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INTRODUCTION

Since its development as a sub-speciality within radiology, Interventional Radiology (IR) has played an increasingly important role in caring for the patient with cancer. This role begins with initial diagnosis of cancer and involvement now extends into minimally invasive treatment of malignancy alone or in combination with other treatment modalities. IR has established a very important role in the management of complications incurred during many oncological treatments. This chapter provides an updated overview of the scope of IR in the management of the oncology patient.

INTERVENTIONAL RADIOLOGY IN THE DIAGNOSIS OF CANCER

Biopsy

In the modern era, the Interventional Radiologist utilises an expanding range of imaging modalities, either alone or in combination, to assess the appropriateness of percutaneous biopsy in individual cases, to obtain a histological diagnosis and or definitively stage malignant disease. The modern interventionalist, therefore, requires skills in interpretation of modern cross-sectional imaging techniques to ensure that percutaneous biopsy is indicated, that the correct lesion is biopsied when there are multiple lesions, and to offer an opinion regarding future management when histological diagnosis based on percutaneous biopsy would not appear representative of imaging appearances.

Percutaneous biopsy was first described by Leiden in 1883 when the procedure was utilised to sample the causative micro organisms of pneumonia[1]. Percutaneous biopsy has been applied in most organ systems with excellent results and few complications[2].

The key to successful and safe biopsy is the use of image guidance which facilitates safe passage of needle into an organ or mass to facilitate histological or cytological analysis[2]. In oncology patients with febrile neutropenia, percutaneous biopsy is also increasingly being performed for microbiologic analysis of lesions within organs such as lung or liver suspicious for opportunistic infections such as fungal infection.

With regard to choice of image-modality to guide percutaneous biopsy, ultrasound (US) has the advantage of real-time imaging, allowing accurate monitoring of the needle trajectory as it traverses tissues en route to the target lesion[3] . When a lesion is visible by ultrasound, with appropriate ultrasound equipment and operator experience, this modality offers much better real-time imaging than CT[3] In addition, the use of US avoids radiation exposure to patients and staff during the course of a biopsy. The use of CT has the benefit of precise needle localization and better localisation of regional anatomy when compared with US[3] (Figure 1). This is particularly important in the case of pelvic or retroperitoneal biopsies which can frequently be difficult to perform using US guidance. The use of CT, has the disadvantage of increased procedure duration and associated radiation dose to patient and staff. The utilisation of CT fluoroscopy allows near real-time imaging of needle trajectory. CT fluoroscopy, when appropriately utilized can reduce the radiation dose associated with CT guided biopsy by reducing the duration of the procedure and also

CT fluoroscopic images can be acquired using lower milliamperage (mA) . One of the potential disadvantages of the utilisation of CT fluoroscopy is increased radiation exposure to physician and staff assisting during the procedure.

Contraindications to percutaneous needle biopsy include coagulation defects which can increase the risk of bleeding following the procedure or lack of a safe access to the lesion[2]. For biopsy of intrabdominal or pelvic lesions, traversing bowel should be avoided. There are relative contra-indications which are specific to individual organ biopsies such as severe emphysema, pulmonary hypertension or previous pneumonectomy in the case of percutaneous lung biopsy. In these situations, the benefits of the procedure need to be weighed against the risks and discussion and consensus at multidisciplinary meetings is extremely helpful. Once it has been decided that the risk:benefit ratio is acceptable, a number of physiological parameters need to be measured and corrected in order to adequately prepare a patient for the procedure.

The pathological samples obtained using IR take one of two main forms; histological and cytological. In general, the yield from cytology is less than that of histology. Although larger specimens are preferred where possible, the size of the sample that can be obtained depends on the size and location of the mass. In general, at our institution, visceral biopsies with the exception of lung biopsies are performed using a 17gauge/18 gauge co-axial needle system. For percutaneous lung biopsy we use a 19 gauge/20 gauge co-axial needle system.

In selected cases, with appropriate lesion selection, percutaneous biopsy can not only establish histological diagnosis but in addition, can facilitate staging of disease. For example if a patient has a malignant-appearing lung lesion in the presence of a liver or adrenal lesion, biopsy of the liver or adrenal lesion can establish histological diagnosis and stage the patient at the same time(Figure 2).

Complications of Biopsy

Many of the complications described following percutaneous needle biopsy are common to biopsy of any organ and include bleeding and infection. Other complications are specific to the organ being biopsied such as pneumothorax and hemoptysis following lung biopsy, bowel perforation following pelvic mass biopsy and hematuria, urinary retention and prostatitis following transrectal prostate biopsy. Appropriate informed consent should include a description of common complications specific to the biopsy being performed. The accepted incidences of complications following a range of IR procedures, including percutaneous biopsy has been reported by the Society of Interventional Radiology (SIR)[2] Incidences of complications, however, can vary between institutions, depending on severity of disease in patient population being treated and the incidence of co-morbidity. Institutional audit should be performed and complication rates should be compared with threshold incidence values which have been calculated for each procedure.

INTERVENTIONAL RADIOLOGY IN THE TREATMENT OF CANCER

Interventional Radiology may be used in a multidisciplinary setting to assist in the management and treatment of cancer. Perhaps the most common means by which IR can facilitate patient treatment is by the provision of image guided central venous access. In addition, IR procedures are currently expanding the range of oncological therapies. These procedures are generally less invasive than surgery and are therefore considered minimally invasive. Chemotherapy agents can be selectively administered as part of chemoembolization procedures and focused treatments using thermal ablation and gene therapy may be administered in the appropriate setting using image guidance.

Central Venous Catheters

Central venous catheters (CVC) provide a means of administering medications or parenteral nutrition to patients. There are 4 main types of CVC device. Temporary peripheral and central non-tunnelled catheters, tunnelled central catheters and implanted devices. Over 200,000 central access devices are inserted per year in the UK[4]. Although these devices have been inserted by anaesthetists and surgeons in the past, these devices are now commonly inserted using IR[5]. This is because real time imaging guidance of the needle or catheter either by radiological screening or ultrasound reduces the incidence of complications related to insertion[6]. For these reasons central venous access using ultrasound guidance is recommended by the national institute for clinical excellence in the UK since 2002. The right internal jugular vein is the most commonly used central access portal[7]. Complications related to central venous access procedures are dependent on choice

of access route and are impacted by patient selection[8]. Complications that occur at the time of insertion are typically related to injury to surrounding structures or mal-position of catheter and occur less commonly when performed with image-guidance than when performed blindly or using external landmarks[8].

Thrombosis

In addition, IR has the ability to diagnose complications related to insertion such as thrombosis and IR can also map alternative access sites in difficult cases. The common long term complications associated with central venous catheter (CVC) placement are thrombosis and infection. The overall long-term incidence of central venous thrombosis is between 30% and 70%[9, 10]. Trauma to the endothelium from the catheter tip is believed to cause the accumulation of thrombus[11]. Although the incidence of symptomatic CVC thromboembolism is less than 5%, asymptomatic thrombosis frequently occurs. Larger catheters with more lumens and catheters inserted into left sided veins are associated with an increased risk of thrombosis as is catheter insertion in patients with inherited prothrombotic tendencies[10]. Thrombosis is a potentially serious complication. It is the second leading cause of death in patients with cancer and 1 in 7 cancer patients who die in hospital do so as a result of venous thromboembolism[12]. Unfortunately thrombotic prophylaxis using low dose warfarin and heparin have not been shown to reduce the incidence of CVC thrombosis[13]. Satisfactory data pertaining to the treatment of catheter related thrombosis are lacking. No uniformly accepted method of anticoagulation or duration of such treatments exists.

Infection

Nosocomial infection introduced at the time of catheter insertion is an important source of patient morbidity. Efforts to reduce the incidence of infection have concentrated on asepsis at the time of insertion and careful skin preparation[14]. Up to 20% of patients with catheter-related blood borne infections die. One third of these deaths are directly attributable to catheter-related infection[14]. Catheter-related infections should be diagnosed by paired quantitative blood cultures. In the absence of shock, local infection or septic thrombophlebitis, a tunneled CVC with an external access device may be left in situ and the infection treated with parenteral antibiotics[15]. The deposition of infected clots within port devices means that once infected removal of the device will required[15].

Embolisation

Minimally invasive image guided cancer treatments as an alternative or adjunct to surgery are currently under development. These cancer treatments consist of image guided procedures which sometimes require more than one IR session to compete therapy. Chemoembolization, radionuclide ablation and thermal ablation are being performed at present. Following contrast enhanced CT or MRI, transcatheter embolization may be performed in order to devascularise neoplastic tissue by occluding tumour arterial supply[16]. Mechanical occlusion is achieved using Gelfoam (Pharmacia & Upjohn, Kalamazoo, MI), polyvinyl alcohol or blood clots. These materials are introduced into the tumour bed following fluouroscopic guided selective arterial catheterisation by IR. Angiographic experience particularly with embolization techniques and in-depth knowledge of normal and variant anatomy relevant to the procedure are vital before embarking on these

techniques. These techniques can be used as the primary modality of treatment of hepatic metastases or in conjunction with ablative treatments or conventional surgery. Arterial embolization can also be employed prior to surgical resection in an effort to reduce operative blood losses particularly when tumours appear hypervascular on preoperative imaging. Palliative embolization of inoperable tumours may also reduce tumour burden and help treat symptoms. This is most commonly performed to assist in the treatment of hepatic disease.

For palliative treatment of hepatic disease, embolization materials may be administered in combination with chemotherapy agents and ethiodized oil (Ethiodol: Savage, Melville, NY). The term "chemoembolization" is used to describe this procedure[17]. Hepatic tumours rely on the hepatic artery for most of their blood supply. This has been demonstrated using radio-labelled albumen which quantified tumour uptake of radioisotope infused through the hepatic artery compared to the portal vein. The uptake of radioisotope was ten-fold greater following hepatic arterial infusion than following portal vein infusion[18]. Embolization of the hepatic artery allows chemotherapy agents to dwell within a target tumour for a longer period of time than infusion of a chemotherapy agent alone. This technique has been used successfully in the treatment of hepatocellular carcinoma (HCC), hypervascular metastases (ocular melanoma) and hepatic endocrine metastases.

Hepatic transplantation for patients with HCC, when there is a single tumour measuring less than 5 cm in size or 2 tumours each less than 3cm in diameter, results in a 70% 5-year survival[19]. For inoperable disease, the 2-year survival of patients with HCC is improved

from 10 % without treatment to 30-40% following transcatheter oil chemoembolization[20]. Significantly increased 2-year survival from 27% to 63% has been demonstrated when chemoembolization has been performed by administering doxorubicin with gelatin[21]. Hormonal symptoms caused by endocrine hepatic metastases can be effectively treated with chemoembolization when somatostatin agents or other medical manipulations become less effective[22]. It is currently unclear whether chemoembolization is superior to embolization in the treatment of hepatic lesions[16]. The effects of chemotherapy alone versus chemotherapy combined with chemoembolization are currently being investigated in the setting of hepatic metastases secondary to colorectal carcinoma[23].

Since embolization causes tissue necrosis, complications such as sepsis, abscess formation and ischemia may occur. Approximately 10% of patients experience complications as a result of chemoembolization[17]. Post-embolization syndrome consists of fever, pain and elevated white cell count. This is experienced by large numbers of patients following embolization[17]. Prior to treating hepatic lesions, bowel preparation, drainage of obstructed biliary systems and octreotide administration for carcinoid tumours help to reduce the incidence of complications. Chemoembolization requires that the portal vein be patent or at least there must be good collateral blood supply to the liver. Otherwise hepatic necrosis is likely to occur following treatment. Interestingly periprocedural antibiotics are not a uniformly accepted method of reducing gram negative sepsis[24]. Ischemia of non-target organs such as the spine is another potential major complication. The incidence of spinal ischemia is reduced by careful planning angiography.

Re-imaging should be performed 4-6 weeks following treatment. The absence of arterial phase enhancement of a lesion which was hypervascular on pre-procedural imaging is suggestive of successful treatment. Nodular enhancement of the portal vein and the appearance of an enhancing lesion usually signify residual disease. Treatment may involve a number of sessions until the entire tumour bed is devascularised. The ability to repeat treatments is an advantage of chemoembolization over surgical options.

Radioembolization of tumours is another modality of treatment that may be administered through a carefully placed catheter using IR. This method had not gained widespread recognition but offers the potential for focused treatment particularly of primary and secondary hepatic malignancies. Microspheres composed of glass, albumen or resin may be combined with radionuclides such as yttrium 90, rhenium or holmium and introduced directly into a tumour mass[25]. The type of radioisotope that is best suited to treating a tumour will depend on the nature of the tumour. These radioisotopes are beta radiation emitters. This form of radiation has a very low penetrating power and its necrosing effects are localised. The emission of some gamma radiation is desirable as gamma radiation can penetrate the body facilitating detection by a gamma camera. Gamma radiation allows the distribution of the radiolabelled particles to be assessed. The efficacy of radioembolization has yet to be determined by randomised control trials, however, accurate IR transcatheter delivery has shown to be safe and preliminary results confirm its efficacy[26].

Thermal Ablation

In addition to chemoembolization and radioembolization, tumour necrosis may also be achieved using a variety of thermal ablation techniques. These methods include radiofrequency (RF), laser, microwave, ultrasound and cryoablation. IR mediated thermal ablation induces tumour necrosis by the application of energy. Radiofrequency ablation (RFA) is performed by applying electromagnetic energy with a frequency of less than 30 MHz to a tumour. Most devices apply energy between 375 and 500 kHz[27]. RFA may be administered using monopolar or bipolar energy sources.

The most commonly used devices consist of multitined electrodes which have an umbrella appearance, clustered electrodes which consist of multiple internally cooled electrodes that are held together as a group and finally perfusion electrodes which allow fluids such as hypertonic saline to be instilled into the tissues being treated[28]. Tissues are heated to temperatures in excess of 60 degrees Celsius ensuring cell death. This method has been shown to be safe with a mortality rate of 0.3% and the rate of major complications is 2.2%[29]. RFA has gained acceptance as a method of treating hepatic and lung disease and is being used in the treatment of adrenal, renal and skeletal lesions[30, 31, 32]. RFA has been reported to be effective in treating tumours up to 7cm in size and a 1cm margin of treated normal tissue surrounding the tumour is desirable. Other methods of ablation are less commonly used than RF[33]. Laser ablation, focused ultrasound ablation and microwave ablation, which uses electromagnetic radiation with a frequency in excess of 30 MHz, are all currently under investigation. Many of these techniques are still in development and the

roles and relative success rates of these modalities in local treatment of malignant lesions at different sites have not yet been clearly defined.

The involutional changes that occur following necrosis should be monitored by serial imaging following ablation. Specific post-ablation CT and MRI imaging protocols are being developed at many institutions in an effort to confirm completeness of ablation and to detect residual or recurrent disease[34].

Gene Therapy

Gene therapy for cancer may be performed by stimulating tumoral immune response (tumor vaccines, cytokines), reducing the expression of oncogenes, restoring tumour suppressor gene function (p53), enhancing chemotherapeutic sensitivity (chemoembolization) and by modifying angiogenesis (retroviruses)[35]. Selective arterial embolization following the delivery of genetic agents by IR reduces unwanted side effects and increases dwell time, achieving a better genetic transfer rate[36]. This therapy may be performed directly using cytokine and p53 genes, however, DNA crosses cell membranes poorly minimizing transfection rates. In order to adequately express a therapeutic molecule within a cell, vector agents that carry genetic agents across the cell membrane more effectively are required[37]. Plasmids and phospholipid agents are often used for this purpose but because only a small proportion of a plasmid enters the nucleus, it is not incorporated into the genome. In addition plasmid mediated delivery is often short-lived. Retroviral, adenoviral and Epstein Barr viruses which cannot replicate are not without their limitations

but can achieve greater and longer lasting genetic expression[38]. Newer therapies are likely to focus on these agents as methods of delivery[39].

INTERVENTIONAL RADIOLOGY IN THE TREATMENT OF THE COMPLICATIONS OF ONCOLOGY

Many complications can occur as a result of organ dysfunction induced by malignancy. Although these complications can be very debilitating, many are reversible. These patients are often in ill health, malnourished and poor operative candidates. Minimally invasive methods of treating these complications are provided by IR. For example, obstruction of the renal, biliary and gastrointestinal systems may be relieved. Tumours that outgrow their blood supply may induce ischemia and necrosis not only inducing pain, but also resulting in perforation and occasionally abscess formation. Localised tumor abscess can be treated by percutaneous catheter drainage, but patient and referring physicians need to be made aware that although such treatments frequently reduce sepsis and alleviate pain and discomfort, high volumes of fluid typically drain persistently from these infected tumors and frequently the catheter must remain in situ for the remainder of the patient's life[40].

Biliary Obstruction

In the oncology patient, biliary obstruction can occur as a result of intrinsic obstruction or extrinsic compression of the bile ducts. The majority of patients presenting with malignant biliary obstruction have obstructive jaundice due to distal common bile obstruction

secondary to pancreatic neoplasm[41]. Other causes of malignant obstruction include cholangiocarcinoma or metastatic disease. Obstructive jaundice secondary to metastatic disease is usually due to metastatic nodal disease at the liver hilum or in peripancreatic nodes. Unlike distal biliary obstruction which can be treated endoscopically, proximal obstruction usually requires percutaneous intervention. Percutaneous transhepatic cholangiography (PTC) involves the injection of contrast into an intrahepatic bile duct in order to image the biliary tree. Percutaneous transhepatic biliary drainage (PBD) may be either external or internal/external if the level of obstruction can be bridged by catheter. Percutaneous treatment of biliary lesions is frequently staged requiring several sessions to achieve therapeutic goals[42]. Currently, metal stents are almost exclusively used for malignant disease with a 6 month patency rate of 50%[43]. In the majority of patients, indices of liver function improve following treatment[40].

There is a higher incidence of complications associated with PBD performed in patients with cancer than in general population[44]. This possibly relates to the presence of co-existing immunosuppression. Patients with cancer can have an incidence of cholangitis following PBD of up to 50%[45]. One third of these infections occur in patients drained externally and two-thirds occur in patients drained externally and internally. In addition, there is a positive association between the duration of PBD and the development of cholangitis[46]. Unfortunately patients requiring PBD are often in the later stages of their disease processes and the median survival following PBD in one series was 57 days among patients with pancreatic carcinoma[43].

Less frequent complications of PBD include catheter dislodgement, occlusion, leakage and electrolyte imbalance. Prophylactic antibiotics, effective in combating Escherichia coli, Klebsiella, Enterococcus, Streptococcus, Enterobacter and Pseudomonas aeruginosa, should be administered prior to percutaneous biliary procedures. In addition, careful manipulation of an infected system and avoiding over-distension with contrast also decrease the risk of bacteremia[47]. PBD can be successfully completed in 95% of patients with dilated ducts but this rate falls to 70% for non-dilated ducts[40]. Major complications of PBD include sepsis, hemorrhage and localized infection/inflammatory process (abscess, peritonitis, cholecystitis and pancreatitis) [43].

Renal Obstruction

The most common renal intervention performed by IR is percutaneous nephrostomy (PCN) (Figure 3). The indications for PCN are urinary tract obstruction caused by intrinsic or extrinsic ureteral obstruction usually secondary to calculus disease, malignancy or iatrogenic causes[48]. Emergency PCN may be required for urinary tract sepsis, pyonephrosis, deteriorating renal function or metabolic disturbances such as hyperkalemia and metabolic acidosis. This procedure reduces the incidence of gram negative septicaemia due to renal obstruction and may improve impaired renal function and reduce inpatient admission times.

Ureteric obstruction is not infrequent among oncology patients. In one series of 218 patients requiring PCN, 76 had underlying malignancy[49]. The most common malignancies causing obstruction in this series were cervical and prostate carcinoma. In cases of

malignant ureteric obstruction, when retrograde stenting is unsuccessful or is not feasible, the ureter can be accessed antegradely through the PCN tract, and once the ureteric stricture is crossed, a ureteric stent can be placed. This may be either a 1 or a 2-step procedure. Obstructed renal collecting systems without pyonephrosis are usually suitable for primary antegrade stenting as a one-step procedure with success rates of over 80%[50]. During a 2-step procedure either a PCN or an internal-external nephroureteral tube is inserted initially and a ureteric stent is placed on a subsequent visit to IR department. Retrograde stenting of an obstructed renal collecting system has the advantage of avoiding renal puncture. In the oncology patient antegrade stenting may be more appropriate because retrograde techniques have a failure rate of 27% among oncology patients compared with 6 % among patients with benign disease. Failure is most commonly due to distortion of the ureteric orifices precluding stent insertion[51]. Plastic stents are favoured over metal ones because they induce less urothelial hyperplasia and they can be easily replaced. This is usually necessary every 3 to 6 months[52]. PCN can be successfully completed in 98-99% of patients. The rate of successful completion of PCN in oncology is mainly determined by degree of dilatation of collecting system and by patient's body habitus[49]. Common major complications of PCN include septic shock and hemorrhage[49].

Upper Gastrointestinal Obstruction

Tumours of the head and neck often preclude oral feeding. Percutaneous gastrostomy or gastojejunostomy tubes may be inserted under fluoroscopy guidance as palliative measures (Figure 4). These are most commonly performed by IR having fewer complications than endoscopically and surgically inserted feeding tubes[53]. Mild pain during feeding soon after

gastrostomy insertion as well as infection are the most common early complications described with incidences of 33% and 23%, respectively[54,55]. The most common long-term complication of gastrostomy tube insertion is tube dislodgement. If the gastrostomy tube falls out having been in situ for greater than two weeks, a tract has usually formed and it is frequently possible to access the tract and reinsert the tube without the need for re-puncture of the stomach. There is no significant difference between the complication rates associated with gastrostomy and gastrojejunostomy insertion.

There have been reports of decompression IR gastrostomy and gastrojejunostomy insertion in patients with malignant small-bowel obstruction. These cases frequently have peritoneal carcinomatosis from malignant disease, with ovarian carcinoma being the most common primary tumor. Ryan et al (1998) reported 45 consecutive patients with metastatic ovarian cancer who underwent a radiologic gastrostomy or gastrojejunostomy with gastropexy[56]. A technical success rate of 98% was achieved and it was concluded that radiologic gastrostomy and gastrojejunostomy can be performed safely in patients with ascites and peritoneal carcinomatosis, if the patients undergo paracentesis first and if the re-accumulation of ascites is prevented after tube placement. In addition to paracentesis, fixation of the stomach to the anterior abdominal wall using gastropexy sutures also plays an important role in preventing pericatheter leakage.

Pain

Pain is a significant cancer related morbidity which is more common in the later stages of disease[57]. Opiates remain the mainstay of pain treatment. In order to reduce unwanted side

effects the three-step ladder and medicine rotation methods are used[58]. With recent developments of new procedures, IR is assuming an expanding role in managing cancer associated pain.

Vertebroplasty represents a new and effective treatment for vertebral body compression fractures refractory to medical therapy. To date, vertebroplasty has mainly been used in the treatment of osteoporotic fractures by introducing cement into the fracture thereby stabilising it. Osteolytic tumours often fracture resulting in instability and pain. Vertebroplasty has been shown to reduce requirements for analgesia and is now being utilized in the treatment of vertebral fractures which result form malignant osseous infiltration[59]. The incidence of major complications is 5% among oncology patients compared with an incidence of 1% in the general population[60]. The most significant complications are leakage of cement into the spinal canal, pulmonary embolus and pulmonary oedema. Vertebroplasty should relieve pain and improve mobility in 50-60% of oncology patients treated. Better results are achieved by treating sub-acute rather than chronic fractures[61].

Upper abdominal visceral tumours, and specifically pancreatic, gastric, esophageal, colorectal, gallbladder and cholangiocarcinoma are frequently associated with abdominal pain which is poorly responsive to analgesic therapy[62]. Celiac ganglion neurolysis and nerve block can be performed for palliation of pain, when resistant to analgesics. The success rate of the procedure has been reported to lie between 70-97%[61]. Alcohol or phenol destroy nerve roots and triamcinalone reversibly blocks nocireceptors. There is

controversy regarding timing of celiac plexus block, with some authors recommending that these interventions should only be performed in the later stages of disease and others arguing that better results have been demonstrated by treating disease in its earlier stage[63]. Successful celiac axis block can be performed using various methods of image guidance. CT guided blockade can be performed using an anterior approach or a posterior approach and the choice between these approaches is usually dependent on operator experience and anatomic considerations in individual patients[61,64]. The most common reported minor complications are transient diarrhoea and orthostatic hypotension experienced by 73% and 12% of patients, respectively[64].

Although IR may be used to treat oncological pain it is worth noting that IR itself can induce pain among patients. The most common procedures which can result in intra-procedural and post procedural pain include biliary and nephrostomy drainages and percutaneous gastrostomy procedures[65]. It is important that interventional radiologists ensure optimal control of pain during interventional procedures and also work within a multidisciplinary team to ensure good pain relief following these procedures.

Pleural Space Intervention

Dyspnoea in the oncology patient is often caused by malignant pleural effusions (MPE) due to pleural and lymphatic involvement. These effusions may be treated by therapeutic thoracocentesis which can usually be performed as an outpatient procedure or by placement of a chest tube which usually requires admission to hospital. To definitively treat pleural effusions which re-accumulate following thoracocentesis or following chest tube removal,

pleurodesis may be performed. A recent systematic review concluded that available evidence supports the need for chemical sclerosants for successful pleurodesis, with talc being the sclerosant of choice, and thoracoscopic pleurodesis as the preferred technique for pleurodesis based on efficacy[66]. Pleurodesis through chest tubes placed by IR can be performed at the bedside avoiding the need for general anaesthetic. However, the above systematic review suggested that risk of recurrence of pleural effusion was less with thoracosopic versus bedside instillation through different sized chest tubes of various sclerosants including tetracycline, bleomycin, talc or mustine[66].

Venous Thromboembolism

Inferior vena cava (IVC) filter placement is an accepted method of managing venous thromboembolism (VTE) in the oncology patient. These filters are often inserted following lower limb deep venous thrombosis (DVT) in patients for whom anticoagulation is contraindicated, in whom a complication of anticoagulation has occurred or in whom recurrent PE's occur in spite of adequate anticoagulation[67]. In the absence of anticoagulation, recurrent DVT occurs more commonly in oncologic patients but the incidence has been reported to be reduced to 4% with an inferior vena caval filter in situ[68]. Randomized control trails in this field are currently lacking. Although many devices are available, empirical use in oncology patients is not supported in the literature at present. The technical success of IVC filter placement is greater than 97% in experienced hands[67].

Abscess Drainage

The percutaneous aspiration and drainage of primary and postoperative abscesses and collections in the absence of indications for immediate surgery has helped reduce patient morbidity and morality and reduce hospital stay[69]. The method of imaging used to perform these procedures depends on the location of the collection. CT, CT fluoroscopy and ultrasound may all be used. Image-guided needle aspiration of fluid collections in oncology is frequently performed to investigate for infection or malignancy. Infected collections or collections causing pain or obstruction of the gastrointestinal, urinary or biliary tracts should be treated by image-guided catheter placement[40]. The incidence of complications associated with percutaneous drainage depends on patient health, location and nature of collection. It is generally reported to be 10%[70].

CONCLUSION

Minimally invasive techniques in the hands of Interventional Radiologists are increasingly utilised in the management of oncology patients from initial diagnosis to treatment of primary tumor and metastatic disease and to management of cancer-related morbidity and complications related to treatment. The use of IR techniques should be evidence-based to ensure optimal outcome following utilization of these techniques in the oncology patient.

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