Abstract

The ventral approach to the hip for femoral head and neck ostectomy is gaining popularity among surgeons due to perceived improved patient recovery compared with the craniolateral approach. Key aspects of patient selection, technical execution, and postoperative management are highlighted in this article.

SURGERY

Ventral Femoral Head and Neck Ostectomy: An Alternative Approach to a Common Surgery

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Femoral head and neck ostectomy (FHO) is commonly performed for treatment of Legg-Calve-Perthes disease, coxofemoral joint trauma, advanced hip dysplasia, and feline slipped capital femoral epiphysis. Surgical removal of the femoral head and neck eliminates pain related to irregular bone-on-bone contact and allows formation of a pseudoarthrosis made up of dense fibrous tissue.[1]

The traditional FHO method involves a craniolateral approach to the joint. The alternative ventral approach has gained popularity due to perceived benefits for the patient and has become the author's first choice in most clinical cases. The ventral FHO spares the gluteal muscles and dorsal joint capsule, which may add stability and reduce postoperative pain and subsequent time to comfortable limb function. Additionally, visualization of the lesser trochanter is improved, and bilateral simultaneous ventral FHO can be performed without patient repositioning.

Challenges of the ventral approach FHO include decreased visual guidance or a "blinded"

Take-Home Points

- Ventral femoral head and neck ostectomy (FHO) spares the gluteal muscles and dorsal joint capsule compared with the traditional craniolateral approach for FHO.
- Reduced postoperative pain and faster return to optimal limb function are subjective clinical benefits of ventral FHO.
- The ventral FHO approach is more challenging as there is less visual guidance for the orientation of the osteotomy.
- Preoperative radiographic planning to determine the patient's ideal FHO angle and attention to limb positioning at the time of the osteotomy are critical.
- A steep osteotomy angle risks inadvertent fracture of the greater trochanter.
- Postoperative rehabilitation is very important for optimal limb function.

orientation of the proximal osteotomy margin and difficulty associated with removal of additional bone following the initial ostectomy.[2] Protection and retraction of the proximal femoral vasculature and iliopsoas muscle during ventral FHO can also be challenging, especially in dogs with advanced hip dysplasia.

Although the ventral approach to the coxofemoral joint is well documented,[3] description of the ventral FHO surgical technique is limited.[2,4,5] This article provides insight into surgical indications for, and important technical aspects of, this alternative approach to FHO.

PATIENT SELECTION

Although FHO is frequently referred to as a "salvage" procedure, the author does not agree with considering FHO only as a last resort, as this may encourage waiting until the patient has significant muscle atrophy and obesity, making postoperative rehabilitation and recovery less successful.

Historically, outcomes for patients weighing more than 20 kg (44 lb) were considered inconsistent and FHO was not recommended for larger breeds.[6,7] More recent literature has reported similar outcomes regardless of patient size,[8] although larger patients with higher athletic goals likely require more dedicated postoperative rehabilitation. Owners should be aware that over the long term, the FHO limb may have muscle atrophy and decreased hip extension and weightbearing, which may affect athletic performance.[8,9] However, overall owner-reported satisfaction with the procedure has historically been good to excellent.[6,8,9]

The decision to choose the ventral versus the traditional craniolateral approach for FHO is most often based on individual surgeon preference. Patients for which the author would not recommend ventral FHO include most patients with craniodorsal coxofemoral luxation, as well as those with advanced hip dysplasia with severe craniodorsal subluxation and limited hip abduction. Additionally, chondrodystrophic conformation and obesity may make identification and retraction of regional anatomy difficult and can pose significant challenges even to surgeons with extensive experience and familiarity with the technique.

RADIOGRAPHIC PLANNING

Due to variation in individual patient anatomy and the blinded nature of the osteotomy, measurement of a preoperative ideal FHO angle is recommended. This angle can be measured on standard ventrodorsal (VD) hip–extended radiographs of the pelvis positioned in accordance with the Orthopedic Foundation for Animals (OFA) technique.

To determine the ideal FHO angle, an ideal FHO line is drawn from the proximal aspect of the lesser trochanter to the medial aspect of the greater trochanter. The long axis of the femur (LAF) is then

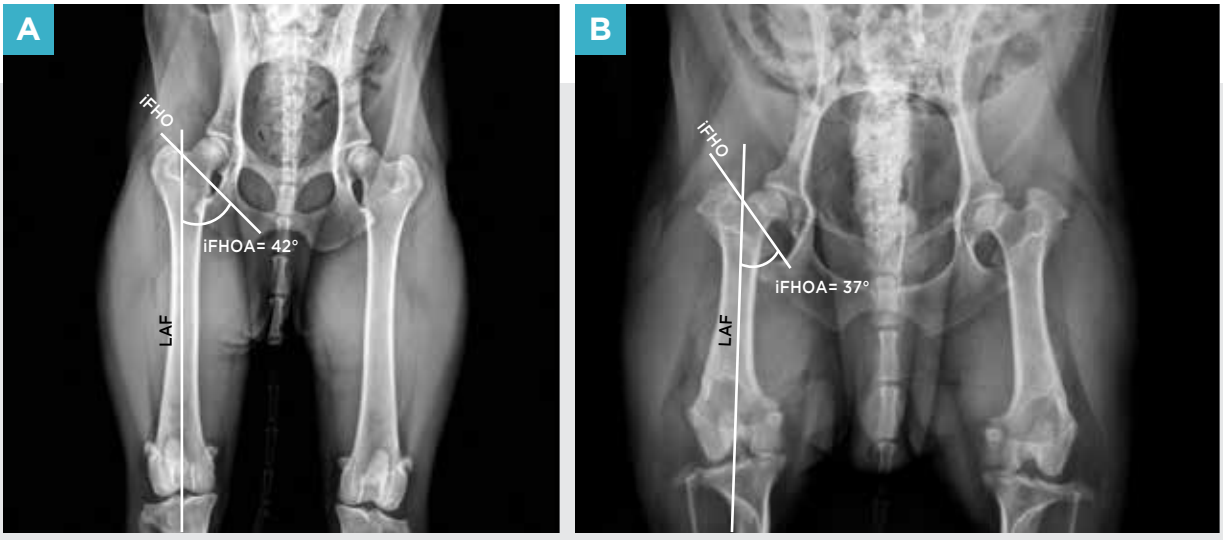

FIGURE 1. Ideal femoral head ostectomy angle **(iFHOA)** measurement in **(A)** a Labrador mix and **(B)** a dachshund. The iFHOA is the angle between the ideal femoral head ostectomy **(iFHO)** and long axis of the femur **(LAF)**.

drawn as a line connecting the "center points" of the bones' diameter at the levels of the lesser trochanter and fabellae. The intersection of the ideal FHO and LAF lines determines the ideal FHO angle (**FIGURE 1**) and acts as an intraoperative guide for orientation of the osteotomy.

SURGICAL APPROACH

The patient is placed in dorsal recumbency with the entire limb and caudal ventral abdomen clipped and aseptically prepared. Routine approach to the ventral aspect of the hip joint is performed as described elsewhere.[3] The initial skin incision is centered on the origin of the pectineus muscle, which is isolated and transected close to its origin on the prepubic tendon and iliopubic eminence of the pelvis.

The femoral artery, vein, and saphenous nerve that run cranial to the pectineus muscle send off a transverse branch of the medial circumflex femoral artery deep to the pectineus muscle (**FIGURE 2**; Note: Surgical orientation of the patient in **FIGURES 2–11** is dorsal recumbency with the head toward the left of the image). These structures must be carefully identified and protected. Blunt dissection between the medial circumflex artery and iliopsoas muscle creates a useful window for a Gelpi retractor and subsequent ideal access to the underlying joint capsule (**FIGURES 3 AND 4**). A generous incision in the joint capsule is then made from the base of the neck distally over the ventral rim of the acetabulum proximally (**FIGURE 5**). Dissection of capsular attachments from and placement of Hohmann retractors at the cranial and caudal aspects

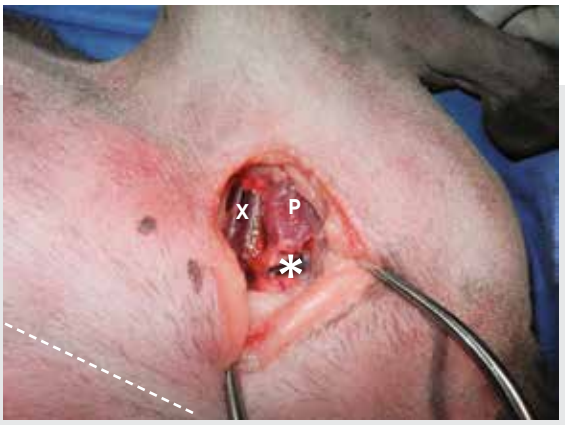

FIGURE 2. Regional anatomy, ventral approach: origin of the pectineus muscle **(P)** transected and distally retracted; femoral artery, vein, and saphenous nerve **(X)**; and medial circumflex femoral artery **(*)**.

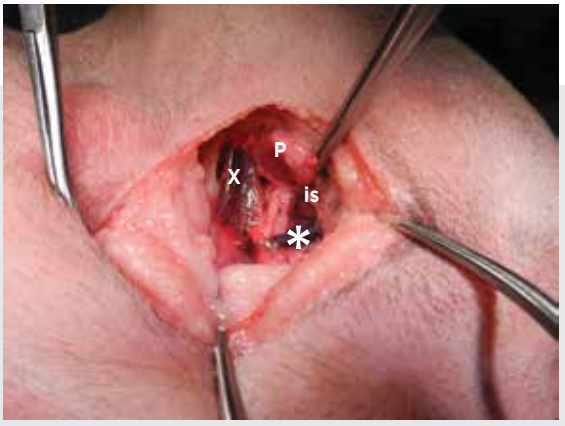

FIGURE 3. Blunt dissection between the iliopsoas muscle **(is)** and medial circumflex femoral artery **(*)**. **P**, pectineus muscle; **X**, femoral artery, vein, and saphenous nerve.

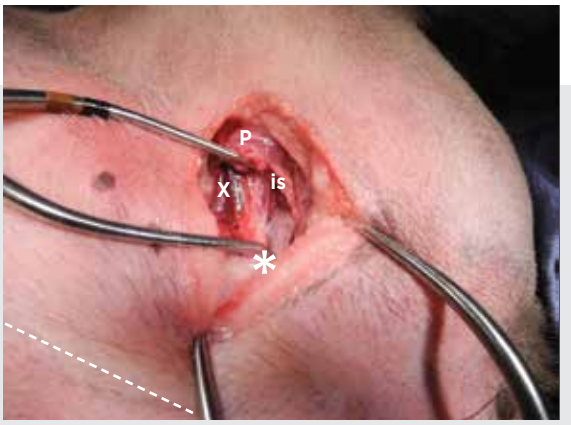

FIGURE 4. Gelpi retraction of iliopsoas muscle **(is)** distally, and medial circumflex femoral artery **(*)** proximally. **P**, pectineus muscle; **X**, femoral artery, vein, and saphenous nerve.

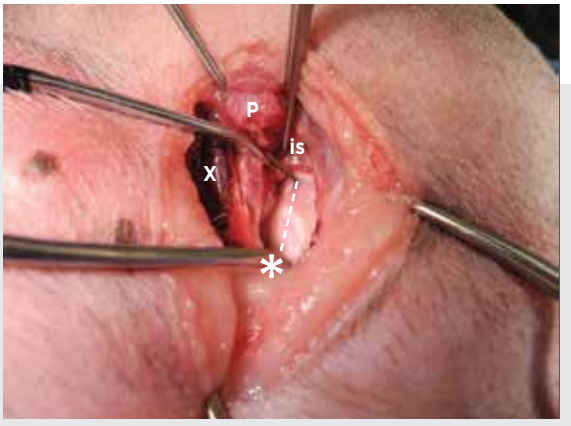

FIGURE 5. Dotted line denotes incision in joint capsule from the base of the femoral neck distally over the ventral rim of acetabulum proximally. **is**, iliopsoas muscle; **P**, pectineus muscle; **X**, femoral artery, vein, and saphenous nerve; *, medial circumflex femoral artery.

of the femoral neck allow exposure of the entire ventral head and neck.

VENTRAL FHO PROCEDURE

The iliopsoas muscle insertion on the lesser trochanter is readily identified on the caudomedial aspect of the femur from this approach, especially with external rotation of the limb (**FIGURE 6**). The surgeon positions themself at the caudal aspect of the patient while an assistant helps retract and support the limb in an abducted position, avoiding any rotation of the femur. Close attention must be paid to the position of the femur during the osteotomy, as this is critical to guide this otherwise blinded cut. The osteotome or saw is positioned vertically just proximal to the level of the lesser trochanter (**FIGURE 7**).

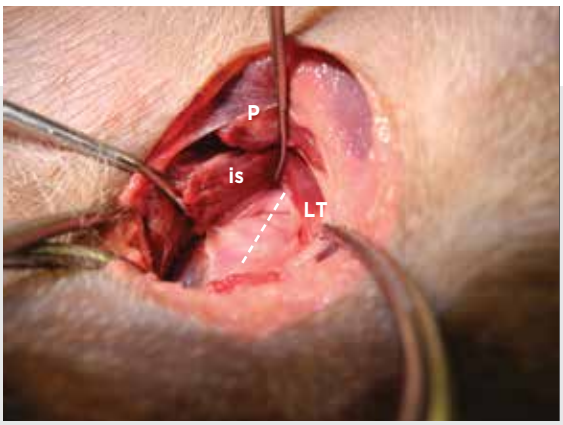

FIGURE 6. Location of lesser trochanter **(LT)** at insertion of iliopsoas muscle **(is)** in relation to joint capsule incision **(dotted line)**. **P**, pectineus muscle.

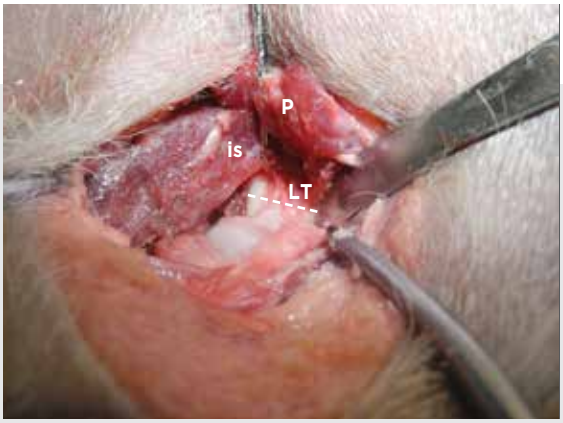

FIGURE 7. Retraction of the iliopsoas muscle **(is)** and pectineus muscle **(P)** exposes the femoral neck. The **dotted line** represents placement of the osteotome or saw just proximal to the lesser trochanter **(LT)**.

To begin, the assistant holds the femur abducted to a relatively perpendicular angle to the osteotomy or saw to allow initiation of a 1- to 2-mm-deep osteotomy (**FIGURE 8**). This marks the start of the osteotomy and prevents the osteotome or saw from slipping toward the femoral head during completion of the osteotomy. The assistant then raises the limb to form the same estimated angle as the preoperative measured ideal FHO angle with the osteotome or saw (**FIGURE 9**), and the osteotomy is completed.

It is important to note that taking an osteotomy angle steeper (higher) than the ideal FHO angle risks inadvertent fracture of the greater trochanter. It is safer to take a shallower (lower) angle and modify the cut postosteotomy.

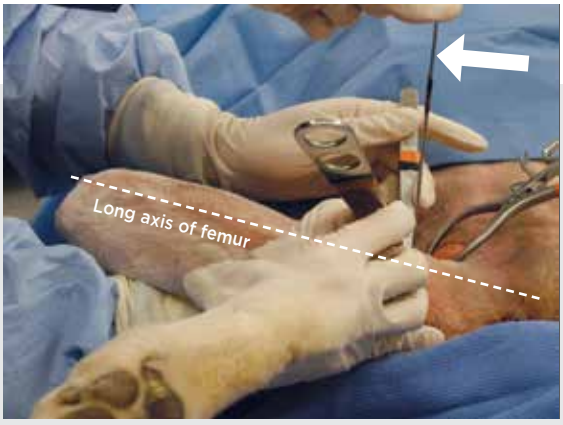

FIGURE 8. Surgeon's perspective of assisted limb positioning. The osteotomy is started with the limb relatively perpendicular to the osteotome **(arrow)** to a depth of 1 to 2 mm.

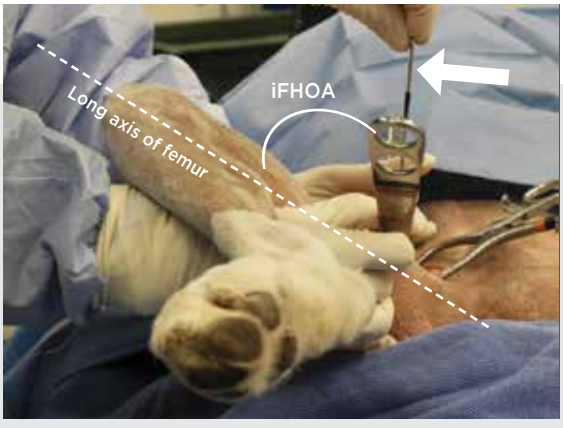

FIGURE 9. Surgeon's perspective of assisted limb positioning. To complete the cut, the assistant raises the limb to approximate the preoperative ideal femoral head ostectomy angle **(iFHOA)** measurement to the osteotome **(arrow)**.

The femoral head is grasped with pointed bone reduction forceps, and any remaining round ligament and joint capsule are sharply transected (**FIGURE 10**).

POSTOSTECTOMY ASSESSMENT AND CLOSURE

Subjective Intraoperative Assessment

The proximal femur is carefully palpated for ostectomy completeness and proximity to the lesser and greater trochanters. The proximal aspect of the femur is best palpated with distal traction of the limb. Excessive femoral neck and sharp bone spurs can be removed with a second osteotomy, bone rasp, or rongeurs.

Surgical Closure

The joint capsule is closed in an interrupted or continuous appositional pattern. The origin of the pectineus muscle can be reattached to the prepubic tendon with mattress sutures (**FIGURE 11**) or can be left transected. The author prefers buried subcutaneous and intradermal continuous closure of the remaining layers due to the location of the incision. The author routinely uses liposome-encapsulated bupivacaine instilled into each tissue layer of the closure to provide up to 72 hours of regional analgesia.

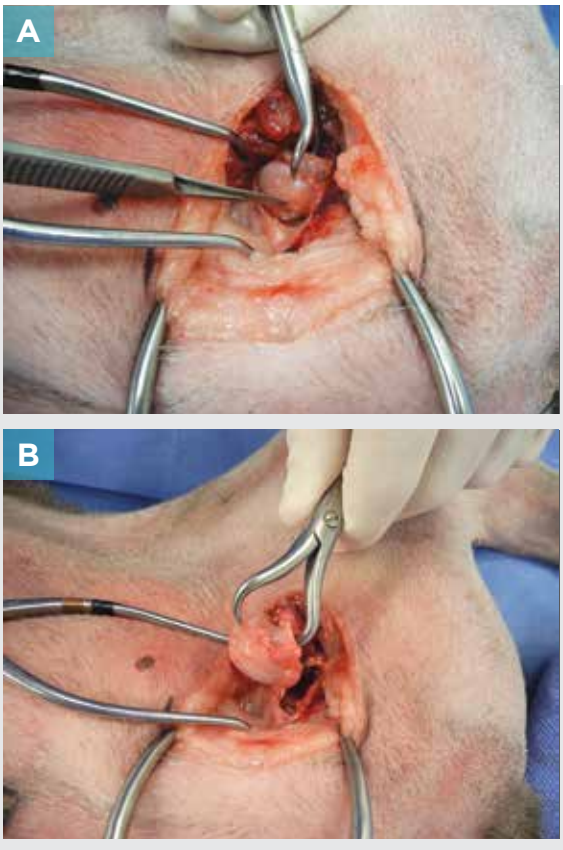

FIGURE 10. The femoral head is grasped with pointed bone reduction forceps and any remaining round ligament and joint capsule are sharply transected.

It is important to note that taking an osteotomy angle steeper (higher) than the ideal FHO angle risks inadvertent fracture of the greater trochanter.

Radiographic Assessment

After surgical closure, but before recovery from anesthesia and clearing of the sterile surgical instruments, a second OFA-like VD hip–extended pelvic radiograph (similar to the preoperative radiograph) is taken. The purpose of this study is to visually assess the ostectomy, and the image can be compared to the preoperative ideal FHO angle measurement for accuracy (**FIGURE 12**). If excessive femoral neck remains, the patient can be returned to the operating suite for revision of the osteotomy prior to recovery from anesthesia.

FIGURE 11. Following joint capsule closure, the pectineus muscle **(P)** has been reattached to its origin **(O)** on the prepubic tendon. **X**, femoral artery, vein, and saphenous nerve; *, medial circumflex femoral artery.

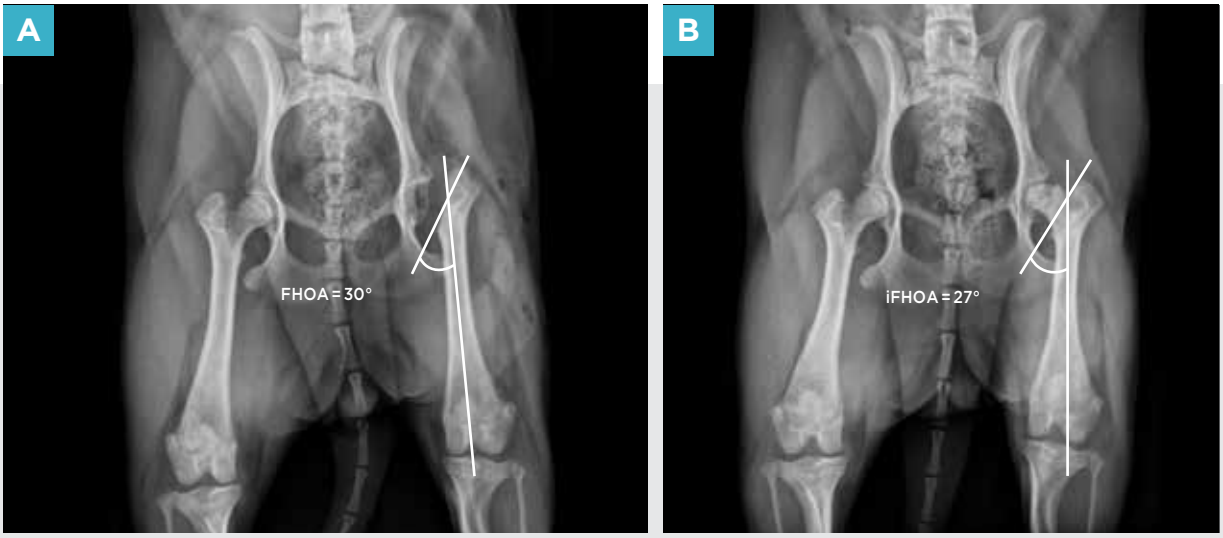

FIGURE 12. Postoperative radiographic assessment. **(A)** The post–femoral head ostectomy angle **(FHOA)** image can be critiqued and compared to **(B)** the preoperative ideal femoral head ostectomy angle **(iFHOA)** measurement.

POSTOPERATIVE CARE AND REHABILITATION

Most patients can be transitioned from intravenous or parenteral to oral pain medications over 8 to 12 hours and discharged for home care. Physical therapy/rehabilitation has been shown to be critical in successful functional outcome.[10,11] Initial postoperative rehabilitation focuses on decreasing pain and inflammation, improving comfort and limb use, and protecting the surgical site. After this initial healing period, rehabilitation is focused on improving range of motion (particularly to hip extension) and promoting muscle mass. This is particularly critical for larger patients with higher athletic goals.[12] TVP

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Dr. Goh earned her veterinary degree at Sydney University, Australia. She completed her postgraduate specialty training (rotating internship, surgical residency, and surgical oncology fellowship) at Colorado State University, where she currently holds a faculty position in small animal orthopedic surgery. Her clinical interests include cruciate disease, hip dysplasia, and arthroscopy.

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