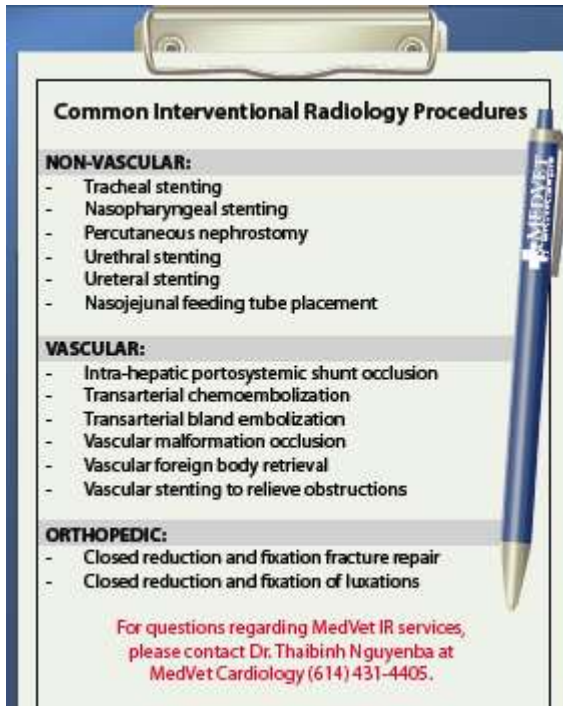




## Introduction to Interventional Radiology



Interventional radiology (IR) is a newer field of medicine that utilizes advanced imaging modalities and sophisticated techniques to provide minimally invasive therapy for a variety of medical and surgical problems. In some cases, IR provides a therapeutic option with less morbidity than traditional methods, whereas in other cases, a new option is present where there is no good, established therapy. Oftentimes, IR is used in a complimentary manner alongside traditional approaches to enhance overall effectiveness.

IR procedures are performed through natural entry-points into the body, such as the mouth or urethra, or through small incisions or punctures of the skin, such as with a percutaneous approach. Therapeutic devices (e.g., stents, coils, vascular plugs) and drugs (e.g., chemotherapy, embolic micro-beads) are delivered to the diseased region of interest by use of a combination of long catheters, sheaths, and wires. Direction and visualization for the procedure is accomplished by advanced imaging methods, most often involving fluoroscopy to provide real-time motion from x-ray imaging. Other adjunct imaging modalities can include ultrasonography, CT-scan with

angiography, and endoscopy. When fluoroscopy is used, sophisticated applications such as digital subtraction and road-mapping are instrumental in enhancing visualization of complex vascular architecture.

In veterinary medicine, the most fully realized application of techniques similar to IR is in the field of cardiology. The cardiovascular system is routinely accessed in a minimally invasive manner via specific points in the peripheral vasculature, such as the jugular and femoral veins or carotid and femoral arteries. Long catheters are maneuvered from the peripheral point of vascular access, through the vasculature, to a cardiovascular defect with the aid of fluoroscopy. This enables direct therapy of the defect, while avoiding open chest and open-heart surgery.

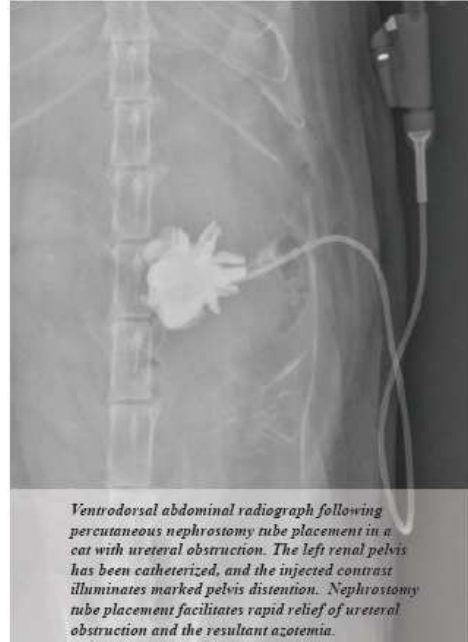
### OTHER VASCULAR APPLICATIONS

These same minimally invasive vascular techniques are utilized in many IR procedures for non-cardiac diseases. By this approach, concentrated chemotherapy and embolic micro-beads are delivered via long catheters specifically into arteries that directly supply a tumor. Known as transarterial chemoembolization, this is commonly used to treat hepatocellular carcinoma when it is either metastatic, deemed non-resectable, or cannot be completely excised. In bland embolization, embolic beads alone are delivered through the maxillary artery to treat intractable epistaxis. The combination of a vena cava stent and embolization coils is now being used in a novel procedure to occlude intra-hepatic portosystemic shunts. This holds promise as a viable alternative to what is currently a difficult and involved surgical procedure for intra-hepatic portosystemic shunt correction.

## NON-VASCULAR APPLICATIONS

Non-vascular IR has also gained increasing prominence in veterinary medicine. Urethral and ureteral stents can be placed in minimally invasive fashion with the aid of fluoroscopy and endoscopy. This helps to alleviate urinary tract obstructions, especially those caused by tumors. More immediate relief is achieved by use of percutaneous nephrostomy, in which the renal pelvis is catheterized through the body wall and relieved of extreme pressures during life-threatening ureteral obstruction. Upper airway obstructions in the nasopharynx and trachea have been managed effectively with metallic stent deployment at the point of obstruction. In particular, tracheal stenting has provided a new, effective therapy where there had previously been no good, established therapy for end-stage tracheal collapse in dogs. Even orthopedic patients can benefit from closed-reduction/fixation techniques made possible by fluoroscopy.

The number of diseases and body systems amenable to IR therapy are vast, owing to the flexibility of minimally invasive care. Though a more novel form of medicine, IR is well established in human medicine with dedicated specialists. For veterinary medicine, the field is much newer, owing to recent increases in availability of high-level imaging equipment in our field. IR encompasses a wide variety of body systems and requires expertise in each of the affected areas. At MedVet, a team approach has been taken toward IR services. Board-certified specialists from a variety of different fields (e.g., internal medicine, radiology, surgery, and cardiology) comprise the core of the IR department. This approach facilitates direct delivery of tailored expertise where appropriate for a patient receiving an IR procedure, taking advantage of the unique skill set of the different specialists. For example, vascular IR procedures benefit from the experience of an interventional cardiologist, whereas urinary tract IR procedures benefit from the endoscopic experience of an internist. All involved specialists have participated in IR training sessions or have been involved with the development of minimally invasive techniques and devices in veterinary medicine. The advanced imaging equipment needed for IR, similar to that available in IR for people, has been functional at MedVet for the past several years in our state-of-the-art catheterization/interventional suite. All of these components speak to a solid past and exciting and sustained future for minimally invasive care at MedVet.



*Ventrodorsal abdominal radiograph following percutaneous nephrostomy tube placement in a cat with ureteral obstruction. The left renal pelvis has been catheterized, and the injected contrast illuminates marked pelvis distention. Nephrostomy tube placement facilitates rapid relief of ureteral obstruction and the resultant azotemia.*