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Arthroscopic Evaluation of Elbow, Hip and Stifle Joint Disorders in Dogs

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Abstract: ***Survey radiographs reveal mainly the bonychanges and most joint disorders do not affect bone primarily. Arthroscopy is a valuable diagnostic tool for detecting intra-articular joint derangements which are difficult to be assessed by routine clinical and radiographic methods. The present study was taken up to evaluate the arthroscopic findings in elbow, hip and stifle joint disorders. The study consisted of 18 dogs divided into 3 groups. Each group consisted of six dogs with elbow joint, hip joint and stifle joint disorders respectively. All the dogs were subjected to arthroscopic evaluation. Arthroscopic evaluation dogs with elbow, hip and stifle joint disorders revealed changes like elbow dysplasia,round ligament and labral tears in hip joint, cruciate ligament ruptures in the stifle joint. The study revealed that arthroscopy is minimally invasive and a superior diagnostic technique for joint disorders.***

Keywords: Arthroscopy, osteochondritis dessicans, Fragmented coronoid process, cruciate ligament rupture

1. Introduction

Joint disorders constitute an important cause for lameness in dogs. These disorders could arise due to congenital, developmental or traumatic causes. Regular diagnostic methods may yield partial and indirect information about the disorder and may fail in detecting the disease at an early stage. Physical examination and radiography give limited information about the various intra-articular changes that occur in joints when compared to other diagnostic modalities[1,4].Survey radiographs reveal mainly bony abnormalities, and most joint disorders do not affect bone primarily. Radiography may help in the initial evaluation of relatively localized, unexplained, persistent or severe jointdisorder[3, 5, 9, 11]. Arthroscopy is minimally invasive, resulting in less surgical morbidity, less postoperative pain, and a faster recovery compared with arthrotomy and it allows better visualization of intra-articular surfaces and structures than arthrotomy in dogs [13].

2. Literature Survey

Hall and Keeran[6] were the first to describe the use of the arthroscope in horses and highlighted its usefulness in diagnosing joint pathology which radiography failed to show.Person [12]reported the technique of arthroscopy of the canine stifle, shoulder and coxofemoral joints and described the first successful use of arthroscopy in the diagnosis and treatment of osteochondritis dissecans of the shoulder joint. Wind and Packard [18]carried out radiographic studies using the lateral view of the elbow to study the affections of the elbow joint. The authors reported that young dogs of heavy and large sized breeds showed a greater predilection for elbow affection like fragmented coronoid process, osteochondritis dissecans of the humeral condyle and ununited anconeal process, especially in the growing stage of the dogs. potential indications for hip arthroscopy include hip dysplasia, osteoarthritis, hip dislocation, evaluation of the joint before triple pelvic osteotomy (TPO) and diagnostic examination (biopsy or culture of bone, cartilage, or synovial membrane) [2,7]¨Potential arthroscopic diagnosis in stifle joint disorders include cranial cruciate tear, caudal cruciate tear, long digital extensor tendon rupture, OCD, menisci tears, osteoarthritis, chondromalacia, autoimmune synovitis, assessment of articular fractures[8,11].

3. Problem Definition

The demand for arthroscopy in Veterinary surgery is increasing as Veterinarians and their clients become aware of its availability and effectiveness as a tool in the diagnosis and treatment of various joint disorders. Standardization of arthroscopy prevents the necessity of an arthrotomy. In addition, arthroscopy added with magnification and coupled with joint irrigation makes it possible to appreciate the articular cartilage in detail as the synovial villi are suspended in the fluid medium and project into the joint cavity [2]. On the contrary, details of the synovial membrane and articular cartilage damage may not be readily appreciable during arthrotomy as these lesions collapse and cling to the underlying surface. The aim of the present study was to evaluate the arthroscopic findings in dogs with elbow, hip and stifle joint disorders.

4. Methods/Approach

A total of 18 dogs with joint disorders and those which showed no discernable lesions on survey radiographs were selectedand were divided into three groups. Group-I consisted of six dogs with congenital or acquired elbow joint disorders. Group-II consisted of six dogs with congenital or acquired hip joint disorders. Group-III consisted ofsix dogs with congenital or acquired stifle joint disorders.All the dogs were fasted for 12 hours and water was withheld for 4 hours before arthroscopy. Arthroscopy of the elbow joint was done with the animal on lateral recumbency. The egress portal was mid-way between the medial humeral condyle and the most proximal part of the olecranon. The arthroscopic portal was one centimeter distal and 0.5 centimeter caudal to the medial epicondyle of the humerus. The patient was

positioned in lateral recumbency with the affected limb above the table. A 1.5 inch 18G needle was inserted in the caudo dorsal portion of the joint between the anconeal process and the olecranon fossa. Synovial fluid was aspirated and the joint subsequently distended with 10 to 15 ml of lactated ringer's solution. The arthroscopic portal for medial approach was then made along the arc of the trochlear notch approximately 1 cm distal to the prominence of the epicondyle. A stab incision was made at this point with a No. 11 Bard Parker blade and the sleeve with sharp trocar was inserted through the incision. Following entry into the joint the trocar was removed and the telescope was coupled with the cannula.For visual exploration of the hip joint, an egress portal and an arthroscope portal was used. For the right hip, the arthroscope portal was placed at 12 o'clock and the egress portal at 5 o'clock. For the left hip, the arthroscope and egress portals were placed at 12 o'clock, and 7 o'clock, respectively. Optimal portal placement was verified intraarticularly by visualization of a guide needle. An 18 to 22-gauge spinal needle (2.5- to 3-inch) was used as a guide to confirm the position for this portal. The hip was flexed slightly, and the femur was positioned parallel to the table to maximize the width of the joint space. The hip was palpated, and the needle was inserted at the midpoint of the proximal edge of the greater trochanter. For stifle joint, the patient was positioned in dorsal recumbency with the pelvis placed at the end of the operating table to facilitate unobstructed access to both sides of the stifle. A cranio-medial approach was chosen. An 18 G hypodermic needle was inserted into the supra patellar pouch and synovial fluid was withdrawn. The joint was then distended with 10-20 ml of lactated ringer's solution. A stab incision was made lateral to the patellar tendon mid -way between the distal aspect of the patella and the tibial crest. The egress cannula with the sharp trocar was directed from cranio-laterally to cranio-medially into the joint. As soon as the joint capsule was penetrated, the sharp trocar was replaced with the blunt obturator. The joint was extended and the blunt trocar was directed parallel to the trochlear groove into the femoro-patellar joint. The trocar was then replaced with the arthroscope. The egress needle was inserted into the proximal patellar joint space parallel to the patella.Irrigation of the joint with sterile lactated ringer's solution was used for joint distension and flushing of debris from the joint space thereby providing clear visualization of the structures of the joint cavity.

5. Results and Discussion

Arthroscopic examination of the 6 cases of elbow affected dogs examined revealed two cases of osteochondritis dissecans i.e., in case 1d and 1f (Fig 2), one case of fragmented medial coronoid process i.e., in case 1a (Fig 1), two cases of degenerative joint disease i.e., in case 1c and 1e and one case of synovitis i.e., in case 1b respectively.The lesions encountered in degenerative joint disease were loose osteophytes, hyperemia of the synovial membrane with villus synovial reaction and discoloration of the articular surface with cartilage fibrillation [2,16].The lesions encountered in osteochondritis dissecans revealed hyperemia of the synovial membrane and a loose cartilage flap [5,14].In case of fragmented medial coronoid process arthroscopic lesions appeared as fibrillations on the medial coronoid process and also an elevated fragment on the medial coronoid process. Similar lesions have also reported on arthroscopic examination of elbow joint in synovitis [5,9,14]. In case of synovitis, the lesions encountered were hyperemic synovial membrane with proliferation of synovial villi.[3](Table 1).Thus reported lesions encountered in present study confirm the findings of earlier reports.

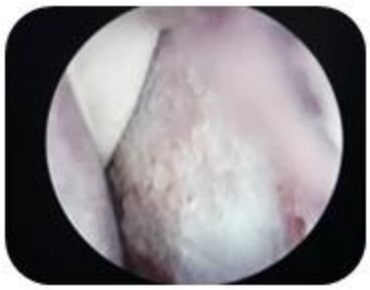

Figure 1: Arthroscopy of elbow showing fragmented medial coronoid process

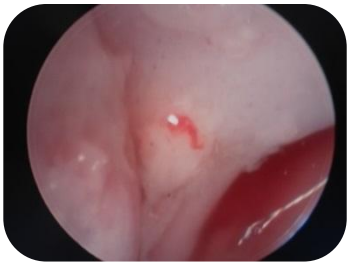

Figure 2: Arthroscopy of elbow showing osteochondritis dessicans

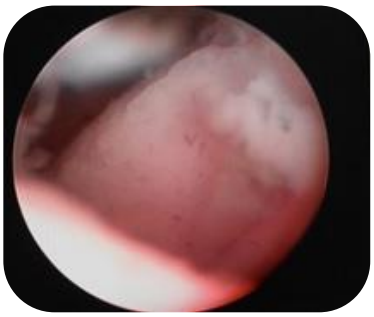

Figure 3: Arthroscopy of Hip showing osteoarthritis

Figure 4: Arthroscopy of Hip showing craniodorsal hip dislocation

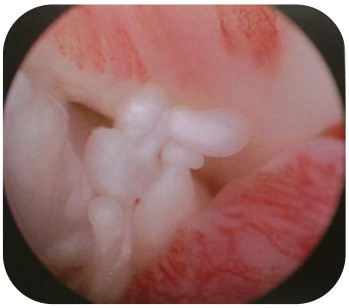

Figure 5: Arthroscopy of stifle showing cranial cruciate ligament rupture

Figure 6: Arthroscopy of stifle showing osteochondritis dessicans

Based on the observations of the present study as well as the findings of the previous studies suggests that arthroscopy is highly sensitive and relatively specific for localization and characterization of elbow joint lesions in dogs[2,15,17]

Arthroscopic examination of 6 affected hip joint cases revealed neovascularization and femoral head remodeling intwo cases i.e., in case 2a and 2f, severe osteoarthritic changes of femoral head in two cases i.e., in case 2c and 2e (Fig 3), craniodorsal hip dislocation in one case i.e., case 2d (Fig 4) and synovitis of hip joint with early remodeling changes in one case i.e., case 2b.The arthroscopic lesions encountered in hip dysplasia were mild wear of articular cartilage with femoral head remodeling. Arthroscopic changes seen in hip osteoarthritis included severe cartilage wear, fibrillation and femoral head remodeling. Arthroscopic changes in hip dislocation included mild labral tear with round ligament rupture. Arthroscopic changes in synovitis included hyperemic synovial villi with early remodeling changes. In the present study, Arthroscopic examination accurately diagnosed all 6 cases of hip joint affections. Hematoma and torn femoral round ligament were common findings in cases of hip dislocation[2,7].Synovitis, wear of the cartilage of the femoral head, mild tear of the labrum and acetabular cartilage wear were common arthroscopic findings in hip dysplasia and osteoarthritis of hip [2].(Table 2).Thus reported lesions encountered in present study confirm the findings of earlier reports. Based on the observations of the present study as well as the findings of the previous studies suggests that arthroscopy is highly sensitive and relatively specific for localization and characterization of hip joint lesions in dogs. [1,2].Arthroscopic examination of the six cases of stifle affected dogs examined revealed two cases of cranial cruciate ligament rupture i.e., in case 3a and 3b (Fig 5), one case of synovitis i.e., in case 3c,one case of osteochondritis dissecans i.e., in case 3d (Fig 6) and two cases of osteoarthritis i.e., in case 3e and 3f. The lesions encountered in two cases of cranial cruciate ligament injury were hyperemia of the synovial membrane, fibrillation of meniscus adjoining the tear, ruptured strands with loss of cross striations and pannus of the articular cartilage [10,17].The lesions encountered in osteochondritis dissecans were an attached, loose cartilage flap along with villus synovial reaction [2,17].Osteochondrosis dissecans of the lateral femoral condyle in two dogs was reported on arthroscopy by Rezende*et al.* (2006).Arthroscopic lesions visualized in one case of synovitis included hyperemic synovial membrane with proliferation of synovial villi [13,17]. Further, Synovitis was observed in three cases [10, 13].Arthroscopic lesions visualized in two cases of osteoarthritis included neovascularization with articular changes, osteophyte formation and subchondral bony changes and fibrillations [8].(Table 3).Earlier studies also indicated that arthroscopy could be used to accurately diagnose cases of cruciate ligament ruptures, collateral ligament ruptures and osteochondritis dessicans which are otherwise not visible on radiography. This concurred with the present findings.

6. Conclusion

The present study reveals that arthroscopy allowed better visualization of intra-articular surfaces and structures and provided finer details of the synovial membrane and articular cartilage damage. Arthroscopy added with magnification and coupled with joint irrigation also made it possible to appreciate the articular cartilage in detail as the synovial villi were suspended in the fluid medium and project into the joint cavity. Arthroscopy was also highlyuseful in the accurately diagnosingvarious joint lesions like ligament ruptures, labral tears and osteochondral defects in the joint that are not visible on radiography and also was very useful in detecting early changes like synovial villi inflammation which may be a sign of joint disorder where conventional radiography failed to detect it. Arthroscopy of the elbow, hip and stifle joints also provided a significant advantage over radiography in unraveling the lesions in dogs with joint disorders. Hence it is a superior technique for diagnosing elbow, hip and stifle joint lesions.

7. Future Scope

As arthroscopic technology has advanced, the scope of treatable conditions has expanded. Today, virtually every joint can be accessed via arthroscopy. Surgical arthroscopy evolved into a major therapeutic modality, rather than merely a diagnostic tool. No longer would patients have to undergo debilitating and painful surgery with extensive incisions. When indicated, arthroscopy would become the preferred method of surgical treatment over conventional, old-fashioned procedures. A three dimensional vision would be great, especially in cruciate ligament reconstructive surgery. Furthermore, a manual movable optic, which can be turned from 0° to 90°, would help the surgeon significantly. For 20 years, the industry has been trying to develop these scopes, but till now it has not been of any practical use. VRATS – Virtual-Reality-Arthroscopy-Trainings simulator are coming up, but are not yet used.

Table 1: Arthroscopic findings in 6 cases with elbow joint disorders

Cases	Breed	Age	Gender	Arthroscopic findings
1a	Labrador Retriever	10 months	Male	Fragmented coronoid process
1b	Non-Descript	2 Years and 5 months	Male	Hyperemia of the synovial membranes indicating synovitis
1c	Labrador retriever	7 years and 4 months	Male	Fibrillation of the articular cartilage, neovascularization and remodeling of the Humeral condyle
1d	German shepherd	1 year and 2 months	Female	Loose cartilage flap with hyperemia of synovial membrane
1e	Golden retriever	8 years	Male	Fibrillation of the articular cartilage, neovascularization and remodeling of the humeral condyle
1f	Non descript	1 year	Male	Loose cartilage flap with hyperemia of synovial membrane

Table 2: Arthroscopic findings in 6 cases with Hip joint disorders

Cases	*Breed*	*Age*	*Gender*	*Arthroscopic findings*
2a	Labrador retriever	8 months	Male	Swelling and neovascularization of the teres ligament and femoral head remodeling
2b	Non descript	4 years	female	Synovitis with early remodeling changes
2c	Neopolitan mastiff	6 years and 5 months	Male	Fibrillation of the articular cartilage, neovascularization and remodeling of the femoral head
2d	Non descript	3 years	Male	Craniodorsal luxation with labral tears and round ligament rupture
2e	Labrador Retriever	8 years and 3 months	Male	Fibrillation of the articular cartilage, neovascularization and remodeling of the femoral head
2f	Labrador retriever	9 months	Male	Neovascularization of articular cartilage and remodeling of the femoral head

Table 3: Arthroscopic findings in 6 cases with stifle joint disorders

Cases	*Breed*	*Age*	*Gender*	*Arthroscopic Findings*
3a	Pug	2 years and 5 months	Male	Cranial Cruciate Ligament rupture
3b	Non descript	1 year and 5 months	Female	Osteochondral flap with Cranial cruciate ligament rupture
3c	Labrador retriever	3 years and 7 months	Male	Synovitis with fibrillation of the articular cartilage, neovascularization and remodeling of the stifle joint
3d	Golden retriever	1 year and 3 months	Male	Loose cartilage flap with hyperemia of synovial membrane
3e	Labrador retriever	6 years and 5 months	Male	Fibrillation of the articular cartilage, neovascularization and remodeling of the stifle joint
3f	Labrador retriever	7 years and 3 months	Male	Fibrillation of the articular cartilage, neovascularization and remodeling of the stifle joint

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