

# The Clinical, Radiographical and Arthroscopical Diagnosis of Cranial Cruciate Ligament Lesions and Surgical Therapy in Dogs

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Received: 31.05.2001

**Abstract:** Cranial cruciate rupture was diagnosed by clinical, radiographical and arthroscopical examinations in 15 dogs, and arthroscopically observed intraarticular degenerative changes were arthroscopically described and surgically treated.

The drawer test was positive in 9 cases and indefinite in 6 of the cases suspected of having a rupture in the cranial cruciate ligament. In 2 cases, pain was present and in 4, swelling was observed in the joint. In the drawer test, in cases positive according to the radiographical examinations, the tibia was placed more cranially than the femur. In 4 cases, swelling was observed radiographically in the medial part of the joint. During arthroscopical examination, different stages of inflammation and hyperaemia were noted in the synovial membrane in all cases. Osteochondritis was observed on the medial surface of the distal medial condylus in 3 cases. Degenerative lesions were noted in the meniscus in 2 cases. Total rupture of the ligament was noted in 9 cases, while the ligament was fringed in 6 cases. Later, the rupture of the cranial cruciate ligament was treated by modified tensor fascia lata muscle graft.

In conclusion, while the diagnosis of cranial cruciate ligament ruptures could not be performed accurately clinically and radiographically, intraarticular changes and ligament rupture were correctly evaluated by arthroscopy. By the surgical method performed, all of the cases were treated successfully.

**Key Words:** Arthroscopy, cranial cruciate ligament, dog, treatment.

## Köpeklerde Ön Çapraz Bağ Lezyonlarında Klinik, Radyografik ve Artroskopik Tanı ve Cerrahi Sağıltım

**Özet:** 15 köpekte klinik radyografik ve artroskopik muayene ile ön çapraz bağ kopuğu tanımlanmıştır. Artroskopik olarak eklem içinde şekillenen değişiklikler tanımlanmış ve cerrahi olarak sağıltılmıştır.

9 olguda çekmece gözü testi pozitif bulunurken ön çapraz bağ kopuğu şüpheli 6 olguda belirgin değildir. 2 olguda ağrı bulunurken 4 olguda eklemde şişme gözlenmiştir. Çekmece gözü testinin pozitif olduğu olgularda radyografik muayenede tibianın femura göre daha kranialde yer aldığı gözlenmiştir. 4 olgunun radyografik muayenesinde eklem medial kısmının şiştiği görülmüştür. Artroskopik muayene sırasında tüm olguların sinovyal membranında hiperemi ve yangının değişik safhaları görülmüştür. 3 olguda distal medial kondilusun medial yüzeyinde osteokondritis saptanmıştır. 2 olguda menisküste dejeneratif lezyonlar görülmüştür. 9 olguda ligamentin tam kopuğu görülürken 6 olguda saçaklanma tarzındadır. Sonrasında ön çapraz bağ kopuğu modifiye tensor fasciae latae kas grefi uygulaması ile sağıltılmıştır.

Sonuç olarak; klinik ve radyografik olarak ön çapraz bağ kopmalarının tanısı tam olarak doğru yapılamazken, artroskopi ile özellikle eklem içi değişiklikler ve bağ kopuğu doğru biçimde değerlendirilmiştir. Uygulanan cerrahi yöntem ile tüm olgular başarı ile sağıltılmıştır.

**Anahtar Sözcükler:** Artroskopi, köpek, ön çapraz bağ, sağıltım.

## Introduction

Most hind limb lameness seen in dogs is caused by stifle joint lesions (1-3). These lesions are mostly observed in the cranial cruciate ligament (CCL) and often

occur because of ruptures (1,4). The reasons for ligament rupture are either acute (traumatic) or chronic (degenerative) (5-7). The stability of the stifle joint is destroyed when the rupture occurs (8). Following this,

degenerative changes develop in intraarticular substances (1,2,9). Due to CCL rupture, intraarticular meniscus lesions, hyperplasia and hyperaemia in the synovial membrane, and osteochondrosis in the cartilage tissue may occur (2,7,9). CCL rupture may occur in every breed of dog, but elderly animals of giant breeds are thought to be predisposed (5).

In acute CCL ruptures, a sudden lameness, swelling of the joint, stability and destruction occur (1,7,8).

For the diagnosis of CCL ruptures, physical examination, radiography, magnetic resonance imaging (MRI), arthroscopy and arthrotomy methods are used (5). By arthroscopic examination, it is possible to determine the degenerative changes which occur in the anatomical structures within the joint (10-12). Arthroscopic examinations may provide useful information about the diagnosis and therapy of the meniscus rupture which cannot be defined radiographically, and about total or partial rupture of CCL, osteochondritis and synovial membrane lesions (13-15).

Many techniques are suggested for the treatment of CCL ruptures. Modified tensor fascia lata muscle transposition is one of them (16).

The aims of this study were to investigate the use of clinical, radiographical and arthroscopical techniques in the diagnosis of the CCL; to determine the extent of intraarticular degeneration using arthroscopy; and to assess the effectiveness of a modified tensor fascia lata muscle graft in the treatment of the rupture.

## Materials and Methods

Fifteen dogs of different ages, sex and breeds with suspected rupture of the CCL were evaluated. All dogs were examined clinically, radiographically and arthroscopically. Palpation was carried out when the animal was standing and atrophy in the muscles, pain in the stifle joint, and swelling of the joint capsule, tibial crest, patella and patellar ligament were evaluated. The same examinations were reperformed after the animal was laid on the opposite side to the injured leg. In addition, flexion, extension, and internal and external rotations of the joint were also evaluated. Pain and crepitation were tested. All of the animals were firstly exposed to the cranial drawer test, and then the affected legs were X-rayed, in lateral and cranio-caudal directions.

## Arthroscopical Diagnosis Techniques

The stifle joint was prepared for aseptic surgical techniques and the dogs were laid in dorsal recumbency under general anaesthesia. Xylazine HCl (Rompun, Bayer) was used for premedication in doses of 2.3 mg/kg and Ketamine HCl (Ketalar, Eczacıbaşı) was used in doses of 10 mg/kg. The joint cavity was filled with sterile Ringer's lactate solution using a hypodermic needle, before arthroscopy. The initial arthroscopical access was made laterally to the patellar ligament, between the patella and tibial crest. An arthroscope of 30° vision angle with a diameter of 2.7 mm was used (Richard Wolf). The cruciate ligaments, menisci, synovial membrane, and patella and femur condyluses were examined. The arthroscope was replaced medially to view the lateral femur condylus. During the operation, both stifle joints were continuously lavaged with sterile Ringer's lactate solution (Eczacıbaşı).

To repair the CCL rupture, the surgical technique described by Sağlam and Kaya (16) was used. In the cases with osteochondritis, subchondral bone was curetted, the joint was lavaged during arthrotomy and closed by the routine technique.

## Results

CCL rupture was present in the right stifle joint in 8 cases and in the left in 7 cases. No irregularities were observed in the posture and conformation of the cases on physical examination. Pain was evident in 3 cases, and swelling of the joints was noted in 4 cases, but nothing extraordinary was found. The cranial drawer test was positive in 9 cases, and indefinite in 6.

Lateral X-ray revealed that the tibia was located more cranially than the femur in 8 cases. In the medial aspect of the swollen joints of 4 cases, there was a remarkable increase in opacity in radiography.

Arthroscopical examination revealed in all cases of hyperplasia and hyperaemia the synovial membrane. Osteochondritis was observed in the medial part of the distal medial condylus of the femur in 3 cases (Figure 1). The joint capsule was hyperaemic in 8 cases. Lesions were observed in medial meniscus in 2 cases. There were complete ruptures of the CCL in 9 cases (Figure 2), and partial fringed ruptures were present in 6 cases (Figure 3).

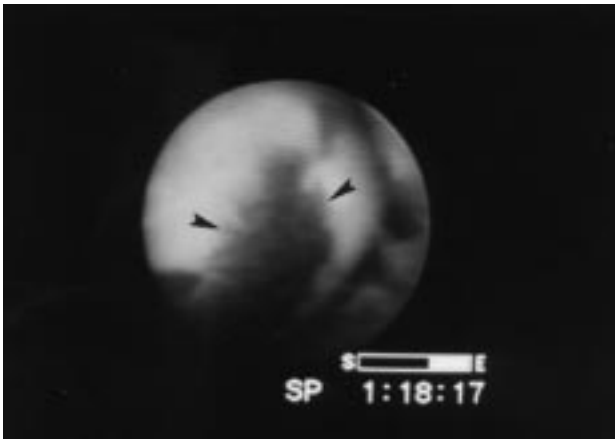


Figure 1. Osteochondritis in the medial femoral condyle (arrow)

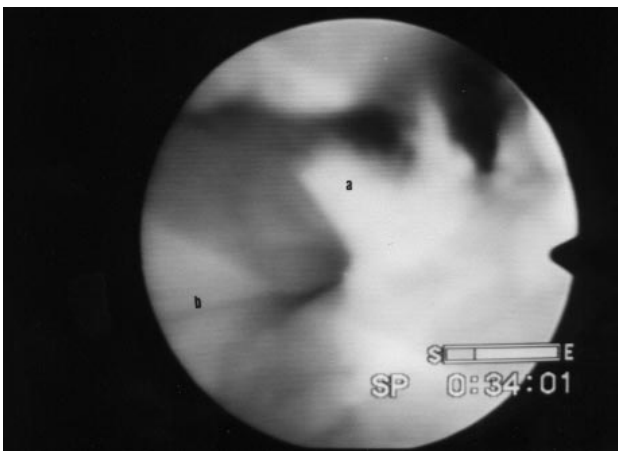


Figure 2. a. Complete rupture of the cranial cruciate ligament. b. Medial meniscus

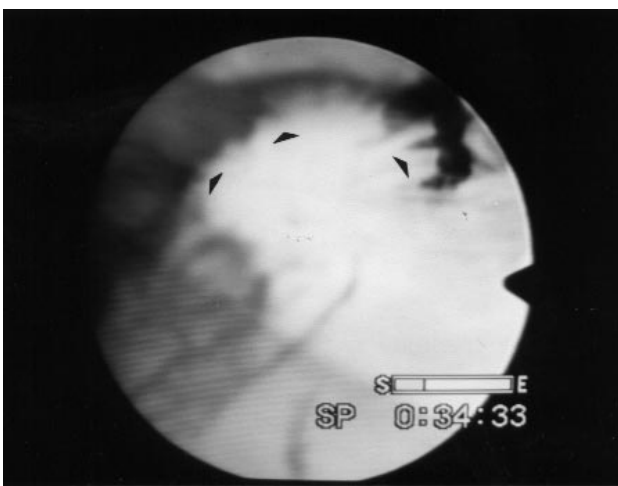


Figure 3. Partial fringed rupture of the cranial cruciate ligament (arrow).

No complications occurred after the modified tensor fascia lata muscle grafts. In the postoperative 6-month period the owners were interviewed, and they reported no complaints about the animals.

### Discussion

CCL rupture is a common problem in dogs. It can be seen in every dog breed at every age because of traumatic and degenerative causes. However, many researchers report that giant breeds and elderly dogs are predisposed (1,2,5,7).

Of the 15 cases examined here, 3 were directly traumatised, but the reasons for the rupture in the other cases remained undefined.

It is reported that the diagnosis of a CCL rupture can be a problem (7) and examination methods, such as physical, radiographical, MRI and arthroscopy, are of enormous use (5,8,17).

In this study, all of the cases were firstly examined physically postural conformational degenerations were found in 4 cases. In these cases, the dogs were not able to weightbear on the affected legs. Therefore, the stifle joints were bent and atrophies occurred in these legs compared to the opposite side. Out of the 4 cases with postural changes, 3 showed pain on palpation; in addition to this pain, the medial aspect of the joint was remarkably swollen. For the remaining one case, nothing was found so it was considered that the rupture was new.

For the diagnosis of CCL ruptures, the use of radiography provided significant information. In the lateral view, the tibia was located more cranially than the femur. It is also reported that the changes in the joint capsule and severe intraarticular lesions can be determined by radiography (5,8).

There were no subchondral defects on femur condyluses radiographically. The reason for this is that the stifle joint has a rather complicated structure and therefore cartilage lesions located on the inner surface of the lateral and medial condyluses of the femur cannot be observed. Four cases with pain had an increase in the opacity of the medial parts of the joint, which was considered to be due to a chronic inflammation in the joint capsule. In 8 cases, the tibia was located more cranially than the femur. For the rest of the cases, it was considered that the rupture was new, and joint instability was still intact.

The accurate diagnosis of CCL ruptures is difficult if only physical and radiographical examinations are carried out (10,11,17). It is possible to observe intraarticular structures directly by arthroscopy, and so more information is obtained by this method than by other diagnostic methods (5,17).

Hyperplasia in the synovial membrane was shown to have occurred in 4 chronic cases by arthroscopical examination. Because of the changes in the joint function due to the rupture, hyperaemia was present in all of these cases. In 3 out of the 4 cases, there was osteochondritis in the distal medial condylus of the femur. However, these lesions could not be determined radiographically because of their superficial localisation in the medial part of the medial condylus.

After identification of intraarticular lesions by arthroscopy, treatment can be carried out by noninvasive methods (10,11,18). However, in this study, arthroscopic surgical treatment was not performed.

When CCL ruptures happen, due to the loss of function in this ligament, degenerative diseases in the joint, biochemical and ultrastructural changes in the

cartilage (9) injuries in the meniscuses and lesions on the synovial membrane may develop (5,7,19,20).

Many researchers suggest many different methods for the treatment of CCL ruptures. There are many methods available for rupture treatment, but the basic purpose of all of them is the replacement of joint instability (2,16). In our study, CCL ruptures were treated with the method described by Sağlam and Kaya. After arthrotomy, it was treated by musculus tensor fascia lata graft (16). No complications occurred and in the postoperative 6-month period, the owners reported no complaints about their animals.

In conclusion, for the diagnosis of the CCL ruptures, physical, radiographical and arthroscopical examinations must be performed systematically. Physical and radiographical examinations provide limited information, and it is possible to learn more about the degenerative changes in the intraarticular anatomical structures noninvasively and lesions are seen clearly by arthroscopy. In all CCL ruptures, modified tensor fascia lata muscle graft was performed and positive results were obtained.

## References

1. Scavelli, T.D., Schrader, S.C., Matthiesen, D.T., Skorup, D.E.: Partial rupture of the cranial cruciate ligament of the stifle in dogs: 25 cases (1982 – 1988). JAAHA. 1990, 196, 1135 – 1138.
2. Harasen, G.L.G.: A retrospective study of 165 cases of rupture of the canine cranial cruciate ligament. Can Vet J. 1995, 36, 250-251.
3. Rooster, H., Ryssen, B., Bree, H.: Diagnosis of cranial cruciate ligament injury in dogs by the tibial compression radiography. Vet Rec. 1998, 142, 366-368.
4. Innes J.F., Bacon, D., Lynch, C., Pollard, A.: Long-term outcome of surgery for dogs with cranial cruciate ligament deficiency. Vet Rec. 2000, 147, 325-328.
5. Johnson, J.M., Johnson, L.A.: Cranial cruciate ligament rupture. Vet Clin of North Am: Small Anim Prac. 1993, 23, 717-733.
6. Whitehair, J.G., Vasseur, P.B., Willits, N.H.: Epidemiology of cranial cruciate ligament rupture in dogs. JAVMA. 1993, 203, 1016 – 1019.
7. Duval, J.M., Budsberg, S. C., Flo, G.L., Sammarco, J.L.: Breed, sex, and body weight as risk factors for rupture of the cranial cruciate ligament in young dogs. JAVMA. 1999, 215, 811-814.
8. Rooster, H., Bree, H.: Radiographic measurement of craniocaudal instability in stifle joints of clinically normal dogs and dogs with injury of a cranial cruciate ligament. AJVR. 1999, 60, 1567 – 1570.
9. Lipowitz, A.J., Wong, P.L., Stevens, J.B.: Synovial membrane changes after experimental transection of the cranial cruciate ligament in dogs. AJVR. 1985, 46, 1166-1170.
10. Knezevic, P.F., Wruhs, O.: Die Arthroskopie Bei Pferd, Rind, Schwein Und Hund Vet Med Rev. 1973, 1, 53-63.
11. Gestel, M.A.: Diagnostic accuracy of stifle arthroscopy in the dog. JAAHA. 1985, 21, 757-763
12. Cook, J.L., Payne, J.T.: Surgical treatment of osteoarthritis. Vet Clin of North Am: Small Anim Prac. 1997, 27, 931-944.
13. Bree, H., Ryssen, B.: Diagnostic and surgical arthroscopy in osteochondrosis lesions. Vet Clin of North Am: Small Anim Prac. 1998; 28, 161-189.
14. Berthrant, S.G., Lewis, D.D., Madison, J.B., Haan, J.H., Stubs, W.P., Stallings, J.T.: Arthroscopic examination and the treatment of osteochondritis dissecans of the femoral condyle of six dogs. JAAHA. 1997; 33,451-455.
15. Person, M.W.: A procedure for arthroscopical examination of the canine stifle. JAAHA. 1985, 21, 179-188.
16. Sağlam, M., Kaya, U.: An operative of cranial cruciate ligament rupture using modified intracapsular repair technique with musculus tensor fascia lata's graft in dog. The Journal of the Faculty of Veterinary Medicine University of Ankara. 2000, 47, 81 – 88.

17. Miller, C. W., Presnell, K.R.: Examination of canine stifle: Arthroscopy versus arthrotomy. JAAHA. 1984, 21, 623-639.
18. Lewis, D.D., Goring, L.R., Parker, R.B., Curasi, P.A.: A comparison of diagnostic methods used in the evaluation of early degenerative joint disease in the dog. JAAHA. 1986, 23, 305-315.
19. Flo, G.L.: Meniscal injuries. Vet Clin of North Am: Small Anim Prac. 1993, 23, 831-843.
20. Kılıç, E., Özyayın, İ. : Köpeklerde ligamentum patellanın deneysel patellar avulsionunun çelik tel ve polydioxanone iplikle onarımı. Kafkas Üniv. Fak. Derg. 1999, 5, 179-188.