Total Joint Replacement Surgical Technique in Dogs and Cats

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Awareness that total hip replacement (THR) surgery is a highly successful surgical procedure is the first step in providing this solution for dogs and cats with nonseptic hip pathology. The next step is a good understanding of the surgical procedure itself. The decision of who will perform the procedure is more profound. Animal owners do not expect every veterinarian to be proficient in orthopedic surgery. Similarly, not every veterinary orthopedic surgeon has the desire to become proficient doing THRs. Maintaining proficiency lies somewhere in the realm of performing the procedure at least 50 times per year for this relatively technically demanding procedure.

A prerequisite for THR surgery is training and competence in orthopedic reconstructive and fracture repair surgery with emphasized interests in the coxofemoral joint. Training courses should be considered mandatory. These can be conducted either during surgical residency training, on the individual level mentored by a high volume THR surgeon, or on the multi-participant course level. Multiple training courses are available annually taught by skilled THR surgeons.

The most common THR system used in the United States and with outcomes reported in the literature is the BioMedtrix Universal Total Hip and the Micro Total Hip. Prosthesis fixation consists of Biologic Fixation (BFX™) and Cement Fixation (CFX™) Implants. A common instrumentation system and surgical technique allows surgeons the option to use either fixation method and alter plans intraoperatively. This modular total hip system increases the surgeon's options during both primary joint replacement and revision surgeries. The BFX and CFX implants can be used interchangeably as a "hybrid" prosthesis.The cementless cup and stem achieve their initial stability using the interference press-fit concept.

The Micro Total Hip System components and instrumentation have a similar design to the Universal CFX system. The system consists of cemented components only and the implant sizes are appropriate for small breed dogs and cats. Micro THR may be performed in small breed dogs weighing less than 12 kg, and as small as 2.5 kg, and in cats. The Nano THR is the smallest implant available and the prosthesis has a fixed head (i.e. not modular). Currently available total hip systems should be able to accommodate almost all of the needs of the diverse canine and feline breeds and sizes presented to the veterinary surgeon.

Cement fixation requires less precision in femoral canal fit and final positioning of the femoral stem. Therefore, in some patients, a cemented stem may be the preferred choice because of the dog's large size or cylindrical medullary canal geometry of the femur, poor bone quality, or advanced age. Likewise, in very small dogs and cats, cement fixation of the cup and stem allow the surgeon flexibility of implant sizes. In younger patients with a flared proximal metaphyseal region of the femur, a press-fit cementless stem may be preferred.

Because its initial stability relies on intimate contact with bone, the conventional press-fit stem requires greater surgical precision and more thorough patient selection than a cemented stem. In all but the smallest patients, a press-fit cup is preferred over a cemented cup regardless of the type stem fixation used. During revision of a failed cemented stem, a cementless stem is sometimes a better option than cementing in another femoral component. The decision to use cemented or cementless implants is made prior to surgery, varies with surgeon experience and preference, is influenced by the bone morphology, and should allow intraoperative flexibility to change the preoperative surgical plan.

The surgical procedure starts by positioning the dog with the hemipelvii superimposed in the sagittal plane and held securely in position using a positioning device. The positioning device must stabilize the pelvis for the duration of the procedure to prevent movement during retraction, reaming, and impaction of the implants. Malpositioning of the pelvis will invariably lead to malpositioning of the acetabular component.

The hip joint is exposed using the modified cranial-lateral approach to the hip joint. A deep gluteal tenotomy at the insertion is performed leaving the caudal one-third to one-half of the tendon intact. A longitudinal capsulotomy parallel to the femoral neck is performed. If the ligament of the femoral head is intact, it can be transected with a narrow sharp instrument that will enter the joint space. The hip is luxated, externally rotated 90°, and the femoral neck is osteotomized at a precise angle using a guide instrument. Dissection and debridement is further developed to provide clear and unobstructed access to the acetabulum and instrument aligned access to the central axis of the femoral canal. If a press-fit cementless cup and stem are to be used, the acetabular bone bed is prepared first and the cup implanted, followed by preparation and implantation of the femoral component. If both components are cemented, the femur is prepared first, followed by the acetabulum. In cemented hip replacement, the bone is prepared to allow the surgeon to accurately position the implant within the cement mantle. Bone ongrowth to the surface of the cement follows during the next 6 weeks. In cementless hip replacement, the bone bed preparation determines the exact positioning and stability of press-fit implants. Also, the absence of a cement mantle necessitates that bone preparation be precise to result in initial press-fit stability and eventual stable fixation by osteointegration (bone ingrowth).

Following implantation of both components, a prosthetic femoral head with the appropriate neck length is assembled onto the femoral stem. The range of motion of the reduced joint is evaluated. The range of motion should be full without the femoral head lifting out of the acetabular component. If the range of motion and stability of the joint are satisfactory, the joint and the wound are lavaged copiously with pulsatile irrigation in preparation for closure. If bone cement was used, the joint and adjacent tissues are carefully inspected and any remnants of bone cement are removed. The wound is closed in layers, beginning with the joint capsule. The transected tendon of the deep gluteal muscle is reattached securely to its insertion. The reflected vastus lateralis muscle is sutured to its origin or, if necessary, to the ventral edge of the tendon of the deep gluteal muscle. The overlying tissues are closed in layers.