



Veterinary Specialists of Alaska, P.C. Client Information Sheet: Canine Hip Dysplasia (HD)

Canine Hip Dysplasia

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Hip dysplasia is a common condition in dogs. Affected dogs are genetically predisposed to abnormal development of the ball (femoral head) and socket (acetabulum) that make up the hip joint. Typically, the socket is too shallow. This results in laxity or looseness in the joint because the ball tends to slide out of the socket. As the pup matures, the abnormality becomes more pronounced and the laxity increases. Over time the ligament that holds the ball in the socket becomes stretched or even torn. Similarly, the joint capsule stretches, resulting in further laxity. Slippage of the ball within the socket leads to damage of the articular cartilage and, eventually, to arthritis (Figure. 1).

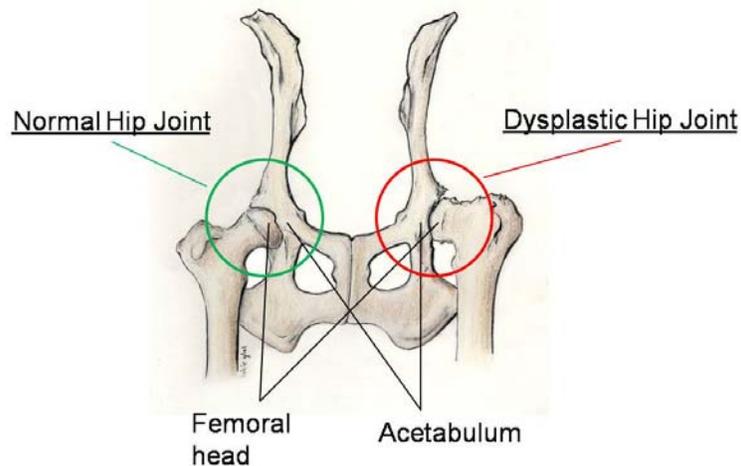


Figure 1: Drawing of a normal hip joint (left) and dysplastic hip joint (right). Note the irregular shape of the femoral head (ball) and neck and the irregularity of the bone on the neck on the right side. In addition, the acetabulum (cup or socket) is more shallow on the right, when compared to the left.

There is a wide range of clinical signs exhibited by dogs with hip dysplasia. Some dogs exhibit minimal or no clinical signs (lameness) despite having severe hip dysplasia. Other dogs exhibit pronounced lameness with mild hip dysplasia.

The most common symptom of hip dysplasia is difficulty rising to a standing position, especially after a nap following heavy exercise. These patients seem to “stiffen up” after exercising then resting. In many cases the stiffness resolves rapidly, the dog seems to “warm out of it”. The stiffness becomes more pronounced and more persistent as the disease progresses. Some patients actually become sore while on a walk and will simply sit down to rest. Difficulty or reluctance to jump into a car or onto furniture is another common observation in dogs with dysplasia affecting both hips. A “bunny hopping” gait also is commonly seen in dogs with hip dysplasia. These dogs hop with their hind legs hitting the ground simultaneously, as opposed to the more normal striding gait. Dogs with hip dysplasia often exhibit a narrow based stance with both hind feet held close together while standing or walking.

Occasionally, patients experiencing severe pain will become aggressive in an attempt to avoid having to move or in response to unwanted or painful contact.



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Because hip dysplasia generally affects both hips, affected dogs may not appear to “favor” one leg over the other. They simply shift more of the weight bearing responsibility onto the front legs. Over time, these dogs become overdeveloped in the forelimbs and chest and underdeveloped in the hind legs. These dogs may have an increased risk of injury to the joints and tendons of the front legs.

Hip dysplasia can be unilateral or more severe in one hip than in the other. In these patients, lameness of the affected leg is evident.

Fortunately, there are several treatment options for dogs with hip dysplasia. Early detection is beneficial in the treatment of hip dysplasia. Unfortunately, many dogs with hip dysplasia do not exhibit lameness in the early stages. For this reason, we typically recommend having your veterinarian obtain screening radiographs (x-rays) when your dog is 6 months old even if there is no sign of lameness. This can often be done when your pet is being spayed or neutered. Unfortunately, many dogs will have normal hip x-rays at this age and develop dysplasia later (Figures 2-4).



Figure 2: Normal hip.



Figure 3: Young dog with HD.
Note femoral head (ball) laxity.



Figure 4: Dysplastic hip with
advanced arthritis.

Dogs with hip dysplasia experience pain from different sources at different stages of the disease. Initially the pain is the result of stretching and tearing of the joint capsule as the femoral head (ball) tries to ride up and out of the acetabulum (socket). The joint capsule responds to this repeated trauma by becoming thicker and tougher. As the joint capsule thickens, the joint actually becomes more stable. At this stage, many patients experience a decrease in pain and the lameness diminishes or resolves for a period of time. These animals frequently respond well to medical treatment, or specific surgical procedures (see below). Later in life, the cartilage of the ball and socket wears away and leaves exposed bone contacting exposed bone. These patients experience pain as a result of the bone-on-bone contact.

If hip dysplasia is detected early enough, surgery can be performed to stabilize the joint, which prevents continued stretching and tearing of the joint capsule. This alleviates the capsular pain and, more importantly, can preserve cartilage, thereby preventing the development of arthritis.



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During the later stages, treatment is aimed at eliminating contact between the femur and the pelvis. This can be accomplished by removing the femoral head and neck and allowing scar tissue to stabilize the joint (femoral head ostectomy or FHO) or by removing the ball and socket and replacing them with artificial implants (total hip replacement).

Medical management is a fundamental aspect of treatment for many dogs with hip dysplasia. In mild cases, medical management alone will alleviate the pain and lameness associated with hip dysplasia.

Treatment Options for Hip Dysplasia:

Treatment options for hip dysplasia range from medical management to total hip replacement with several intermediate options. After thoroughly evaluating your dog, we will make recommendations for you and your pet and assist you in the decision making process.

A: Medical Management:

Medical, or conservative, management is a cornerstone of treatment for many patients with hip dysplasia. We frequently recommend medical management for young dogs with hip dysplasia when evaluation reveals that pelvic osteotomy is inappropriate. Our goal in treating these patients is to keep them comfortable by minimizing the pain associated with capsular inflammation. Medical management is our first line of treatment in mature dogs as well. In many cases, medical management alone is sufficient to control clinical signs in dogs with mild to moderate arthritis.

The administration of non-steroidal anti-inflammatory drugs (NSAIDs) plays a key role in the conservative management of canine hip dysplasia. NSAIDs reduce pain by reducing inflammation. This form of treatment alone can significantly improve the comfort level and quality of life for patients with hip dysplasia. Importantly, reducing inflammation can allow these patients to exercise without pain. This, in turn, helps them to maintain a lean body weight and adequate muscle mass and tone. Long term use of NSAIDs can affect liver and kidney function in dogs. Most veterinarians will recommend periodic evaluation of liver and kidney function through blood tests for patients receiving daily NSAIDs.

It appears that joint supplements such as glucosamine and chondroitin are beneficial in dogs with arthritis. These supplements appear most effective when used in combination. The exact mechanisms of action are debatable but it appears that they exhibit some anti-inflammatory activity. They may also be effective in slowing the degradation of articular cartilage and in improving the quality of joint fluid in inflamed joints. They are regarded as very safe and can be used in conjunction with NSAIDs.

With conservative management, we strive to reduce stress on the joints by maintaining a lean body weight and maximizing muscle mass and tone. The gluteal muscles provide a secondary source of support to the hip joint. Maintaining strength and conditioning of the gluteal musculature can reduce stresses placed on the hip joint. These goals are achieved by reducing caloric intake and maintaining an active lifestyle. Body fat affects these patients in two ways. The added weight significantly increases the stress on the joints. Interestingly, it has recently been shown that fat cells actually induce a state of chronic inflammation which exacerbates the inflammation associated with arthritis.



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Physical rehabilitation often plays a role in the conservative management of hip dysplasia. Specific exercises and activities are beneficial in maintaining range of motion in the joints. Exercise in an underwater treadmill is very beneficial because the buoyancy of the water reduces impact on the joints. The resistance of the water helps to strengthen the muscles. The treadmill helps to encourage a full-length stride, improving range of motion in the hips. This form of treatment is especially helpful for overweight patients trying to lose weight.

Once an ideal body weight is achieved, we may recommend a special diet for dogs with arthritis. This diet is focused on minimizing inflammation by providing optimal ratios of essential fatty acids.

B: Surgical Treatment:

Juvenile Pubic Symphysiodesis (JPS)

Juvenile pubic symphysiodesis is a procedure that is appropriate for dogs with hip dysplasia identified at a very early age. Ideally, the procedure should be performed before the pup reaches 4 months of age. This technique involves surgically closing the growth plate on the bottom of the pelvis. This causes the sockets (acetabuli) to tip outward at the top as the pup continues to grow (Figure 5). Tipping the sockets in this fashion increases stability of the hip and prevents the ball from sliding out of the socket, thereby preventing damage to the ligament, joint capsule, and articular cartilage.

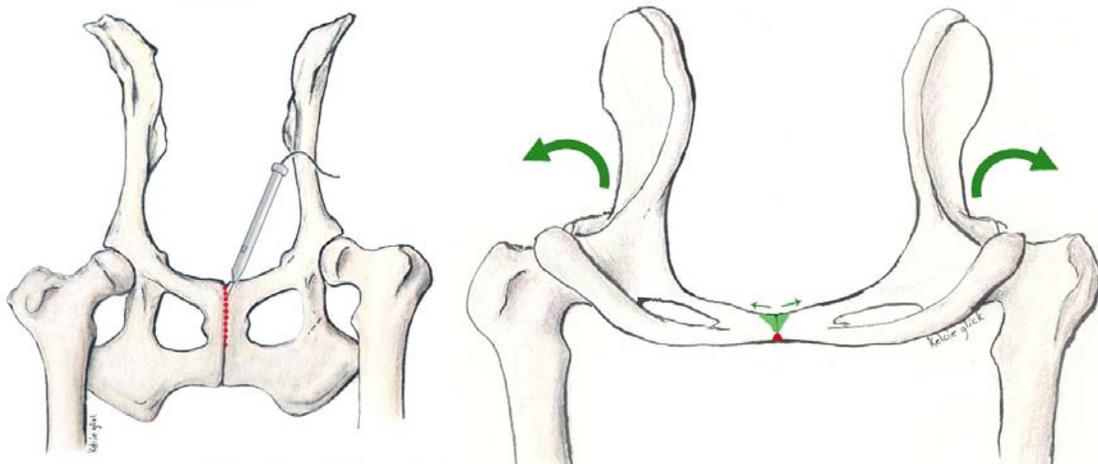


Figure 5: Juvenile pubic symphysiodesis (JPS) is best performed in puppies with hip laxity and clinical signs consistent with hip dysplasia prior to the age of 4 months (left). The procedure results in more stability of the hip by increased coverage of the femoral head (right: note the green arrows, indicating the effect of JPS: increased coverage of the femoral head, or ball of the hip joint).

Our experience with JPS is very limited. It is uncommon, and difficult, to definitively diagnose canine hip dysplasia in pups at this age. It is imperative that your dog be spayed or neutered at the same time that this surgery is performed. The reason is that performing this procedure in a dysplastic dog can create hips that look normal on x-rays. If these dogs are allowed to have puppies, the puppies can develop hip dysplasia.



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Triple Pelvic Osteotomy (TPO)

Triple pelvic osteotomy is another procedure appropriate for young dogs. With this procedure, the acetabulum (socket) is surgically repositioned so that it sits more directly over the femoral head (ball). The pelvis is cut in three places so that the socket can be repositioned and held in place with a specially designed plate and six or eight screws (Figures 6-8). This prevents the ball from sliding out of the socket and prevents further damage to the articular cartilage. Dogs who are 5-12 months of age benefit the most from this surgery. However some dogs as old as 18 or even 24 months can still benefit from the TPO procedure.



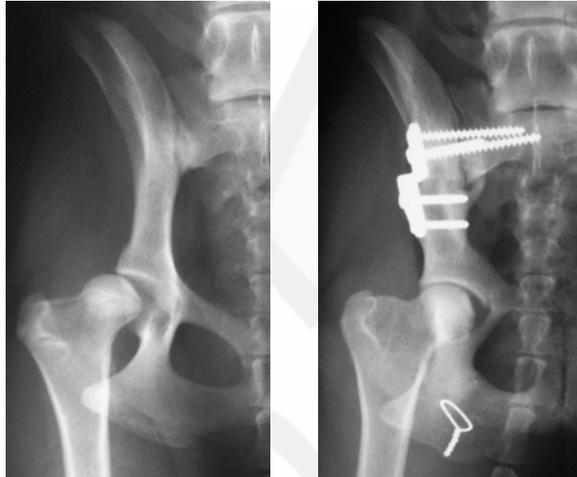
Figures 6-8: Bone model showing the dysplastic hip joint before surgery (left), the increased amount of femoral head coverage achieved after triple pelvic osteotomy (middle), and the difference between operated and non-operated sides (right).

Careful screening and thorough evaluation prior to surgery are essential to determine if your dog will benefit from this procedure. Screening for this procedure is performed while the patient is under general anesthesia or heavy sedation. The hips are manipulated to determine the degree of laxity (looseness) and to try to identify evidence of cartilage damage. Additional radiographs are obtained to evaluate the ball and socket more thoroughly. This evaluation will assist us in determining if your dog is a candidate for the surgery and in determining the appropriate amount of rotation of the socket. Many patients will benefit from surgery on each hip. We prefer to wait at least one week between surgeries. This reduces the risk of intra and post-operative complications. The exact timing is determined based on a number of factors such as the size and age of the patient and the severity of dysplasia.

The ideal patient for this procedure is a skeletally immature dog with hips that are loose but remain free of secondary damage to the cartilage of the ball and socket. One benefit of this procedure is that it aims to preserve the natural ball and socket joint, avoiding some of the complications associated with replacement of the joint (Figures 9 and 10).



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Figures 9-10: Radiographs of triple pelvic osteotomy:
pre-operative (left) and 8 months post-operative (right)

Postoperative Care:

These patients must be activity restricted for at least 8 weeks after surgery. Immediately after surgery, the plate and screws are all that is holding the pelvis together. Excess activity during the postoperative period may result in premature loosening of the plate and screws and delayed healing of the osteotomies. We recommend that patients undergoing TPO surgery be confined inside the house for the first 8 weeks after surgery. During this time, they should be kept off of slippery floors and off of stairs. They should not be allowed to run, jump, or play. They should be allowed three or four short leash walks daily for bathroom purposes only. We recommend obtaining x-rays 8 weeks after surgery to assess healing of the bones and stability of the implants. Activity restriction is continued and radiographs are repeated every 4 weeks until there is evidence of adequate bone healing. At that point, the patient is allowed to gradually resume more normal activity.

Potential Complications:

There are a few potential complications associated with this surgery. The most common is implant loosening. This typically occurs in patients who are too active during the postoperative period, prior to bone healing. The sciatic nerve, which is responsible for normal flexion of the hip, knee, and ankle (or hock) is adhered to the pelvis. Consequently, injury to the nerve can occur during the procedure. Some male patients exhibit difficult urination immediately following surgery. This is probably due to tension on the urethra created by repositioning the pubis. Fortunately, these complications are extremely uncommon when surgery is performed by an experienced surgeon and typically resolve within 4-6 weeks.



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Dorsal Rim Arthroplasty (DARthroplasty)

With this procedure, new bone is added to the dorsal rim of the acetabulum (socket), effectively deepening the socket. By extending the dorsal rim of the socket, the femoral head is more securely contained within the joint. The goal of this procedure is to slow the progression of arthritis by reducing further damage to the femoral head. During this procedure, a special instrument is used to shave several thin strips of bone off of the wing of the ilium (pelvis bone). These strips of bone are then sutured to the joint capsule over the top of the femoral head. Bone tunnels are created in the pelvis above the socket and additional bone graft is packed into the area between these tunnels and the strips of bone to help encourage new bone production. The grafted bone eventually fuses to the pelvis and aids in stabilizing the femoral head within the acetabulum (Figures 11 and 12).

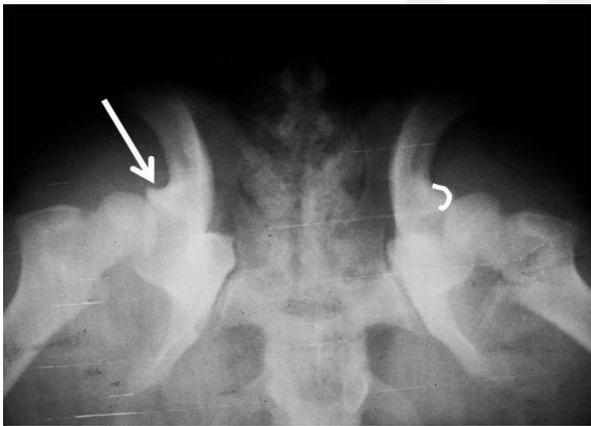


Figure 11: A shallow acetabulum in a dog with HD. Note the minimal coverage of the femoral head, depicted with the white arrow (left) and outline of the acetabulum. (white line on the right)

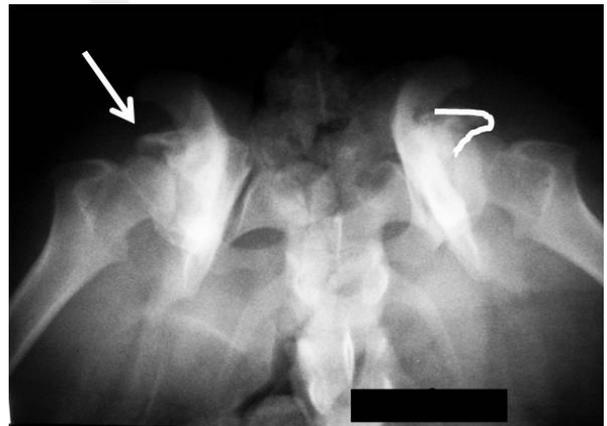


Figure 12: The same dog as in figure 10 after successful DARthroplasty. Note the improved coverage of the femoral head (white arrow and outline of acetabulum). Excellent function was evident soon after surgery. This follow-up radiograph was taken at 5 years after surgery. The dog's gait was normal.

This procedure is most appropriate for dogs that are a little too old for pelvic osteotomy and too young for total hip replacement. Candidates for this procedure are identified during hip evaluation.

Postoperative Care:

These patients must be adequately confined during the postoperative period in order to allow the graft to fuse to the pelvis. We typically recommend obtaining radiographs 8 weeks after surgery in order to assess bone healing and incorporation of the graft.

Potential Complications:

Injury to the sciatic nerve is one potential complication associated with this procedure. This is because the sciatic nerve courses through the muscles directly behind the hip joint. Fortunately, in our experience, this complication is extremely rare and typically resolves during the first few weeks after surgery. Progression of arthritis may occur after surgery, resulting in persistent lameness and the need for additional surgery or continued conservative care.



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Femoral Head Ostectomy (FHO)

Femoral head ostectomy is most appropriate for dogs with severe arthritis. In these patients the loss of cartilage on the femoral head and on the socket results in bone-on-bone contact within the joint. This is a very painful condition. Removal of the femoral head and neck eliminates the bone-on-bone contact and can significantly improve the comfort level of these patients.

With this procedure, the entire femoral head and neck are cleanly excised on a straight line between the greater trochanter and the lesser trochanter (Figures 13 and 14). The joint capsule is then closed over the socket in order to cushion the femur from the pelvis. Careful attention to complete excision of the femoral neck and appropriate closure of the soft tissues is necessary for an optimal outcome in these patients.

Postoperative Care:

After surgery, the hip becomes stabilized by scar tissue which forms between the femur and pelvis and by the gluteal muscles above the hip. Aggressive physical rehabilitation is necessary to ensure that range of motion is preserved and to maximize development of the gluteal musculature. It is important to begin physical rehabilitation in these patients very soon after surgery (Figure 15). Liberal use of pain medication combined with an appropriate exercise regimen is essential to maximize the final outcome of this procedure.



Figure 13: Radiograph of a dog with hip dysplasia. Note the arthritis of the hip joint.



Figure 14: Radiograph of the dog from figure 12 after femoral head and neck ostectomy (FHO).



Figure 15: Hydrotherapy is an excellent treatment modality after FHO.

Potential Complications:

Complications are rare with this procedure, however sciatic nerve injury has been reported following FHO. Nerve deficits typically are temporary. Persistent lameness and decreased range of motion following surgery are our biggest concerns after FHO.

Prognosis:

FHO is typically reserved for dogs under 30 pounds. However, many patients over 30 pounds have benefited from FHO. Prior to the development of total hip replacement, FHO was the treatment of choice for patients with severe pain from hip arthritis. Most patients improve after this procedure. However, larger patients often exhibit a persistent lameness due to the loss of the ball and socket joint and resultant loss of biomechanical advantage. These patients also frequently exhibit decreased range of motion due to scar tissue formation.



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Total Hip Replacement (THR)

Total hip replacement is the treatment of choice for mature dogs with hip dysplasia and arthritis that is non-responsive, or inadequately responsive, to medical management. With this procedure the painful, arthritic joint is removed and is replaced with an artificial joint similar to the implants currently used for hip replacement in people. The artificial joint is made up of three parts; the femoral stem, the femoral head, and the acetabulum (cup or socket) (Figure 16). The femoral stem and head are made of cobalt chrome stainless steel and the acetabulum is made of ultra high molecular weight polyethylene plastic. These parts each come in a variety of sizes and can be used interchangeably. This modular design allows us to assemble an artificial joint well matched to the size of your dog.

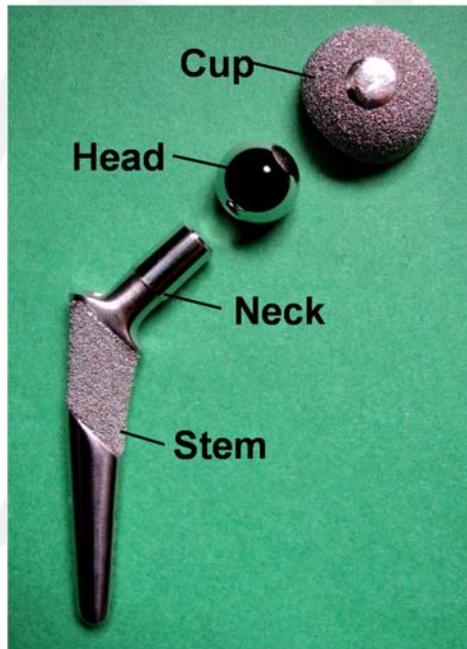


Figure 16: The components of an artificial hip joint consist of cup, head, and stem with neck.

We currently utilize implants provided by Biomedtrix. We utilize both biologic and cemented fixation styles of implants.

Biologic fixation implants are inserted directly into the prepared bone bed. Bone preparation is very precise, resulting in a very tight fit initially. These implants are partially coated with small titanium beads creating a network of small tunnels (Figure 17). Over time, bone grows into these small tunnels securing the implant within the bone bed.

With the cemented implants, the bone bed is prepared and filled with sterile polymethylmethacrylate (PMMA) or bone cement. The prosthesis is then inserted into the cement which hardens and secures the implant (Figure 18).



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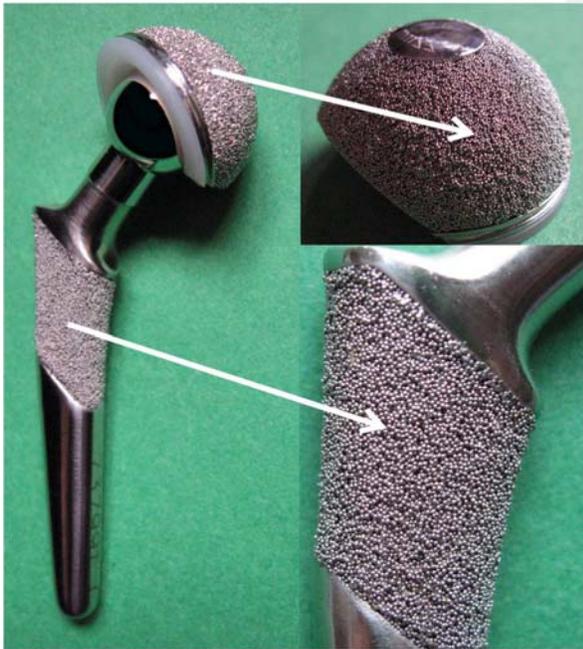


Figure 17: Biologic fixation style of a canine artificial hip. Bone grows into the irregular surface (white arrows) of the implants over time. This results in a stable fixation.



Figure 18: Cemented fixation style of a canine artificial hip. The components (white arrows) are stabilized within the bones by the use of bone cement.

The biologic fixation system also is fully interchangeable with the cemented system. This level of compatibility allows a very wide range of choices for each patient. The final selection of implants often is based on anatomic characteristics of the patient identified during surgery.

Benefits of THR:

Total hip replacement is a very effective means of decreasing pain, increasing mobility, and improving quality of life. With this procedure, the painful bone-on-bone joint is completely removed and is replaced with a polished, artificial, metal on plastic joint. This provides a stable, pain free joint with excellent range of motion (Figure 19).

Indications for THR:

Total hip replacement is most often performed in dogs with arthritis resulting from hip dysplasia (Figure 4). Hip replacement can also be performed in some patients with arthritis resulting from poorly healed hip fractures. Total hip replacement may be appropriate in some cases of hip luxation (dislocation).



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Procedure:

Each patient is carefully screened prior to total hip replacement. The skin, ears, and teeth are inspected to make sure there is no evidence of infection. Samples of blood and urine are obtained to insure proper organ function and to attempt to rule out systemic or urinary tract infections. Specific radiographs are obtained in an effort to accurately predict the optimal implant size and style for your pet.

During surgery, the femoral head is removed allowing access to the femoral shaft and improving access to the acetabulum. Specialized instrumentation is used to create the bone bed for the acetabular implant. The acetabular implant is then seated into the pelvis. The femoral shaft is then prepared to accept the femoral stem. Once the femoral stem is implanted the appropriate femoral head is applied and the joint is reduced (the ball is placed into the socket). The artificial joint is then inspected for stability and range of motion.

Following assessment of the artificial joint, the joint capsule is closed carefully. The sutures in the joint capsule and overlying tendon are crucial in providing stability to the joint in the immediate postoperative period. The remaining soft tissues are closed routinely. Radiographs are obtained postoperatively to assess implant sizing and placement (Figures 19 and 20).



Figure 19: Biological fixation of an artificial hip joint. Over time bone grows into the porous surface of the metal implants.



Figure 20: Hip replacement using the cemented hip system. Note the gray area (cement) surrounding the femoral stem.

Postoperative Care:

Most patients remain in our care for 2-4 days after total hip replacement to ensure adequate confinement during this critical period. We recommend activity restriction for the first 6-8 weeks after surgery to allow adequate bony in-growth and stabilization of the implants. During this period, your dog is allowed access to one floor of your house. We recommend keeping your pet off of slippery floors in order to reduce the risk of falling and dislocating the hip. We also recommend limiting access to stairs. We recommend three “bathroom breaks” each day to allow urination and defecation. These bathroom breaks should be about 5 minutes each and your pet should be leashed or closely supervised.



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The first recheck is performed two weeks postoperatively. During this recheck the skin incision is assessed for healing and the skin sutures are removed. We also assess comfort and range of motion at this time. Follow-up radiographs are obtained 6-8 weeks after surgery to assess stability of the implants.

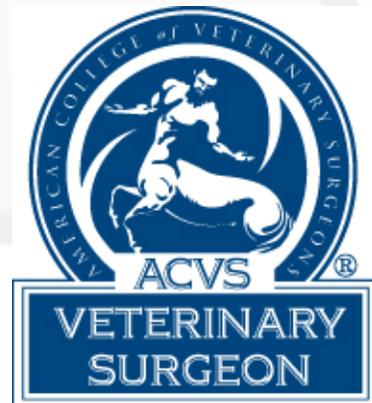
If the follow-up radiographs confirm that the implants are stable, you will be allowed to begin taking your dog on short leash walks. Alternatively, we may recommend physical rehabilitation at our facility. The goal during this time period is to rebuild muscle mass, regain conditioning, and improve range of motion in the joint. After 4-8 weeks of conditioning, your dog can resume normal activity (Figure 21).



Figure 21: Excellent leg function and quality of life can be achieved with an artificial hip. This dog, "Rocket", was one of the first cases undergoing total hip replacement surgery at Veterinary Specialists of Alaska, P.C. The pictures were taken 5 years after surgery.



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