

Everything You Need to Know About Femoral Head Ostectomy...and More

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There have been at least 50 papers published between 1961 and 2012 related to femoral head ostectomy (FHO) (also known as femoral head and neck excision, FHNE). Studies that compare FHO to other treatment options, such as total hip arthroplasty, for coxofemoral osteoarthritis (OA) in a population of dogs have not been reported. To evaluate the procedures outcomes, subjective information must be severely critiqued for validity and objective data must be obtained for more reliability. Pluhar (referenced below) completed a literature review in 2007 that was presented at the ACVS Surgical Forum that summarized development of the FHO procedure to its current state. Her review below is largely quoted along with updated information inserted.

Femoral head and neck excision arthroplasty was first described in 1945 by Girdlestone to treat people with tuberculosis lesions in a hip joint and other hip disorders. Most people over 55 years old that have a primary Girdlestone procedure are unhappy with the functional and pain relief results. However if the surgery is done for a failed arthroplasty, the outcome is improvement compared to their existing condition. Spreull and Ormrod, who learned the procedure in the late 1950's, were first to describe FHNE in dogs in 1961. Spreull reported on 7 dogs that had FHO for a variety of reasons. The one large dog, a Labrador retriever, that was treated for hip OA never used the limb and was euthanized. Ormrod treated 2 Lab puppies with severely dysplastic hips that reportedly did well. Since then many papers have been published reporting the outcome of dogs that have undergone FHO with conflicting results. Many of the reports base their results and conclusions on owner subjective evaluations of their pet's pain and function or subjective evaluation at a single follow-up by a veterinarian. Most of these studies would be appraised as Level of Evidence 4-5 and have questionable validity if reviewed using criteria for levels of evidence developed for evidence-based medicine. Unfortunately, the FHO procedure as with many procedures we do as veterinarians are based on anecdotal evidence or studies without large case numbers, randomization, or proper controls that collect objective data. Therefore care must be taken when drawing conclusions from such studies without critical appraisal.

The first experimental study on FHO was performed in immature, healthy sheep to examine the effects of the surgery on the tissues around the hip. Subjectively, the sheep had good use of the limb, but marked muscle atrophy was also noted. Femoral osteophytosis was noted as soon as 3 weeks after surgery and the acetabulum was almost completely filled with bone at 5 months. Most of the remaining experimental studies were performed on normal dogs to compare different soft tissue interposition techniques. In one study, veterinary students performed the biceps sling using either the cranial or caudal pass. The findings were that the caudal pass gave better coverage of the ostectomy site. Creating a beveled edge of the muscle flap to reduce excess bulk was also described. Two studies compared the biceps sling to a standard FHO. In both studies, there was no difference in function between the groups when measured subjectively; importantly however, objective force plate analysis in one of the studies showed greater weight bearing with the FHO compared to the sling at 6 and 16 weeks. In addition, the muscle flap was congested in the early postoperative period, sometimes became septic, and always ended up with severe atrophy of the muscle and replacement with fibrous tissue. Another study found no difference in gait analysis in normal dogs with FHO with or without a partial flap of the deep gluteal muscle sutured over the ostectomy site. A single study on normal dogs showed better results with muscle flaps compared to FHO. Subjective evaluation 3 weeks after surgery showed that a partial thickness biceps flap was better than a deep gluteal flap and both had better limb use and hip range of motion than FHO. One final experimental study used a flap of the caudal portion of the rectus femoris muscle to interpose between the femoral ostectomy and the acetabulum. This flap was shown to maintain its vascular supply after 28 days. Despite a well vascularized flap, the dogs with the flap were bearing less weight, were more lame, had a slower return of function, and more muscle atrophy compared to dogs with FHO alone. Despite a strong advocacy for muscle slings to pad the pseudoarthrosis, there is little to no objective experimental or clinical evidence to support these procedures; there is no improvement over FHO and there is added surgical time and morbidity associated with the flap.

There are many subjective studies evaluating outcome after FHO, again with conflicting results. One of the first assessed the outcomes at least 5 weeks after surgery in 75 dogs. Most dogs were evaluated by their owners, but there were 23 dogs with veterinary rechecks. The ostectomy was covered with the deep gluteal muscle sutured to the iliopsoas muscle. Of the dogs over 30 kg that had the surgery for hip OA, 12 of 13 had subjectively good to excellent results, although the owners reported that the dogs were painful with excessive exercise and stiff during cold or damp weather. Another study of clinical dogs that had either FHO alone, with a biceps sling or with the greater trochanter attached over the ostectomy site were assessed by their owners. Although there were no differences among the three groups by owner survey, the FHO was assessed as the preferable procedure because it required less time and had less morbidity. Three papers by CL Lippincott discuss the use of a biceps sling to mitigate the poor limb use in larger dogs after FHO

alone. Dr. Lippincott did not advocate total joint replacement over 20 years ago due to the high rate of cement loosening performed in his hands; the loosening rate was much higher when first generation cementing techniques were used. Owners evaluated their dogs' function and their satisfaction with the surgery in 92 dogs with a mean weight of 32 kg. All dogs were dysplastic or had hip OA. The results were excellent in 57.6% of cases, good in 31.5%, fair in 8.6%, and poor in 2.1%; but there was no cohort without the sling. The converse is that 42.4% of the dogs had outcomes less than excellent which is a very high failure rate. This failure rate, even though subjective, must now be compared to studies completed over 15 years ago that report return to normal function following total hip replacement. Additionally, hip replacement technology has made huge advancements in the last 20 years with success rates at $\geq 95\%$.

Most of the older papers assess FHO results by subjective evaluation of the dog's function by the owners or by the owner's satisfaction with the procedure. The weight of the dogs and the indications for the FHO vary in many of these papers. Most authors conclude that the results in terms of function of FHO surgery are better in smaller dogs, less than 15 kg, and in dogs that have avascular necrosis of the femoral head, coxofemoral luxation, or fracture of the acetabulum or femoral head or neck. Even in smaller dogs, the outcome has been reported to be less than optimal. One large study of dogs with femoral head avascular necrosis (Legg-Perthes Disease) concluded that dogs that had FHO did better than those that did not have surgery and 70% of the surgically managed dogs recovered in 3 months or less. Another study assessed FHO in 267 dogs, 141 dogs with avascular necrosis and 44 with hip dysplasia. Based on the owner's assessment, 50 % of dogs had marked muscle atrophy, 20% continued to have hip pain, and 30% had continued lameness. The incidence of lameness was greater in larger dogs. Another study of 35 dogs that had FHO for reasons other than dysplasia or hip OA had 20 dogs that were reassessed by the surgeon. The findings were that the outcome was worse when the problem was more chronic and when the dog was larger.

A more recent long-term study of long-term outcome compared young dysplastic dogs that were medically managed, had bilateral triple pelvic osteotomies (TPO), or bilateral FHO. The follow-up time was 3-4 years and there were subjective evaluations by both the owners and the surgeons and objective gait analysis. The dogs with TPO had the best functional results and the FHO dogs did better than the dogs that did not have any surgery. Bone spurs were seen in 70%, gait abnormalities in 60%, and intermittent lameness in 20%, of the FHO dogs. The authors also reported that with FHO the limb is mechanically abnormal with muscle flaccidity and loss of range of motion and 60% of the dogs had not regained muscle mass even many years after the surgery. Two recent papers from Germany assess FHO, one by owner evaluation and one by surgeon evaluation, some with force plate evaluation. In the first study, the indication for FHO was trauma in 66%, avascular necrosis in 25%, and hip OA in 9% of the 155 cases. There was no difference between those that had joint capsule closed over the acetabulum or those that did not. Similar to other studies, the dogs tended to become lame with increased activity, after long periods of inactivity, and with changes in the weather; and dogs that weighed more than 30 kg were more likely to show these problems as compared to those less than 30 kg. A 2001 WSAVA abstract reported that larger dogs had greater osteophytosis, had more lameness, and had a worse prognosis for recovery in a study of dogs one year after FHO.

The study by Off and Matis (see reference) included dogs with objective kinetic and kinematic gait analysis following FHO in 132 large and small dogs and 51 cats. The functional results were reported as good in 38%, satisfactory in 20%, and poor in 42%. Functional deficits remained in both large and small dogs. Subjectively, 95% of owners said they were satisfied with the results. The authors concluded that with FHO pain is reduced but at the cost of function and postoperative problems are more apparent in larger dogs and not visible in small dogs during rapid gait movement. Therefore, discrepancies existed between objective and subjective outcomes and the contemporary assumption that small dogs compensate better after FHO than large dogs is inaccurate evidenced by their gait analysis results. It was stated that FHO should be restricted to exceptional circumstances where joint preservation is not possible or when infection or other contraindications preclude joint replacement, even in small dogs. This is hypothesized to be true in cats as well.

Finally, two reports from Canada assessed administration of non-steroidal anti-inflammatory drugs (NSAID) to dogs undergoing FHO. One study assessing carprofen and ketoprofen found that vertical ground reaction forces were greater in the first 2 weeks in the dogs that got the NSAIDs. At 4 months greater weight bearing was positively correlated with dogs with shorter duration of clinical signs before surgery and with maintaining the integrity of the iliopsoas muscle on the lesser trochanter. The other study assessed long-term administration of tolafenamic acid versus a placebo in dogs with FHO. The magnitude of the vertical ground reaction forces was lower after 4 months as compared to preoperative values in the placebo group dogs. The dogs in the tolafenamic acid group were assessed to use their limbs sooner, to be more amenable to physical therapy, and to return to normal more quickly as compared to the placebo group dogs. The most recent paper reported simultaneous bilateral FHO for 15 dysplastic puppies. The procedures were done simultaneously to shorten the overall recovery, to reduce the number and overall time of anesthetic events, to decrease cost, and to try to maintain symmetry in the pelvic limbs. In the 12 dogs with follow-up, 5 owners thought function was excellent and 7 felt it was good, pain free with slight lameness and tires with excessive exercise. Seven owners thought their dog's gait was abnormal and 4 thought there was muscle atrophy. The reasons given for opting for FHO were the expense of total hip replacement surgery or not wanting to delay surgery until the dog reached skeletal maturity.

Many factors have been identified that may have an effect on the outcome of FHO surgery. Many authors agree that one or more of these factors are important. They are:

Surgeon experience

- Perhaps the more experience, the better the outcome – but this is doubtful when scrutinized by objective gait analysis.
- Use the technique that works best for you, remain critical of your results, and keep open minded to change.

Surgical approach

- Most agree with a cranial lateral approach for large dogs, whereas a ventral approach may be used in small dogs and cats
- Soft tissue interposition / muscle flaps is necessary
- Complete removal of the femoral neck and any bone spurs is important
- The lesser trochanter should be preserved with the iliopsoas insertion tendon attached.

Dog or cat age, weight, and size

- It does not matter and the outcome is unpredictable.
- Cats do not have consistently good results but are more difficult to evaluate outcomes.

Indications for surgery

- The indications are the same as for total hip replacement when THR is not an option.
- Animal owners should always be made advised that there are options to FHO.
- Animal owners should be advised of the short comings of FHO.

Consequences of the FHO procedure

- Normal hip biomechanics is destroyed by the procedure.
- A limb length discrepancy to some extent will always be present during weight bearing.
- Rehabilitation will be prolonged
- Pain relief is unpredictable
- Revision of a FHO to a hip replacement is feasible in some scenarios, but the possibility of a revision should not be considered a sure opportunity if the FHO fails.

Pre-existing and postoperative duration of clinical signs

- Shorter duration and less muscle atrophy might result in a better outcome
- Muscle atrophy suggests chronic duration even if the observation of symptoms is subclinical.

Postoperative physical therapy/exercise

- Rehabilitation therapy is important to maximize outcome.
- Early return to function is advocated.
- Thigh muscle mass redevelopment and comparison to the contralateral normal limb is a good indicator of limb usage.
- Hip extension and abduction must be well tolerated if full recovery is achieved.

Concurrent orthopedic problems

- The outcome may be worse if other orthopedic problems exist.
- The risk of potential contralateral knee problems in the future should be discussed.

Owner expectations

- Owners' expectations should be adjusted based on peer reviewed published outcome evidence.
- Owners that want optimal function should not opt for FHO.

Many authors conclude that in large dogs, FHO should only be recommended when total hip replacement is not an option. This may be due to the owner's financial constraints, unavailability of a surgeon or appropriate implant, or skeletal immaturity of the patient. Due the increase in the number of surgeons qualified to perform total hip replacement, the wider variety of implant sizes (16 sizes for dogs and cats from 5.5-180 pounds), and the popularity of newer cementless procedures, most of these contraindications to joint replacement are no longer valid. A large prospective study to compare outcome of FHO and total hip arthroplasty with coxofemoral osteoarthritis is needed. It is difficult to complete this type of study because randomizing dogs into the FHO group will be undesirable. It is important to consider what outcome measures should be used to assess success. The results may differ greatly depending on whether owner satisfaction/assessment of their dog's function or objective functional assessment using gait analysis is used to assess outcome.

References

Pluhar GE: Femoral Head and Neck Excision. Proceedings American College of Veterinary Surgeons Symposium, Chicago, Illinois 2007
Off W, Matis U: Excision arthroplasty of the hip joint in dogs and cats: Clinical, radiographic, and gait analysis findings from the Department of Surgery, Veterinary Faculty of Ludwig-Maximilians-University of Munich, Germany. Vet Comp Orthop Traumatol 23:297-305, 2010
A long list of FHO references is available from the author at DrLiska@GCVS.com