history
- Clinical examination
- Reviewing all prior imaging
- Laboratory tests
- Preparation of site of entry
- Preparation for sedation / general anaesthesia

1.2.3. Complications

- At site of entry - bleeding, haematoma, false aneurysm, AVF
- At site of intervention - arterial dissection, occlusion, rupture
- Remote - distal embolization
- Sepsis
- Complications specific for the procedure
- Complications of contrast media
- Complications due to sedation or anaesthesia
- Complications due to co-morbid conditions

1.2.4. Post procedure care

- Monitoring of vital signs
- Pain relief
- Observation for complications at site of access, at site of intervention and distal complications
- Antibiotics where indicated
- Long-term follow up

1.3 Balloon angioplasty and stenting in lower limb arteries

Percutaneous transluminal balloon angioplasty(PTA):

Mechanically increasing the lumen of stenosed arteries by inflating a balloon dilation catheter to a pre-determined diameter.

Stents:

Metal scaffolds used to treat stenotic and occlusive vessels by supporting vessel walls to maintain patency once dilated. Introduced into the vessel in a compressed state and are then expanded at the site of interest.

Indications

- Lifestyle-limiting claudication
- Critical limb ischaemia (rest pain, ulcer, gangrene)
- To increase inflow or outflow prior to or after bypass surgery
- Bypass graft stenosis

PTA may be performed even with unfavourable anatomy in

- Patients who are at high risk for surgery
- Unavailability of autologous vein for bypass
- Patient with short life expectancy

Success of percutaneous angioplasty depends on

- length of the stenosis
- degree of stenosis
- concentric or eccentric lesion
- pathology (atherosclerosis or fibro muscular hyperplasia }
- calcified plaque or not
- overall extent of the disease
- control of risk factors
- skill of the interventionalist

Decision between surgical bypass and percutaneous angioplasty is complicated.

Selecting patients for percutaneous angioplasty includes considering

- Symptoms for intervention
- Conservative treatment
- Risk factor reduction
- Surgery vs PTA

Arterial lesions in the lower limbs are classified into following categories for the purpose of balloon angioplasty and stenting.

CATEGORY 1

- PTA alone is treatment of choice
- High success rate

CATEGORY 2

- Well suited for PTA
- Followed by surgical bypass to treat multilevel vascular disease

CATEGORY 3

- Amenable to PTA
- Moderate chance of success compared to surgery

CATEGORY 4

- Extensive disease
- PTA has limited role
- Low percentage of success

ILIAC ARTERY PTA

- **CATEGORY 1**
Stenosis is less than 3 cm in length, concentric and not calcified
- **CATEGORY 2**
Stenosis is 3 – 5 cm in length
OR
Less than 3 cm long but eccentric or calcified
- **CATEGORY 3**
Stenosis is 5 – 10 cm long
OR
Occlusion is less than 5 cm long after thrombolytic therapy
- **CATEGORY 4**
Stenosis greater than 10cm long
OR
Occlusions greater than 5 cm long after thrombolytic therapy
OR
Extensive bilateral aorto-iliac atherosclerosis
OR
Iliac stenosis in a patient with abdominal aortic aneurysm or another lesion requiring aortic or iliac surgery

FEMOROPOPLITEAL PTA

- **CATEGORY 1** -
Single stenosis or occlusions up to 3 cm in length that are not at the origin of superficial femoral artery or distal part of popliteal artery
- **CATEGORY 2** -
Single stenosis or occlusions 3 to 10 cm in length, not in distal popliteal artery
OR
Heavily calcified stenosis up to 3 cm in length
OR
Multiple stenosis or occlusions each less than 3cm
OR
Single or multiple lesions where there is no continuous tibial runoff, to improve inflow for distal surgical bypass
- **CATEGORY 3** -
Single lesions 3 – 10 cm in length involving the distal popliteal artery
OR
Multiple focal lesions each 3-5 cm in length which may be calcified
OR
Single stenosis or occlusions greater than 10 cm in length
- **CATEGORY 4** -
Complete occlusion of common femoral artery and / or superficial femoral artery
OR
Complete occlusion of popliteal artery and proximal trifurcation.

Contraindications

- Medically unstable patient
- Lesions that are not haemodynamically significant
- Lesions with adjacent large fresh thrombus
- Lesions immediately adjacent to an aneurysm
- Lesion in an essential collateral vessel

Pre procedure preparation

- Clinical history and physical examination
- Doppler ultrasound
- Ankle- brachial index
- **COMPLETE DIAGNOSTIC ARTERIOGRAPHY**
Grade X
- Hb%, serum creatinine, serum electrolytes, coagulation parameters
- Stop oral intake 6 hours prior to procedure
- Start intravenous hydration the night before to ensure adequate hydration
- Preparation of arterial puncture site, usually the groins
- Acute care hospital

Patient care during procedure

- Monitoring – cardiac, BP, record vital signs
- Pulse oxymetry, separate personnel to monitor
- Intravenous access
- Intra arterial pressure measurements
- Facilities for emergency resuscitation
- **POST PROCEDURE ARTERIOGRAPHY**

Grade X

Complications

- Puncture site - bleeding, haematoma, false aneurysm, AVF
- Rupture of plaque - at puncture site or at the site of intervention causing thrombosis and propagation of thrombus leading to ischaemia
- Angioplasty site - thrombus, rupture of artery
- Distal vessel - dissection, embolization
- Systemic - renal failure, myocardial infarction, cerebro vascular accident

Post procedure care

- Bed rest
- Observation of puncture site & distal vasculature
- Haemodynamic monitoring
- Urine output, cardiac symptoms, pain in distal limb
- Renal function tests at 24 – 48 hrs
- Monitor initial ambulation
- Assessment by vascular surgeon
- Risk factor reduction

1.4. IVC filter placement

Inferior vena caval filters are intravascular devices intended to prevent pulmonary embolism (PE) by trapping venous emboli from sources in lower limbs, pelvis and IVC.

Indications

- IVC, iliac or femoro-popliteal DVT and one or more of
 - contraindication to anticoagulation,
 - complications of anticoagulation or
 - failure of anticoagulation
- Massive PE and residual DVT
- Free floating ilio-femoral or IVC thrombus
- Severe cardiopulmonary disease & DVT
- Poor compliance with anticoagulant medications

Additional indications in SELECTED patients

- Severe trauma without documented PE or DVT
 - closed head injury
 - spinal cord injury
 - multiple long bone or pelvic fracture
- High-risk patients
 - immobilized, in ICU, prophylactic pre-op:

Ideal position is infrarenal IVC. Suprarenal filter placement is indicated for

- Renal vein thrombosis
- IVC thrombus extending above renal vein
- Filter placement during pregnancy
- Thrombus extending above previous infrarenal filter

Contraindications

- Total thrombosis of IVC
- Inability to gain access to IVC

Pre procedure inferior vena cavogram is required for the following information

- Infra renal length of IVC
- Infra renal diameter of IVC
- Location and number of renal veins
- IVC anomalies
- Intrinsic IVC disease

Complications

- Recurrent PE
- IVC occlusion
- Filter embolization
- Access site thrombosis
- Incorrect deployment

Post procedure care

- Observe for limb oedema
- Monitor vital signs
- Plain radiograph of abdomen to assess filter position annually

1.5 Chemoembolization of liver malignancies

Chemoembolization – infusion of chemotherapeutic agents followed by embolization with gel foam or PVA particles

Liver dominant malignancy – hepatic component is the only site of disease OR what is most likely to cause patient morbidity or mortality

Indications

Liver dominant hepatic malignancies not amenable to surgical resection

Hepatocellular carcinoma
Metastases from colo-rectal cancer,
ocular melanoma, soft tissue sarcoma

Contraindications

- More than 50% liver involvement
- Serum bilirubin greater than 2 mg / dL
- Hepatic encephalopathy
- Contraindications to angiography
- Contraindications to chemotherapy

Pre procedure evaluation

- Contrast enhanced CT or MRI
- Patency of portal vein
- Full blood count
- Prothrombin time
- Liver function tests
- Renal function tests

Pre procedure medication & preparation

- Anti emetics
- Steroids
- Antibiotics
- Hydration with N saline
- Bowel preparation the night before

Chemotherapeutic agents

- Cisplatin
- Doxorubicin
- Mitomycin

Complications

- Liver failure
- Abscess
- Post-embolization syndrome
- Cholecystitis
- Biloma
- Pulmonary artery oil embolism
- Gastrointestinal bleeding
- Arterial dissection

Post procedure care

- Antibiotics for 3-7 days
- Anti emetics
- Analgesia

Follow-up imaging

- 4 – 6 weeks after the procedure
- CT / MRI to look for absence of arterial enhancement
- If no active disease ; once every 3-4 months

1.6 Percutaneous biliary drainage

Percutaneous biliary drainage is a therapeutic procedure that includes percutaneous cannulation of a peripheral bile duct followed by placement of a tube or a stent for external or internal drainage.

Indications

- Palliation for unresectable primary or metastatic malignant obstruction
- Benign stricture
- Preoperative decompression
- Sepsis associated with biliary obstruction
- Prophylactic decompression after ERCP
- When ERCP is not possible or not available
- Failed ERCP

Relative contraindications

- Uncorrectable bleeding disorder
- Large volume of ascites

Pre procedure preparation

- Prothrombin time
- Check and correct any coagulopathy
- Renal function tests
- Prophylactic antibiotics

Complications

- Pericatheter bile leak
- Sepsis
- Haemorrhage
- Peritonitis, cholecystitis

Post procedure care

- Monitoring for vital signs
- Analgesia
- Antibiotics
- Catheter care

1.7 Nephrostomy

Nephrostomy: Percutaneous introduction of a catheter into the pelvicalyceal system.

Indications

- Relief of acute obstruction
- Obstruction complicated by infection
- Obstruction causing impaired renal function
- To allow percutaneous access to kidney for stent placement, stone removal, endopyelotomy, dilatation of strictures, urodynamic studies, infusion of drugs, laser therapy of upper urinary tract transitional cell carcinoma
- For urinary diversion in the presence of a urinary leak from ureter
- Prophylactic placement prior to ESWL of large renal stones

Relative contraindications

- Clotting deficiency
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Pre procedure preparation

- Review prior imaging
- Check for coagulopathy; clotting profile and full blood count
- Serum creatinine
- Intravenous access and ensure adequate hydration
- Stop oral intake 6 hours prior to procedure

Complications

- Bleeding
- Sepsis
- Tube displacement
- Perforation of pelvicalyceal system and adjacent viscera

Post procedure care

- Bed rest till haematuria begins to clear
- Monitor vital signs
- Fluid balance
- Catheter care
- Antibiotics

1.8 Sedation and analgesia in Interventional Radiology

Practice of interventional radiology uses sedation, analgesia and anaesthesia to relieve anxiety, minimize discomfort and to reduce unwanted movement but can expose patients to additional risks.

1.8.1 Options

- Local anaesthesia
- Local anaesthesia with sedation
- Regional anaesthesia
- General anaesthesia

1.8.2 Indications to use general anaesthesia

- Anxious / agitated / confused / uncooperative patient
- Children
- Prolonged and painful procedures in adults
- Cerebral angiography and interventions
- When there is potential for airway obstruction as a result of the procedure
- Whenever radiologist is in doubt to manage deep sedation or analgesia in patient by him/ herself

Whether the intervention is done as an out patient, a day case or as an in ward patient has to be decided.

1.8.3 Facilities

Following facilities should be available on site when interventional radiology procedures are performed.

- Designated monitoring personnel
- Anaesthetic machine
- Ventilator
- Multichannel monitor
- Oxygen source
- Face masks and nasal prongs for oxygen delivery
- Oral and nasal airways
- Suction apparatus
- Ambu bag
- Laryngoscopes
- Tracheal tubes
- Defibrillator
- Tipping trolleys
- Medications
 - Intravenous anaesthetic agents
 - Sedatives
 - Opiates
 - Muscle relaxants and reversal agents
 - Antidotes
 - Essential drugs and infusions
- Emergency call system

2. References

- Society of Interventional Radiology Guidelines
- Interventional Radiology by Wilfrido R. Casteneda-Zuniga
- Abram's Angiography