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CLINICAL REPORT

Effective Medical Management and Physiotherapy Program of Femoral Head and Neck Osteotomy in 24 Dogs and Cats; Clinical Report

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Keywords:

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Abstract

Case Description- Twenty-four cases of dogs and cats were presented for inability to move and/or getting up one of the legs while walking and leaning on the other.

Clinical Findings- Physical and radiographic examinations revealed that the patients had coxofemoral luxation, hip dysplasia, comminuted acetabular fracture, avascular necrosis of femoral head and/or femur head fracture.

Treatment and Outcome- The patients went under routine femoral head and neck osteotomy (FHO) surgery. A 3-4 weeks full postoperative management was applied. Serial follow up suggested that all patients were in excellent condition with no or insignificant and non-problematic lameness. Younger and small sized patients had better outcome. However immature patients are in risk of limb shortening due to excision of physis.

Clinical Relevance- Although many studies have been published in FHO, anyone cannot find the applicable information and full postoperative management in an individual published paper. Hence, the purpose of this report was to provide applicable clinical information and offering a full medical and physiotherapy program. The authors' offer, special aftercare table and seriously believe that this program will deliver a better outcome. The table includes antibiotic and analgesic therapy, physiotherapy program and other considerations.

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1. Case Description

A total of 24 cases of dogs and cats were presented for inability to move and/or getting up one of the legs while walking and leaning on the other. The animal's information include: number, breed, sex, age and weight are shown in Table 1. The presentation of 7 cases, were in Shahid Chamran University of Ahvaz and others were in pet clinics located in Ahvaz, Iran.

2. Clinical Findings

Physical and radiographic examinations revealed that the patients had coxofemoral luxation, hip dysplasia, comminuted acetabular fracture, avascular necrosis of femoral head and/or femur head fracture. The numbers of patients diagnosed with each above-mentioned reason which the FHO indicated are shown in Table 1.

3. Treatment and Outcome

The patients went under FHO surgery due to chronic status of the patients and/or material needed for surgery such as toggle pin. After 16 hours food and 2 hours water restriction, the patients were intramuscularly sedated using a mixture of acepromazine (0.2 mg/kg, Alfasan, Woerden, The Netherland) and ketamine (5 mg/kg, Alfasan, Woerden, The Netherlands). After sedation occurred, clipping and scrubbing the area was applied while the affected limb hung. Then, anaesthesia was induced using a mixture of diazepam (0.2 mg/kg, Caspian Tamin Pharmaceutical Co., Rasht, Iran) and 10 mg/kg ketamine through an IV catheter. In some cases intubation was applied to have a patent air way. Immediately before the initiation of the surgery, cefazoline (22 mg/kg, IV, Exir Pharmaceutical Co., Borujerd, Iran) administrated as prophylactic antibiotic therapy. In addition, preemptive analgesia applied using ketoprofen (2 mg/kg, IV, Razak Laboratories, Karaj, Iran). Also, fluid therapy was considered with 10 ml/kg/h dextrose saline 1/3+2/3 solution (10 mg/kg/h, Samen Pharmaceutical Co., Mashhad, Iran). The craniolateral approach to the hip joint used. The incision located and curves slightly cranially to end just short of the dorsal midline proximally and one third to one half the length of the femur distally. Incision was slightly cranial to the greater trochanter in a proximal to distal direction. The incision continued proximally to open septum between the cranial border of the superficial gluteal muscle and the tensor fasciae latae muscle. Then fascia lata incised and vastus lateralis retracted cranially and biceps femoris caudally. Blunt dissection provided

visualization of a triangle bounded dorsally by the middle and deep gluteal muscles, laterally by the vastus lateralis muscle, and medially by the rectus femoris muscle.

Table 1. Patients' information undergoing femoral head and neck ostectomy

Information	Species	Distribution/description
Number of cases	Dog	20
	Cat	4
Breed	Dog	Mix breed: 10
		Pomeranian spitz: 1
		German Shepherd: 4
		Terrier: 2 Shitzoterier: 1 Husky: 2
	Cat	Dhs: 4
Sexuality	Dog	Female: 12 Male: 8
	Cat	Female: 2 Male: 2
Age range	Dog	<1 year: 11 >1 year: 9
	Cat	>1 year: 4
Weight range	Dog	<10 kg: 7 15<weight<20 kg: 9 >20 kg: 4
	Cat	<5 kg: 3
Indication	Dog	Coxofemoral luxation: 9 Fracture of head femur: 3 Hip dysplasia: 3 Old or multiple fracture of acetabulum: 3 Avascular necrosis of femoral head: 2
	Cat	Coxofemoral luxation: 4
Affected legs	Dog	Both legs: 1 (German Shepherd) One leg: 19 and four cats (affected side (right/left) not documented)
	Cat	All four cats experienced one affected leg (affected side (right/left) not documented)

Superficial and middle gluteal muscles retracted dorsally and partial tenotomy of deep gluteal muscles tendon provided best visualization of hip joint. Differently, in 3 of 21 cases greater trochanter osteotomy applied for better visualization. In the patients of coxofemoral luxation, it was easier to locate the head femur. Sciatic nerve was located under biceps femoris and caudodorsal to deep gluteal muscle and protected carefully when greater trochanter osteotomy applied. In other patients after visualization of hip joint the head observed when capsule around head and neck femur and acetabulum incised. At

that time, round ligament excised with curved Mayo scissors while cranial-caudal moving of femur. Later, osteotomy applied by osteotome and mallet on the imaginary line between midline of greater trochanter and head femur laterally and lesser trochanter medially while a Hohmann retractor was placed under the head femur. Head femur grasped by a towel clamp and pulled out the area (Figure 1). If the osteotomy line was rough, it would be smoothed using a file. Capsule Closure performed by closing any residual joint capsule over the acetabulum to prevent bony contact and further pain. Finally, after the area was lavaged using saline plus povidone iodine and continued only with saline, the incised muscles and skin closed routinely. Radiograph of the patient immediately after surgery is shown in Figure 2. The full post-operative management is shown in table 2. One dog (German shepherd) experienced both legs hip dysplasia. In that case, the operation was done with three weeks interval for post-operative management.

Fourteen cases (dogs 13/20; cats: 1/4) experienced mild lameness and others had (dogs: 7/20; cat: 3/4) no lameness during one to three weeks after surgery. Gradually decreasing trend of the lameness was observed months later. Three cases (of dogs) experienced muscle atrophy. The three weeks postoperative cares needed in majority of cases. Fortunately, any complication resulted in this report, only in one cat, proximal migration of femur observed. Only mild degree of limb shortening observed in two dogs of younger than 1 year. Following up the cases by physical, radiographic assessment or by phone contacts with the owners' months later revealed that all patients were in excellent condition with no or insignificant/non-problematic lameness.

4. Clinical Relevance

Surgical removal of femoral head and neck termed excision arthroplasty or femoral head and neck osteotomy (FHO).^{1,9} Originally, FHO used for septic arthritis of the hip in human patients in 1926, and then used by veterinary surgeons in 1961.^{5,8,11} In some conditions, pain existed due to coxofemoral region problems and bony contact between the femur and the pelvis. In these circumstances, FHO is one of salvage method and the goal is formation of a fibrous false joint (pseudoarthrosis) by elimination of bony contact.^{1,2,4,9} Thus, pain resolves and patients feel more comfortable than before surgery.^{2,9,11} Although, FHO is a non-reversible procedure, it is a valuable surgery for improving the quality of life for many pets by eliminating

pain.^{2,4,9,11} In dogs and cats, although ventral approach to the hip is more cosmetic however a craniolateral approach generally preferred, as entry follows natural muscle planes and the stability of the dorsal musculature is not compromised.^{1,7,8}

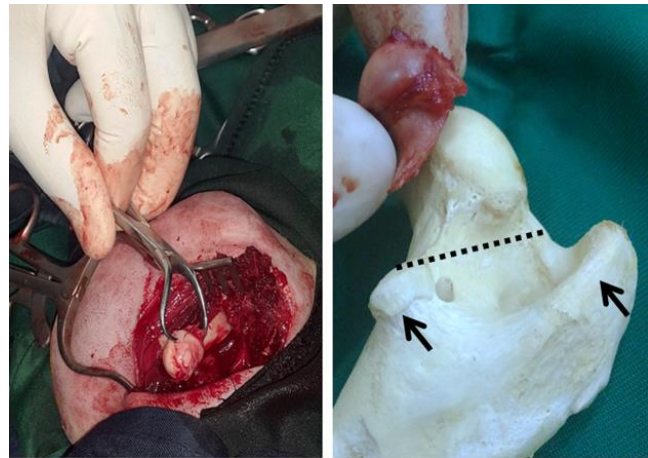


Figure 1. Left: Head femur pulling out the surgical site using a towel clamp. Right: Excised head femur, line of excision (dotted line) and greater and lesser trochanter (right and left arrowhead, respectively).



Figure 2. Radiograph, immediately after FHO surgery.³

Table 2. Postoperative management of femoral head and neck ostectomy in dog and cat.

Antibiotic therapy	♣ Cefazoline (22 mg kg ⁻¹ , IM,IV) every 12 hr for 3 days (if indicated; 5-7 days)
Anti-inflammatory and/or analgesic drug (one of these drugs)	♣ Ketoprofen (Dog: 2 mg kg ⁻¹ SC, IV, IM, q 24h until pain relief). (Cat: 1 mg kg ⁻¹ SC, q 24h until pain relief).
	♣ Meloxicam (Dog: 0.1-0.2 mg kg ⁻¹ SC, IV, IM, PO, q 24h until pain relief). (Cat: 0.05-0.1 mg kg ⁻¹ SC, IV, IM, PO, q 24h until pain relief).
	♣ Tramadol (Dog: 5-10 mg kg ⁻¹ PO – 2-4 mg kg ⁻¹ IV, IM, q 24h until pain relief). (Cat: 2-4 mg kg ⁻¹ PO – 1 mg kg ⁻¹ IV, IM, q 12-24h until pain relief).
	<ul style="list-style-type: none"> • Use the Elizabethan collar; elimination risk of licking at the incision site. • Ehmer sling: for the first five days. • Patient cage rest or in limited area while jumping and running are not possible. • If sever inflammation existed; ice-pack application to the hip for 10 minutes two to four times a day for the first 24 to 36 hr. • Passive exercise (gently flex and extend the hip by Putting the palm on the hip joint and moving the knee joint with the other hand, while the patient is lateral recumbent (preferred) or standing) with/without warm-pack application; two-four times a day and 20-30 times each.
Physiotherapy program	<ul style="list-style-type: none"> • Stop passive exercise. • Lifting up the patient's hands so that the patient weight bearing on both legs and encourage the patient walk backward (10 minutes two or three times a day until the patient be able to walk backward rapidly)
	<ul style="list-style-type: none"> • After walking backward rapidly, allow the patients to move and walk normally under supervision, but not jumping and running. • Reexamined with doctor two weeks after surgery to sutures removal and assess patient's moving and weight bearing. • If possible, underwater treadmill or swimming could be used to improve muscle strength and moving ability (after suture removal)
	<ul style="list-style-type: none"> • If the patient is not using the leg well, further supervision is needed and if not, no further restrictions are necessary.

FHO indicates for many reasons and the most common are: degenerative joint disease resulting from hip dysplasia, Legg-Calve-Perthes disease or aseptic/avascular necrosis of the femoral head and neck, capital epiphyseal and/or femoral neck fractures, comminuted acetabular and/or pelvic fractures (usually associated with multiple soft-tissue injuries), and non-reducible or chronic coxofemoral luxations.^{1,4} The most common indication of FHO in this report was coxofemoral luxation (13 of 24 cases). In these cases toggle pinning was not possible technically due to chronic luxation and/or toggle pin preparation (cost and/or availability).

The patients can tolerate bilateral FHO operation (if indicated) separately (with the optimum 8-10 weeks interval or more and less base on weight bearing and walking ability) or simultaneous (in severe pain existence) and each have their advantages.^{1,4,10}

Age, weight, the chronicity of the problem and the reason which FHO is indicated mainly affect the results. Younger

patients will experience rapid recovery and better getting the habit of walk, jump and run with the excised head femur; however, the excision of physis of proximal femur may put the patient in the risk of limb shortening.^{4,8} Although the smaller patients (in age and weight), have better outcome due to FHO than larger patients, the specific weight guidelines for FHO have not been reported elsewhere.^{4,8} However it has mentioned that the aftercare is much easier in smaller breeds (25 kg body weight) and the best results obtained in younger patients(<1 year).^{1,4,9,10}

The common complications of FHO which may occur are: limb shortening, sciatic nerve trauma, patellar luxation (due to instability of proximal femur), muscle atrophy, decreased range of motion and lameness and biomechanical restriction from a poor pseudoarthrosis (false joint), poor use of the limb due to bone to bone between femur and acetabulum as a result of inadequate removal of bone and/or capsule closing, fracture of the proximal femur (involving the greater trochanter or down

the femoral shaft was described as a possible complication from the use of an osteotome and mallet in osteoporotic bone and in traumatic fractures).^{3,4,6}

Regard to results obtained, some degree of limb shortening observation may be due to physis removal of immature patients, probably. Meaningfully, smaller patients and those with less severity and the short time after the onset of the problem have a better outcome.^{1,4,9,10} In the authors' opinion, some degree of muscle atrophy may be due to severe pressure from the placement of muscles between bone levels, so, further pain and/or lameness may elicited. Muscle atrophy can observe follow FHO. Not appropriate excision of head and neck femur, and/or not careful application of passive and/or active motions can cause muscle atrophy. If the greater and/or lesser trochanter excised or damaged during surgery, it can cause atrophy and lameness, subsequently. These bony prominences are origin and insertion of many muscles.⁷ Only one cat experienced proximal femur migration as a result of not confining the patient a week after surgery. It suggested any complication will not occur, if the FHO apply with much more care, step by step based on the described techniques and if the owners accomplish the surgeon's advices. In that case, the owner confessed that she allowed the patient to walk and move freely, so that the patient jumped off the furniture. Bony contact between proximal femur and acetabulum cause pain. To overcome and prevent this contact, capsule remnants suturing and interposing muscle between the excised femoral neck and the acetabulum suggested. Two methods of interposing muscles are; Method 1: Detaching the cranial third of the deep gluteal muscle from the trochanter major and suturing it's tendon to the insertion of the iliopsoas muscle on the trochanter minor. Method 2: detached a pedicle of biceps femoris muscle, wrapping it around the femoral neck osteotomy and suturing it to the gluteal and vastus lateralis muscles.¹ In this report, capsule suturing applied in the majority of the patients and others not. The results showed that, the outcome were not different with/without capsule suturing and this finding was reported before.¹ In this report, osteotomy of greater trochanter applied in three cases during surgery. In these cases lameness, muscles atrophy, late recovery and further physiotherapy needed. These cases were the first cases of the authors in FHO and the reason which the osteotomy done, were providing a better vision. Reexaminations of the patients have advantages of correct and/or prevent major problems. Physical and radiographic examinations are the best way of the patient's evaluation. In this work, radiographs were taken 1-2 or 3 weeks after surgery in some but not in all patients due to owner tendency.

The prognosis of FHO depends on many conditions include: surgeon experience, patient age and weight, time passed the initiation of the problem and others.¹ It seems the long time passed the onset of problem, older and larger patients and can desirably affect the results.

If bilateral problems are existed, operations should be done 8 to 10 weeks apart or, it will be necessary to delay the second surgery even further until active use of the first limb has been achieved.¹ In this report, the operation in one dog with both legs hip dysplasia was done with three weeks interval for post-operative management. Three weeks after first surgery, the active use of the leg achieved, then the second surgery was done.

The clinical information of FHO is outspread in different papers. Although many studies have been published in FHO, anyone cannot found the applicable information and full postoperative management in an individual published paper. Hence, the purpose of this report was to provide clinical information and offering a full medical and physiotherapy program.

In conclusion, FHO is a good to excellent salvage method regard to its indication in small animals and the prognosis is acceptable.^{1,4,10} The authors' offer, special postoperative management including medical and physiotherapy program following FHO and seriously believe that this program will deliver a better outcome. In the authors' knowledge, the postoperative table suggested in this report, is the first published one.

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Conflict of interests

None declared.

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چکیده

مدیریت دارویی و برنامه فیزیوتراپی اثربخش برای برداشت سر و گردن استخوان ران (FHO) در ۲۴
سگ و گربه؛ گزارش بالینی

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توصیف بیمار - بیست و چهار قلاده سگ و گربه به دلیل عدم توانایی حرکت و/یا بالا گرفتن یکی از پاها در هنگام حرکت و تکیه بر پای دیگر ارجاع شدند.

یافته‌های بالینی - معاینات فیزیکی و رادیوگرافی نشان داد که بیماران، دررفتگی رانی-لگنی، دیسپلازی، شکستگی چندتکه‌ای استابولوم، نکروز غیر عروقی سر ران و/یا شکستگی سر ران داشتند.

درمان و نتیجه - بیماران تحت جراحی FHO قرار گرفتند. مدیریت سه الی چهار هفته‌ای کامل پس از جراحی انجام شد. پیگیری‌های متعدد بیانگر شرایط عالی بیماران با لنگش غیر قابل ملاحظه بود. بیماران جوان‌تر و با جثه کوچک‌تر نتیجه بهتری داشتند. هرچند بیماران نابالغ به دلیل برداشت صفحه رشد در خطر کوچکی اندام قرار دارند.

کاربرد بالینی - اگر چه مطالعات زیادی در مورد FHO منتشر شده است، هیچ‌کس قادر به یافتن اطلاعات کاربردی و مدیریت کامل پس از جراحی در یک مقاله واحد منتشر شده نیست؛ بنابراین، هدف از این گزارش، ارائه اطلاعات بالینی کاربردی و پیشنهاد برنامه کامل مدیریت دارویی و فیزیوتراپی بود. نویسندگان جدول مراقبتی ویژه‌ای پیشنهاد می‌کنند و به جد اعتقاد دارند که این برنامه نتیجه بهتری به همراه خواهد داشت. این جدول شامل درمان آنتی‌بیوتیک و ضد درد، برنامه فیزیوتراپی و دیگر ملاحظات می‌باشد.

کلمات کلیدی: آرتروپلاستی برشی، سر ران، برنامه فیزیوتراپی، سگ و گربه