The following interventional procedures for cancer are available at St James Hospital Dublin

**Chemoembolization**

Applications: Primary Liver Cancer (Hepatocellular Carcinoma)

Secondary Liver Cancer (Colon, Breast, GI tract, Neuroendocrine)

Chemoembolization is a method used to deliver chemotherapy medication directly to liver tumours – either primary tumours that originated in the liver, or metastases that migrated to the liver from cancers at other sites, such as colon, neuroendocrine tumours and breast. Even in cases where chemoembolization is not curative, this approach relieves patient's symptoms and extends survival.

The procedure is performed by inserting a catheter into a blood vessel in the patient's groin and advancing it into the specific artery supplying the liver. Contrast, or a special type of dye, is injected and this visualises the tumour and blood vessels on an X-ray to determine the blood supply to the tumour.

The Interventional Radiologist then injects cancer-drug eluting embolic particles through a catheter selectively placed into the artery feeding the tumour. This mixture keeps a high concentration of medication in contact with the tumour for a period of time longer than that associated with traditional systemic chemotherapy. After the treatment is administered, the catheter is withdrawn, and the patient can usually return home after an overnight stay in the hospital. Chemoembolization offers several advantages over traditional systemic chemotherapy: Prolonging the time the medication stays in contact with the tumour – up to as much as a month – increases the treatment's effectiveness. Moreover, because the medication is delivered only to the tumour – rather than administered throughout the patient's bloodstream – healthy tissues are spared from side effects, allowing us to administer dosages that are greater than those used in conventional chemotherapy, without the systemic side effects. New embolic particles not only hold the chemotherapeutic medication in place, but also block the blood supply to the tumour – depriving it of oxygen and nutrients and thereby halting its growth.

The St James Hospital Interventional Radiology Group have particular expertise in the treatment of colon-related liver metastases by combination embolization and RF ablation therapy which has now become a gold standard for treatment of non-operable metastases.

**Tumour Ablation**

Applications: Primary Liver Cancer (Hepatocellular Carcinoma); Primary Lung Cancer; Primary Renal Cancer; Primary Bone Cancer, Secondary Liver Cancer (Colon, Breast, GI tract, Neuroendocrine); Secondary Bone Cancer; Secondary Adrenal Cancer

St James Hospital Interventional Radiologists are also using interventional radiology techniques to apply heating, or substances such as acetic acid or ethanol directly into tumours as a means of killing cancer cells. This type of treatment, called tumour ablation, is a relatively new technology that is showing promising results for treating cancers of many different types.

Radiofrequency ablation (RFA) offers a nonsurgical, localised treatment that kills the target tissue with heat, while sparing the healthy tissue. Because of the localised nature of this...
Radiological treatments, such as RFA, do not have any systemic side effects. Radiofrequency ablation can be performed without affecting the patient’s overall health and most people can resume their usual activities in a few days.

In this procedure, the Interventional Radiologist uses imaging to guide a small needle through the skin into the tumour. From the tip of the needle, radiofrequency energy is transmitted into the target tissue, where it produces heat and kills the tumour. Preliminary studies have demonstrated that RFA significantly reduced bone pain from metastatic disease in over 90 percent of patients who had failed or were not suitable candidates for conventional therapy. In these studies, there were only a few patients who suffered any side effects or complications. Therefore, RFA was demonstrated to be safe and effective in selected patients. A multicentre clinical trial is underway to further investigate the role of RFA in management of painful bone metastases.

During the procedure, using a CT scanner or ultrasound machine, a small needle-like device is inserted into the tumour through a tiny nick in the skin. The doctor watches this probe as the images are projected with the CT scanner or ultrasound machine onto a viewing screen so that the probe can be precisely guided into the tumour. The probe is then attached to an energy source that delivers heat (using radiofrequency, laser, or microwave energy) or freezing (a treatment called cryoablation), or a special needle (infusion needle) that allows the tumour to be injected with a tumour-destroying substance.

**Relief of Organ Obstruction**

Many cancers can grow to the point where they obstruct the normal flow of urine or bile, causing these fluids to build up in the body. Without treatment, such obstructions can cause not only pain, but infection or even liver or kidney failure. Interventional Radiologists at St James Hospital Dublin can insert an X-ray-guided catheter into the obstructed area to drain excess fluids. They may also insert a stent—a tiny wire mesh tube—into the organ to bypass the obstruction and permit fluids to drain normally. This is important in cases of palliative care.

**Treating Blood Clots and Bleeding**

One common side effect of cancer or cancer treatments is the development of blood clots, or emboli, that can be life-threatening if they travel to the brain, lungs or heart. There are two interventional radiology procedures that can reduce the risks posed by blood clots:

**Intra-arterial thrombolysis.** In this technique, the Interventional Radiologist guides a catheter through the blood vessels and to the site of a blood clot. Clot-busting drugs are infused through the catheter to break up the clot.

**Filter placement.** This technique is most often used when a blood clot is detected in the blood vessels of the leg (a condition called deep vein thrombosis). The Interventional Radiologist guides a small filter into the blood vessel that receives blood from the lower body (the vena cava) and carries it to the heart. If the blood clot dislodges from the vein in the leg, the filter will trap it before it can reach the heart.

**Controlling Bleeding:** If a cancer spreads to the blood vessels it may cause hemorrhage or bleeding. An interventional radiology technique called transcatheter embolisation can be used to clot the affected blood vessels and stop the bleeding.
**Tumour Biopsy**

Many cancers are now diagnosed by needle biopsy. During this procedure, we use imaging techniques (such as CT, X-ray, ultrasound, or MRI) to guide the insertion of a fine needle into the patient's tumour. A small amount of tissue is removed and then examined by a pathologist to determine if cancer cells are present. Needle biopsies are less painful, less disfiguring, and result in a shorter recovery time than conventional surgical biopsy procedures. Needle biopsy, also called image-guided biopsy, is usually performed using a moving X-ray technique (fluoroscopy) computed tomography (CT), ultrasound or magnetic resonance (MR) to guide the procedure. In many cases, needle biopsies are performed with the aid of equipment that creates a computer-generated image and allows radiologists to see an area inside the body from various angles. This "stereotactic" equipment helps them pinpoint the exact location of the abnormal tissue. Needle biopsy is typically an outpatient procedure with very infrequent complications; less than 1 percent of patients develop bleeding or infection. In about 90 percent of patients, needle biopsy provides enough tissue for the pathologist to determine the cause of the abnormality.

Advantages of needle biopsy include:

- With image guidance, the abnormality can be biopsied while important nearby structures such as blood vessels and vital organs can be seen and avoided.
- The patient is spared the pain, scarring and complications associated with open surgery.
- Recovery times are usually shorter and patients can more quickly resume normal activities.

**Palliation - Interventional Radiologists Can Help Reduce Pain and Improve Quality of Life**

Bones are the third most common location where cancer cells spread and metastasize. Bone metastases occur when cancer cells gain access to the blood stream, reach the bone marrow, begin to multiply and then grow new blood vessels to obtain oxygen and food – which in turn causes the cancer cells to grow more and spread. Some bone metastases become painful because the tumour eats away at the bone, creating holes that make the bone thin and weak. As the bones are replaced with tumour, nerve endings in and around the bone send pain signals to the brain. If left untreated, bone metastases can eventually cause the bone to fracture – seriously affecting a patient's quality of life. This is particularly true for long bones of the extremities where a fracture may render a limb non-functional. These patients may require surgical intervention to restore the function of their limbs. More commonly, metastases involve the ribs, pelvis, and spine.

For the most part, the goal of treating bone tumours is not curative, but rather palliative by reducing pain, preventing additional bone destruction, and improving function. In treating cancer patients with painful bone metastases, Interventional Radiologists may use one of the two different thermal ablation techniques – radiofrequency ablation and cryoablation. This form of therapy is aimed at desensitising the bone by killing the nerve endings in the vicinity of the metastasis. They can also treat painful vertebral metastases or fractures with vertebroplasty.
Vertebroplasty

The spine is one of the most common sites of metastasis. Vertebral bodies involved by the tumour may become painful and may eventually fracture. Surgical intervention with reconstruction of the spinal column is indicated only if the tumour causes compression of the spinal cord or instability of the spine. Vertebroplasty is an outpatient procedure performed using conscious sedation. An Interventional Radiologist inserts a needle through a small incision in the back, directing it under fluoroscopy (continuous, moving X-ray imaging) into the fractured vertebra. The physician then injects a medical-grade bone cement into the vertebra. The cement hardens within about 15 minutes and stabilises the fracture. This treatment reduces pain, prevents further collapse of the vertebra, and restores mobility. Vertebroplasty dramatically improves back pain within hours of the procedure, provides long-term pain relief and has a low complication rate, as demonstrated in multiple studies.