RADIOLOGY


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INTERVENTIONAL RADIOLOGY

Interventional radiology (IR) is a medical specialisation that comprises performing a variety of imaging techniques to acquire images of the organs or tissues of the body which is also called image-guided therapy.

IR states to a variety of techniques which rely on the use radiological image guidance to accurately focus therapy or diagnosis. Most IR treatments are minimally invasive alternatives to conventional and laparoscopic surgeries. Interventional radiologists perform a broad range of procedures such as treating tumours, taking organ biopsies or placing stents into the body via an artery or vein. The certain types of imaging technique are used to guide the instruments to the exact area where the procedure or treatment is to be performed. This reduces the need for open or laparoscopic surgery. There is hardly any area of medicine where IR has not had some impact on patient management.
The crucial skills for an IR specialist are in diagnostic image reading with analysing and the guidance of needles and the use of catheter and wires to navigate around the targeted organ under imaging control. Interventional radiologists are particularly competent in anatomy, image interpretation, hand control with precision skill in interventional therapy.

Physicians may refer patients to an IR for several different purposes. Most patients who undergone interventional radiology have a tumour or a vascular pathology that's treated with image-guided therapy in place of (or combination with) traditional surgery or medical therapy. Interventional radiologic treatment is normally one of numerous treatment choices available extending from simple injection, through drug treatment and up to surgery.

Each patient should be considered on its own merits. Because they use small incisions, interventional radiologic treatment modalities normally are less painful than conventional surgical procedures. Patients get the sedation anaesthesia necessary to be safe and comfortable during an IR procedure.

Continuing advances in technology mean the various conditions that can be treated by interventional radiology is continuing to expand. Clearly documented advantages of minimally invasive IR techniques include lowered risks, reduced complication rate, decreased costs, better comfort, shorter hospital stays, shorter recovery period and return to work earlier. In many cases, interventional radiologic procedures don't require hospitalization and the treatment success rate is better than conventional treatment methods. Several IR treatments can be used to oncologic patients. Such as, trans-arterial chemoembolization can cut off the blood supply to a tumour, while radiofrequency ablation (RFA) and microwave ablation may damage the malignant tissue itself.

Vascular Interventional Radiology:

Arterial Procedures

Some kind of peripheral vascular diseases resulted by arterial occlusion which leading to reduced blood flow to proximal of occlusion. IR specialist can treat this pathology by using balloon catheters (balloon angioplasty) and stents. In some cases, arteries or bypass grafts block suddenly with a clot emboli which resulted in a sudden loss of blood supply of the extremity. Unless the blood flow is restored this situation can lead to amputation of the limb. IR can treat condition to establish blood flow back by injection of antithrombotic or fibrinolytic drugs to directly into the arterial emboli site trough catheters.

Patients with cerebral aneurysms embolization or intracerebral arteriovenous malformations IR specialist uses imaging guidance to place coils into an aneurysm to block the flow of blood and prevent the aneurysm from rupturing which called aneurysm coiling or coil embolization. This procedure effectively reduces the risk of bleeding. It is performed as endovascularly ("within" the artery) through a catheter inserted into the arterial system at the groin and guided to the brain. Tiny coils, glue, or mesh stents are used to promote clotting and close off the aneurysm.

Treatment of bleeding is the most usual vascular emergency treated by minimally invasive IR. Hemorrhage can arise from almost any organ or tissue e.g. from the gastrointestinal system, following a major trauma of visceral organs or even in early postpartum period. Hemorrhage can permanently be stopped by embolization or by stent graft relining or by inflating the balloon catheter in the vessel to stop the bleeding. This allows time for emergency surgical intervention or allows the physicians to prepare the patient for planned surgery. IR is also used to prevent intraoperative bleeding in some kinds of surgical procedures such as a caesarean operation of a patient with a high risk of post-partum hemorrhage from an abnormal placenta.

Venous Procedures

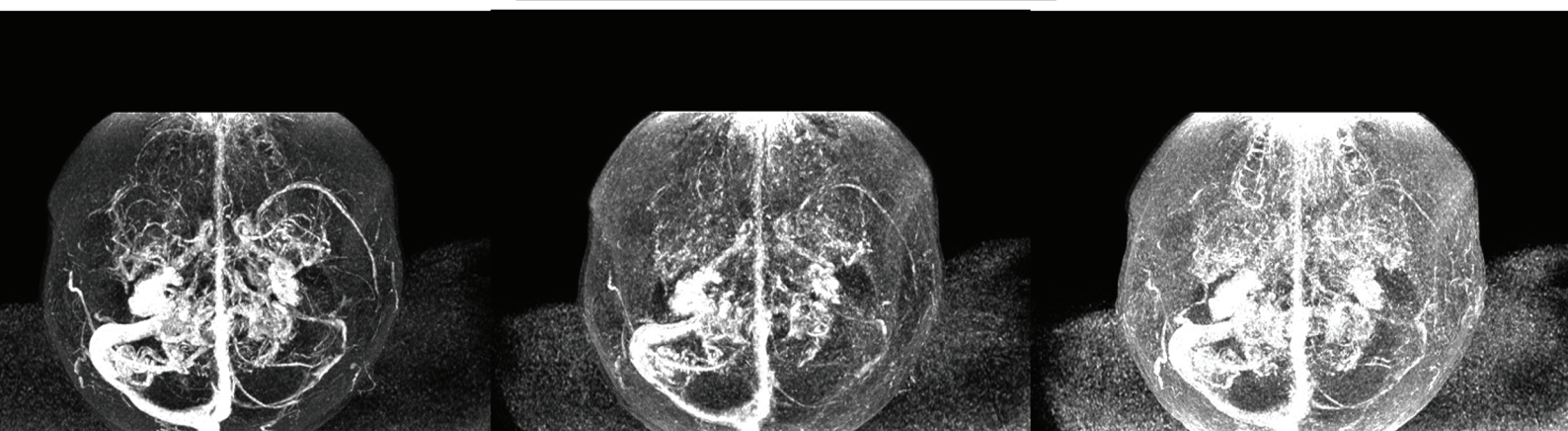
For patients with pulmonary embolism (PE), IR specialist performs two different treatment modalities, one of them is the placement of filters to vena cava inferior for capturing emboli to prevent life threating PE. Another one is, when there is, a massive PE causing collapse, IR specialist may use small catheter tubes to break up the blood clot from pulmonary vessels to restore blood supply.

The varicose veins mostly diagnosed in the legs under the knee but can occur in the pelvis, anal canal or scrotum even in the oesophagus. These can be treated by IR procedures such as by laser or microwave heat treatment or by the use of irritant drugs and special embolization methods.

Venous thrombosis can usually occur in the deep veins of legs which are sometimes treated by the injection of antithrombotic agents for thrombolysis through an intravenous catheter by an interventional radiologist. In some patients, blood clots develop as a result of a narrowing vein and clot can be broken down by IR techniques such as using balloons or stents. In some cases, intrathoracic tumours can compress a vein which leads to facial swelling, headache and other symptoms. These patients' symptoms can be relieved by IR stenting.

Non-vascular Interventional Radiology:

It's accepted as interventional oncology but the procedures are also successful in benign disorders. The main purpose is relieving symptoms or treating diseases with the most proper and least invasive option. Most of the IR interventions can be done on an outpatient clinic or with a day surgery means short hospital stay. Interventional radiology procedures are used for the listed purposes below:



· Treating the tumour/cancer by ablation or embolization
· Relieving the pressure effects of cancer on the surrounding structure or other systems (e.g. opening oesophageal stenosis, securing bowel passage, nephrostomy or biliary drainage)
· Draining of pathological fluid from chest or abdomen
· Placing feeding tubes (gastrostomy, jejunostomy)
· Treating collapsed spinal bones (vertebroplasty)

Treatment of tumour: These types of interventional radiology procedures are proposed to reducing the size of tumour or destroying tumours at their primary and/or metastatic lesions. This is an important topic with growing significance and leading to improved survival rate with low morbidity.

Hepatic, renal and other tumours (bone, lung etc.): These types of tumours can be treated by destructive therapy modalities (ablation) usually relating thermotherapy (by RF, ultrasound, microwave, laser) or cryotherapy. Oncological IR procedures is performed and monitored by one or combined multiple imaging techniques (ultrasound, CT or MR imaging).

As a benign condition, uterine fibroids can cause heavy menstrual bleeding and pain. These tumours also can be treated by specific IR intervention which called UFE (uterine fibroid embolization) which leads to reduction in tumour size.

In some tumour cases, IR specialist needs to combine embolization with drug therapy (chemo-embolization) or radiotherapy (radio-embolization) which targets directly the tumour and limits some of the side effects of systemic chemotherapy.

Interventional Radiology on Stone Diseases:

Kidney stones (nephrolithiasis) are solid masses made of crystals. Although kidney stones usually originate in kidneys, they can develop anywhere along the urinary tract; from kidneys to bladder. Urinary calculi are common and cause severe flank pain, sometimes associated with infection and obstruction of the urine passage. Obstruction of the urinary tract in the presence of infection can quickly cause irreversible renal injury which resulted in acute kidney failure. IR techniques include transcutaneous catheterization of the kidney for urine drainage (nephrostomy) and removing the renal stones using some instruments placed through the skin into the kidney. Large renal calculi are best treated by percutaneous nephrolithotomy which is an IR technique.

Gallstones are one of the most common upper abdominal disorders. Most of the patients are undergone laparoscopic surgery. When stones or tumours block bile drainage this causes jaundice, this is usually treated via endoscopy or ERCP. In some cases, physicians require interventional radiology to obtain drainage by placing catheter tubes through the liver to either remove the stones or place stents to allow drainage.

List of important and frequent IR procedure.

· Angiography
· Angioplasty and/or stenting
· Carotid stenting
· Endovascular treatment for cerebral vasospasm
· Inferior vena cava filters placement and removal
· Treatment of vascular malformations
· Varicose vein ablation
· Central venous catheterization
(PICC lines, ports, dialysis catheters, etc.)
· Drain placements (to remove fluid from visceral organs)
· Abscess drainage

·Articular aspirations or intraarticular injections (for injury, arthritis, or inflammation)
·Bursal injection
·Carpal tunnel ultrasound and injection
·Image guided cervical nerve root sleeve corticosteroid injection
·Lumbar epidural corticosteroid injection
·Lumbar nerve root sleeve injection
·Vertebroplasty
·Nephrostomy
·GI procedures or placing a gastrostomy tube (feeding tube)
·Spinal cord embolisation
·Thyroid fine needle aspiration (FNA)
·Transarterial Chemoembolisation (TACE)
·Uterine fibroid embolisation
·Biliary drainage
·Liver biopsy
·Selective Internal Radiation Therapy [SIRT]: Radiotherapy for liver cancer
·Pleural aspiration and chest tube placing
·Biopsy sampling
·Bone and soft tissue tumours' treatment by using ablation technologies

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