Interventional Radiology at the UC Davis VMTH:
Advanced Minimally Invasive Options for Veterinary Patients

The University of California, Davis Veterinary Medical Teaching Hospital (VMTH) is continually trying to increase the quality of the services offered to its patients. Minimally invasive procedures are readily available for veterinary patients at the VMTH, and related to that, one of the specialties that has massively expanded over the last few years is Interventional Radiology (IR). IR has been recognized as a key aspect of human medical care for several decades, and is rapidly becoming an integral component of veterinary medical care, as well. The goal of IR is to use imaging modalities such as fluoroscopy and ultrasound to perform minimally invasive diagnostic and therapeutic procedures.

“One of the major advantages of IR is the ability to treat diseases that previously had no treatment options, or that required extremely invasive surgeries,” states Dr. Bill Culp, a UC Davis surgeon who regularly performs these procedures at the VMTH. “Many of these procedures can dramatically improve the quality of life for our patients, while also avoiding long recovery periods.”

A vast array of specialized IR instrumentation is available that is often unique to the procedure that is being performed. Some of the equipment commonly utilized during IR procedures includes stents, sheaths, guidewires, diagnostic/selective catheters, and balloons. The VMTH is fully equipped for the myriad of IR techniques that are available, allowing for procedures to be performed in a shortened time frame and in the most efficient manner.

There are several applications for IR in veterinary medicine in the treatment of both benign and malignant disease. Currently, most of the procedures performed at UC Davis fall into the category of stenting of obstructive lesions or vascular therapies, although other minimally invasive options exist.

Obstruction resulting from neoplasia causes significant morbidity regardless of the location. The most common locations of these obstructions are within the urethra, ureter, colon, esophagus, trachea, nasopharynx, and blood vessels. These obstructions result in clinical signs that can only be alleviated or improved by eliminating the obstruction. Urethral obstruction is one of the most commonly encountered malignant obstructions in veterinary medicine. Bladder, urethra, and prostatic tumors can cause obstruction of urine flow with a resultant alteration in electrolyte balance that can be life threatening. Placing a stent within the urethra can allow for voiding of urine and immediately improve the patient’s clinical status. This procedure is easily and quickly performed by someone experienced in stent placement, and is one of the most often performed IR procedures at UC Davis.

Benign ureteral obstructions are often encountered in feline cases, and the historic treatment options have been limited. Medical management works in certain cases, and surgical decompression of the kidney can be considered. However, ureteral stent placement has revolutionized how the VMTH treats these cases, and provides the hospital with a less invasive alternative, yielding a potentially superior outcome. Ureteral stenting involves the placement of a tube extending from the renal pelvis to the bladder, and the stent can be passed through the ureter either with a combination of cystoscopy and fluoroscopy or surgery and fluoroscopy. The stent causes passive dilation of the ureter and allows for urine flow to continue from the kidney to the bladder. The VMTH also perform ureteral bypass, which is an alternative for cases that do not or cannot undergo ureteral stenting. As with ureteral stents, the bypass devices allow for urine to continue to flow from the kidney to the bladder and prevent the signs associated with ureteral obstruction.
With esophageal, colonic, nasopharyngeal, tracheal and vascular obstructions, patients are often managed medically depending on the extent of disease, or with surgery, when possible. In some instances in which medical management is unsuccessful and/or surgery is not recommended, stent placement can be considered for palliation of the clinical signs associated with the obstruction. Placing the stent may allow for a normal quality of life in a previously, severely affected patient.

Several vascular-based procedures have been developed that are being employed as both a primary treatment for vascular abnormalities and for neoplasia. An IR procedure for the treatment of intrahepatic portosystemic shunts has been developed and is showing promise in the treatment of this difficult disease process. Intrahepatic shunts (shunts developing within the hepatic parenchyma) are particularly difficult to treat due to their location. Surgery has been historically offered but morbidity associated with the procedure is considered high. An alternative option proposed is the delivery of an embolic agent (most commonly coils) to slowly and progressively close down a shunt allowing for diversion of the blood flow through normal vascular means. Other benign vascular abnormalities including arteriovenous fistulas, arteriovenous malformations and idiopathic epistaxis are also being treated regularly with IR techniques.

Two locoregional oncologic options are being performed regularly at UC Davis: intra-arterial chemotherapy and embolization/chemoembolization. Intra-arterial chemotherapy involves the administration of chemotherapy into the artery or arteries directly supplying a tumor. This allows for the tumor to receive the first pass of chemotherapy as opposed to being exposed to a filtered amount of chemotherapy as is seen when chemotherapy is given intravenously. Advantages of intra-arterial chemotherapy include increased intra-tumoral concentration of a chemotherapeutic agent and potentially a decrease in chemotherapy-associated side effects.

Transarterial embolization (TAE) and transarterial chemoembolization (TACE) involve the use of IR techniques to deliver an embolic agent directly to a tumor; TACE delivers chemotherapy in addition to the embolic agent. TACE attacks the tumor on two fronts: 1) chemotherapy is administered directly into the tumoral arterial supply and 2) the blood supply to the tumor is embolized. Tumors that are commonly treated with TAE and TACE at UC Davis include hepatic and nasal tumors, although investigation into the use of these procedures for tumors in other locations is ongoing.

As improvements are made in diagnostics and equipment, it is likely that the opportunities to utilize IR techniques will increase in companion animals, thus altering the treatment regimens that have been historically pursued. Dr. Culp is actively pursuing several clinical trials investigating IR techniques, and the program has been grown through a strong collaboration across several services.

“There are very few veterinary practices performing IR procedures, as advanced training and equipment is required,” Dr. Culp added. “The VMTH is one of the top institutions in the world in the field of veterinary IR, and the program is continuing to grow. Currently, the VMTH has the largest IR program on the West Coast, offering the most extensive variety of veterinary IR diagnostics and treatments. We are looking forward to continuing to expand this specialty at UC Davis and to strive to give our patients the best possible quality of life.”