LESSONS LEARNED FROM 1500 TOTAL HIP REPLACEMENTS
William D. Liska, DVM, DACVS
Gulf Coast Veterinary Specialists, Houston, Texas

Key Points
- Total Hip Replacement
- Lesson
- Canine Feline

Canine total hip replacement (THR) is a common surgical procedure performed in veterinary orthopedic surgery practices. The goals are to provide a pain free joint and restore biomechanical function for the life of the animal. All high expectations are met when everything proceeds as planned during surgery, postoperatively, and during the life of the animal. The novice surgeon should not be surprised if a complication arises because a complication can arise following even the simplest surgical procedure. The experienced surgeon will not be surprised if a complication arises because the learning curve has revealed complications as self-evident. Hayes et al reported the use of the cumulative summation technique to clearly demonstrate that the learning curve involves many cases. The developers of the implants, instrumentation, and surgical technique from inception have made available numerous educational courses with workshops to train surgeons properly about THR surgery so the risks in reality are minimal. For this report, the registry of 1500 consecutive THRs performed by 1 surgeon between October, 1990, and March, 2011, was reviewed.

A referral for a THR does not mean that a THR is the primary or only problem or that a THR is even indicated. Approximately 20% of dogs referred for a THR due to hind limb lameness with radiographic evidence of coxofemoral osteoarthritis have a concomitant problem that is of higher priority. Other priorities primarily include cranial cruciate ligament injury, medial patella luxation, neurological dysfunction, or neoplasia. Numerous other temporary or relative contraindications have been identified. A partial list includes pyoderma, remote infection, septic arthritis, periarticular neoplasia, OA that is subclinical, OA that has never been treated or received a pain management therapeutic trial for symptomatic relief, recent surgery that has complications that could be compounded by THR surgery, endocrine disease such as Cushing’s or diabetes mellitus, compensated or impending organ system failure, neuromuscular disease, myopathy, thrombotic disease, immune mediated erosive arthritis, immunosuppression, wrong species, patient size extremes (<1.5 kg; extreme obesity in giant breeds), young age less than 6 months, and surgeon reluctance for any reason.

There are multiple indications for THR. Approximately 80% of all THRs are performed due to the presence of osteoarthritis secondary to hip dysplasia. The incidence of this indication is declining as new THR indications are recognized and reported. Other indications include idiopathic OA, complicated coxofemoral luxation, capital physeal fracture, avascular necrosis of the femoral head, malunion of the pelvis or acetabulum or femur, pelvic osteotomy revision, nonunion of femoral head or neck fracture, femoral head ostectomy revision, revision of a previously performed THR, painful injury that can not be resolved by noninvasive means, non-neoplastic osteopathy, and focally localized neoplasia.

The male:female incidence is 769:731. 97 canine breeds received a THR plus 9 Domestic Short Hair cats. The 5 most common breeds are Mixed Breed (20.1%), Labrador Retriever (19.6%), German Shepherd (12.3%), Golden Retriever (11.1%), and Rottweiler (5.0%). The age

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range is from 6 months to 16.5 years (mean 4.8 and median 4.2 years). The body weight range is from 2.45kg to 85kg (mean 30.6kg and median 30.9kg) with the frequency of small dogs increasing. Bilateral THR was performed on 54.6% of the dogs with OA secondary to hip dysplasia as the primary indication. Bilateral THR was performed on 40.5% of all 1500 of the dogs to receive a THR. THR was performed on 9 dogs that had either a previous FHO or a nonunion of the femoral neck.

The duration of clinical sign onset to THR surgery in dogs with OA increased between 2001 and 2009 compared to 1992 and 2000 (mean 14.5 vs 10.6 months; median 6 vs 4 months, respectively). The mean duration of clinical signs prior to THR in dogs undergoing staged bilateral THR is 12.6 months (median 6 months). The mean interval between the first THR and the second THR is 9.6 months (median 5 months) (Reported by Lockwood et al, JAVMA, 2011).

Correct positioning of the implants is a major determinant of long term success. Proper implant positioning starts with positioning of the animal with the hemipelvii perfectly superimposed during the surgery. Pelvic tilt and acetabular retroversion angles vary among dogs so evaluation of these parameters should also be part of preoperative planning. Femoral medullary canal and proximal femoral cancellous bone density varies considerably and must be considered during implant selection to avoid complications. Preoperative planning should also include excellent lighting and visibility full depth into the surgical field. A headlight is recommended.

The prosthesis components are modular. There are 17 acetabular cup, 17 femoral stem, and 6 femoral head diameter sizes. Femoral neck lengthening ranges from 0-9mm. The most common size used is a 23mm CFX or 24mm BFX cup, a #7 CFX and #7 BFX stem, with a 17 femoral head and +3mm neck length. The frequency of a particular implant size selection is trending toward smaller sizes since smaller dogs and cats are receiving THRs. Since introduction of the BFX system, 76% of the total implants used are cementless (BFX) fixation. Small implants for small dogs and cats are cemented fixation only. 93% of the implants used were cementless fixation when the option was open for either cemented for cementless fixation.

Implant fixation is either cemented with PMMA or cementless biological osteointegration into a porous implant surface. Cementless fixation is preferred but both methods are reliably stable long term. The prosthesis for large dogs, and thus the fixation, can be interchangeably hybridized. Default to cemented fixation can be due to dorsal acetabular rim wear, cylindrical proximal femoral medullary canals, low density femoral cancellous bone, thin femoral cortices, and for small prostheses not commercially available as cementless components.

Implant positioning should be evaluated intraoperatively prior to closure as well as radiographically postoperatively. Two concentric circles formed by the lateral face of the cup and by the neck entering the head channel are present with the limb held in neutral if implant positioning is correct. Dyce and Cross have reported methods to radiographically evaluate implant version and inclination.

Surgery time from incision to last suture averages 82 minutes for CFX and 59 for BFX implantation. There many variables that influence surgery time such as severity of OA, patient size, body condition score, surgical team training / expertise, and distractions.

Aftercare is most successful with good owner compliance limiting activity to good traction indoors surfaces or to a leash outdoors for 5-6 weeks. There should be no running, jumping, playing, or stairs. Dogs tend to “do too well too quickly” and will not self limit activity beyond about 10 days after surgery. Rehabilitation includes progressive longer distance and/or duration twice a day walks following radiographic confirmation of secure implants 5-6 weeks
after surgery. Rehabilitation continues for 30 days or progressively longer until the highest level of desired activity is reached. Endurance activity is unlimited. Some strenuous activity, such as free-style Frisbee or Shizhund competition, should be preceded by custom designed training and radiographic prosthesis and bone hypertrophy monitoring programs. Annual prosthesis and bone quality monitoring is recommended. Proactive rehabilitation to encourage limb usage is implemented at suture removal time only if dogs are still noticeably lame (<5%) at that time.

Objective data that ground reaction forces return to normal within 6 months following THR for osteoarthritis (OA), THR in small dogs with avascular necrosis of the femoral head (AVN), and THR for capital physeal fracture (CPF) treatment, has been reported by Budsberg, Kalis, and Jankovits, respectively.

Prosthesis materials are extremely durable. Submicron wear debris is generated and unavoidable as with prostheses in humans. An example of material durability includes a cemented THR in a dog documented to have run over 9000 miles with the owner in 9 years after surgery. The implants were secure and implant wear was minimal. Minimal wear debris could be found in the periarticular soft tissues.

The risk of THR complication is low. Patient selection and surgeon experience are variables that affect the complication rate. Fortunately most complications can be resolved with revision surgery to maintain the prosthesis. Complication include luxation, femur fracture, infection, sciatic neurapraxia, aseptic loosening, cup protrusio, incision dehiscence, incision granuloma, medullary canal infarction, pulmonary embolism, transarticular tendon detachment (gluteal or external rotator muscle tendons), and others rare events.

Complications that can not be resolved with revision surgery can usually be resolved with prosthesis explantation. Explant surgery is easier with cementless implants that are loose. Well fixed cementless implant removal creates technical challenges. Well fixed PMMA in the acetabulum bed can be removed with a high speed burr. Septic PMMA in the femoral canal can be removed via the proximal osteotomy site or a canal window osteotomy. It is generally not necessary to remove well fixed aseptic PMMA in the femoral canal. Explantation creates, in essence, a femoral head ostectomy – one of the original surgical options.

Survival after THR surgery averages 4.6 years (range 0-16.6 years; median 3.9 years). Mortality is most commonly due to unrelated neoplasia and multi-organ system failure of old age. Death related to an anesthesia or THR complication is rare.