# Arthrotomy versus arthroscopy in the treatment of the fragmented medial coronoid process of the ulna (FCP) in 421 dogs

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## Summary
In a retrospective trial over eight years 518 joints from 421 dogs with fragmented medial coronoid process of the ulna (FCP) were included. Seventy-five joints had an additional osteochondrosis dissecans of the medial aspect of the humeral condyle. Forty-six point eight percent of the dogs (197/421) were younger than one year. Two hundred and forty-seven joints were treated by conventional arthrotomy and 271 joints were treated by arthroscopy. Two hundred and thirty-eight cases (103 treated by arthrotomy and 135 by arthroscopy) were re-evaluated clinically and radiographically and 191 cases (88 treated by arthrotomy and 103 by arthroscopy) by means of a questionnaire at an average of 23 and 21 months after the operations, respectively. Forty-two point four percent (81/191) of the cases treated by arthrotomy did not show any lameness, 29.3% (56/191) showed temporary lameness after rest or heavy exercise, and 28.3% (54/191) showed constant lameness. The signs of which had, however, been reduced by surgery in 14 of these cases. Sixty point one percent (143/238) of the cases treated by arthroscopy did not show any lameness, 29.4% (70/238) showed temporary lameness after rest or heavy exercise and 10.5% (25/238) showed constant lameness, out of which four cases had improved after surgery. In the cases treated by arthroscopy, the period of convalescence was shorter. Differences between these methods were not observed with respect to the development of subsequent arthrosis. The results of the study show that arthroscopy, with its minimal invasive character, gives better functional results than conventional arthrotomy. However, the development of secondary arthrosis cannot be avoided by either method.

## Keywords
FCP, dog, arthrotomy, arthroscopy, comparison

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## Introduction

Fragmented medial coronoid process of the ulna (FCP) is a frequent cause of lameness of the front limbs in medium and large size dog breeds (10, 24). It can occur on its own or simultaneously with osteochondritis dissecans (OCD) of the medial aspect of the humeral condyle or ununited anconeal process (UAP) in the same joint (22, 34). For treatment of FCP, surgical therapy is most often recommended in the literature (2, 9, 13, 20, 21, 25, 29). In spite of surgical treatment, arthrosis still progresses pace (5, 9, 14, 21, 27). The prognosis concerning the improvement of lameness depends upon when surgery is performed and the degree of pre-existing arthrosis. It is considered to be "good" if surgery is performed at an early stage, i.e. when arthrosis has not yet set in or is at a low level (1, 5, 24). However, it is unfortunately difficult to make an early diagnosis, because the fragment itself can rarely be identified radiographically (24). Therefore, some authors recommend a diagnostic arthrotomy in predisposed dog breeds with persistent lameness and pain in the elbow joint, even if changes are not visible or are only minor on the radiographs (8, 18). Arthroscopy is recommended as an alternative method for the early diagnosis of FCP (3, 17, 32). This minimal invasive method is clearly superior to other screening procedures (radiography, computed tomography) in these circumstances (20, 32). In recent years, arthroscopy has not only been used as a diagnostic measure but also for surgical removal of FCP (3, 30). Studies evaluating the results of the arthroscopic surgery are sparse, but they appear to be very promising (30). So far, controlled studies comparing the results of treatment after arthroscopic versus conventional surgery do not exist in the current literature. Therefore, it was the aim of the study, presented herein, to compare the results of both treatment methods in a large number of patients in a standardised manner with regard to the development of lameness and arthrosis, and also to compare these results to other studies in the literature.

## Material and methods

### Dogs

Four hundred twenty-one dogs, with a total of 518 joints affected by FCP (n = 443) or FCP and OCD (n = 75), which were treated within a period of eight years at the Clinic of Small Animals, School of Veterinary Medicine Hannover, Germany, were included in the study. All of the dogs showed lameness of the front limb of a varying degree, which was located in the elbow joint. The tentative diagnosis of FCP was based on clinical signs, physical and radiographical examinations and was confirmed during subsequent surgery (arthrotomy/arthroscopy).

A total of 37 breeds were included (Table 1). The Bernese Mountain dog was the breed most commonly treated, followed by the Rottweiler, German Shepherd, Labrador Retriever and Golden Retriever. In all but seven dogs, the weight exceeded 20 kg. The dogs weighing less than 20 kg were two Border Collies and

**Table 1** Breed distribution of 421 dogs with FCP or FCP/OCD undergoing arthrotomy or arthroscopy (percentages in brackets)

| Breed | Dogs undergoing arthrotomy | Dogs undergoing arthroscopy | Total no. |
|---|---|---|---|
| Bernese Mountain Dog | 47 | 49 | 96 (22,8) |
| Rottweiler | 40 | 34 | 74 (17,5) |
| German Shepherd Dog | 27 | 31 | 58 (13,8) |
| Labrador Retriever | 21 | 22 | 43 (10,2) |
| Golden Retriever | 18 | 22 | 40 (9,5) |
| Mixed breed | 12 | 11 | 23 (5,5) |
| Newfoundland Dog | 8 | 7 | 15 (3,6) |
| Boxer | 3 | 9 | 12 (2,9) |
| American Staffordshire Terrier | 4 | 4 | 8 (1,9) |
| German Wirehair | 2 | 2 | 4 (0,9) |
| Airedale Terrier | 1 | 3 | 4 (0,9) |
| Swiss Mountain Dog | 2 | 2 | 4 (0,9) |
| Giant Schnauzer | 1 | 3 | 4 (0,9) |
| German Wachtel | 1 | 2 | 3 (0,7) |
| Briard | 1 | 1 | 2 (0,5) |
| Bobtail | 0 | 2 | 2 (0,5) |
| Gordon Setter | 1 | 1 | 2 (0,5) |
| Irish Setter | 1 | 1 | 2 (0,5) |
| Rhodesian Ridgeback | 0 | 2 | 2 (0,5) |
| Hovawart | 0 | 2 | 2 (0,5) |
| Giant Münsterländer | 1 | 1 | 2 (0,5) |
| Border Collie | 1 | 1 | 2 (0,5) |
| other breeds* | 7 | 8 | 15 (3,6) |
| **Total** | 201 | 220 | 421 (100) |

* one each of Australian Shepherd Dog, Bordeaux Dogge, Bouvier de Flandres, Bull Mastiff, Chow-Chow, Eurasian, Flat Coated Retriever, Landseer, Pit Bull Terrier, Polish Shepherd, Russian European Laika, Samojede, Bloodhound, Irish Terrier, St. Bernard

one each of the Australian Shepherd Dog, Irish Terrier, Chow-Chow, Eurasian and mixed breed Hunting Terrier. The average weight was 35 kg, the heaviest dog being 70 kg (New-foundland Dog) and the lightest 14 kg (mixed breed Hunting Terrier). Male patients were affected more frequently with 67.7% (285/421) than female patients with 32.3% (136/421). The age of the dogs ranged from five months to eleven years, with an average of 22.5 months. 197 dogs (46.8%) were younger than one year on presentation (Table 2).

## Radiographic examination

The affected and the contralateral elbow joint were examined radiographically in mediolateral extended and hyperflexed views, and in the craniolateral-caudomedial-oblique view. Besides diagnosing signs of elbow dysplasia, the radiographs were investigated for existing arthrosis. A classification into different degrees of arthrosis was made according to the guidelines of the International Elbow Working Group (16):

- *Degree 0:* lack of formation of osteophytes, sclerosis of the ulna caudal to the coronoid process possible
- *Degree 1:* formation of osteophytes in one/several locations less than 2 mm in size
- *Degree 2:* formation of osteophytes in one/several locations between 2-5 mm in size
- *Degree 3:* formation of osteophytes in one/several locations of more than 5 mm in size

All of the joints showed a, more or less, significant sclerosis of the ulna caudal to the coronoid process on radiographs. Except for sclerosis, 109 joints did not show formation of osteophytes. The majority of joints (n = 409) showed additional arthrosis of varying degrees (Table 3). An incongruency of the elbow joint on the mediolateral extended view was observed in 52 joints, meaning that there was a "step" formation between radius and ulna in which the distal surface of the ulnar trochlear notch is more prominent than the articular surface of the radius (23). In 17 elbow joints this intra-articular step was more than 2 mm, and in 35 joints (17 joints of the arthrotomy group; 18 joints of the arthroscopy group) it was less than 2 mm.

## Surgical treatment

### Arthrotomy

For the conventional removal of the FCP, a medial approach to the elbow joint between the pronator teres and flexor carpi radialis muscles was chosen (8). After opening the joint capsule and inner rotation of the lower front limb, the medial coronoid process was removed with the help of a sharp spoon or with an osteotome. If an additional OCD was present, the flap was removed and the cartilage bed was curetted. After rinsing the joint with sterile lactated Ringer's solution, the wound was sutured in a routine manner. After surgery the elbow joint was bandaged for one to two days. This conventional surgery was carried out in a total of 247 joints. In cases of a "step" of more than 2 mm (n = 7), a proximal

osteotomy of the ulna was performed additionally.

## Arthroscopy

Arthroscopic surgery was carried out from the medial side of the joint (32). An arthroscope with a diameter of 2.4 mm and a 25° cranial-oblique view angle was used[a]. Arthroscopic findings were documented with a colour image printer[b].

For the extirpation of the FCP and the OCD various grasping forceps[a,c,d], a retrograde scalpel and a motor driven shaver with different burrs[d] were used. The instrumental portal was located 1-1.5 cm cranial to the arthroscope. They were inserted straight into the joint without the use of a trocar sleeve. After removal of the FCP or OCD flap, the underlying bone was curetted gently with the shaver. Then the joint was thoroughly flushed again and the skin incisions were closed. Usually a dressing was not applied after the operation. This arthroscopic surgery was carried out in 271 joints. In cases of a "step" of more than 2 mm (n = 10), a proximal osteotomy of the ulna was performed additionally without opening the joint. In cases with osteotomy of the ulna a bandage was applied for one to two days.

## Evaluation of treatment results

The results of the therapy were analysed using a questionnaire, containing questions regarding: the improvement of lameness, the extent of the remaining complaints, any complications, the duration of the healing process and the need for follow-up treatment. In addition, the patients` owners were asked to return their dogs for a clinical and radiographic follow-up examination. This follow-up examination was carried out more than six months after surgery. After inspection and determination of the degree of lameness present, a radiographic examination of both elbow joints for the assessment of the degree of arthrosis was carried out in the same manner as the initial examination. Radiographs taken during the initial examination and the follow-up examination were analysed and compared with regard to existing arthrosis.

Analysis of the therapeutic results was based on examination of the patients presented to the clinic, as well as the results of the questionnaire filled in by the owners.

**Table 2** Age distribution of 421 dogs with FCP or FCP/OCD undergoing arthrotomy or arthroscopy at the time of diagnosis (percentages in brackets)

| Age | Dogs undergoing arthrotomy | Dogs undergoing arthroscopy | Total no. |
|---|---|---|---|
| 4-6 months | 14 | 18 | 32 (7,6) |
| 7-8 months | 35 | 33 | 68 (16,2) |
| 9-12 months | 48 | 49 | 97 (23,0) |
| 13-18 months | 32 | 40 | 72 (17,1) |
| 19-36 months | 38 | 42 | 80 (19,0) |
| Older | 34 | 38 | 72 (17,1) |
| **Total** | 201 | 220 | 421 (100) |

**Table 3** Degree of arthrosis in the elbow joint (n = 518) showing either FCP or FPC/OCD undergoing arthrotomy or arthroscopy at the time of diagnosis (percentages in brackets)

| Method of surgery | Type of disease | Degree of arthrosis before surgery 0 | 1 | 2 | 3 | Total no. |
|---|---|---|---|---|---|---|
| Arthrotomy | FCP | 52 (24.4) | 83 (39.0) | 44 (20.7) | 34 (15.9) | 213 (100) |
| | FCP/ OCD | 1 (2.9) | 5 (14.7) | 17 (50.0) | 11 (32.4) | 34 (100) |
| Arthroscopy | FCP | 55 (23.9) | 79 (34.3) | 57 (24.8) | 39 (17.0) | 230 (100) |
| | FCP/ OCD | 1 (2.4) | 8 (19.5) | 19 (46.3) | 13 (31.7) | 41 (100) |
| | **Total** | 109 ( 21,0) [1)] | 175 (33,8) [2)] | 137 (26,4) [3)] | 97 (18,7) [4)] | 518 (100) |

Degree 0 = lack of osteophytosis, sclerosis of the ulna caudal to the coronoid process possible; Degree 1 = osteophytosis in one or more locations under 2 mm; Degree 2 = osteophytosis in one or more locations between 2-5 mm; Degree 3 = osteophytosis in one or more locations over 5mm; [1)] = five dogs with "step" formation regardless of the height, [2)] = twenty-one dogs with "step" formation regardless of the height, [3)] = fourteen dogs with "step" formation regardless of the height, [4)] twelve dogs with "step" formation regardless of the height

The following classifications were made:

- *"Good":* The dog was not lame, even after heavy exercise.
- *"Satisfactory":* The dog showed temporary lameness after rest or exercise, but predominantly was not lame.
- *"Unsatisfactory":* A permanent lameness of a varying degree existed.

A comparison of the results of both surgical methods was carried out using the $\chi^2$ contingency table test. The statistical evaluation of clinical and radiographic examinations was carried out using the Student *t*-test for paired random samples, and the Wilcoxon-test for independent random samples. A value of $p < 0.05$ was considered to be significant (19).

[a] Fa. Wolf, Knittlingen, Germany
[b] Mavigraph UP-1800 EPM, Fa. Sony, Hannover, Germany
[c] Fa. Storz, Tuttlingen, Germany; Fa. Wolf, Knittlingen, Germany
[d] Linvatec Inc., Florida, USA

**Table 4** Results of therapy re-evaluated after arthrotomy (191 joints with FCP or FCP/OCD) and after arthroscopy (238 joints with FCP or FCP/OCD) broken down according to examination of patients in the clinic and results from questionnaire filled in by owner (percentages in brackets)

**Arthrotomy**

| Findings | Results clinic | | | Results questionnaire | | | Total no. |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 1 | 2 | 3 | |
| FCP | 60 (35.7) | 12 (7.1) | 18 (10.7) | 17 (10.1) | 32 (19.1) | 29 (11.3) | 168 (100) |
| FCP/OCD | 4 (17.4) | 6 (26.1) | 3 (13.0) | 0 (0) | 6 (26.1) | 4 (17.4) | 23 (100) |
| **Total** | 64 (33.5)[1)] | 18 (9.4)[2)] | 21 (11.0)[1)] | 17 (8.9) | 38 (19.9)[3)] | 33 (17.3) | 191 (100) |

**Arthroscopy**

| Findings | Results clinic | | | Results questionnaire | | | Total no. |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 1 | 2 | 3 | |
| FCP | 87 (43.5) | 18 (9.0) | 9 (4.5) | 46 (23.0) | 34 (17.0) | 6 (3.0) | 200 (100) |
| FCP/OCD | 6 (15.8) | 9 (23.7) | 6 (15.8) | 4 (10.5) | 9 (23.7) | 4 (10.5) | 38 (100) |
| **Total** | 93 (39.1)[1)] | 27 (11.3)[1)] | 15 (6.3)[1)] | 50 (21.0)[3)] | 43 (18.1)[4)] | 10 (4.2) | 238 (100) |

1 = good, 2 = satisfactory, 3 = unsatisfactory, [1)] =one dog each with "step" and osteotomy of the ulna, [2)] = three dogs with "step" and osteotomy of the ulna, [3)] = two dogs each with "step" and osteotomy of the ulna, [4)] = five dogs with "step" and osteotomy of the ulna

**Table 5** Degree of arthrosis of the elbow joints with FCP or FCP/OCD subjected to surgery at the time of the follow-up examination broken down according to arthrotomy (n = 103) and arthroscopy (n = 135) (percentages in brackets)

| Method of surgery | Degree of arthrosis during follow-up examination 0 | 1 | 2 | 3 | Total no. |
|---|---|---|---|---|---|
| Arthrotomy | 2 (1,9) | 24 (23,3)[1)] | 36 (35,0)[2)] | 41 (39,8)[3)] | 103 (100) |
| Arthroscopy | 3 (2,2) | 44 (32,6)[2)] | 43 (31,9)[4)] | 45 (33,3)[5)] | 135 (100) |
| **Total** | 5 (2,1) | 68 (28,6) | 79 (33,2) | 86 (36,1) | 238 (100) |

Degree 0 = lack of osteophytosis, sclerosis of the ulna caudal to the coronoid process possible; Degree 1 = osteophytosis in one or more locations under 2 mm; Degree 2 = osteophytosis in one or more locations between 2-5 mm; Degree 3 = osteophytosis in one or more locations over 5 mm; [1)] = one dog with "step" formation regardless of the height, [2)] = three dogs each with "step" formation regardless of the height, [3)] = seven dogs with "step" formation regardless of the height, [4)] = six dogs with "step" formation regardless of the height, [5)] = five dogs with "step" formation regardless of the height

# Results

Out of the 518 joints which had been subjected to surgery a total of 429 joints (82.8%) were re-evaluated. In 238 joints (45.9%) the follow-up examination was carried out after an average of 22 months through clinical and radiographic examination. Forty-one point seven percent of these cases (103/247) were treated by arthrotomy and 49.8% by arthroscopy (135/271).

In a further 191 cases (36.9%) the results were analysed after an average of 24 months with the help of a questionnaire. Thirty-five point six percent of these joints were treated by arthrotomy (88/247) and 38.0% of the joints by arthroscopy (103/271).

In 89 cases (17.2%) follow-up examination was not possible. Twenty-two point seven percent of the joints were treated by arthrotomy (56/247) and 12.2% of the joints by arthroscopy (33/271).

## Arthrotomy

Out of 247 joints which were treated by arthrotomy a total of 191 (77.3%) were re-evaluated after an average of 23 months (six-66 months). The results are shown in Table 4 and are broken down by the type of disease (FCP, FCP/OCD) and the type of follow-up examination.

In 42.4% (81/191) of the cases the results were "good" and "satisfactory" in 29.3% (56/191). Twenty-eight point three percent (54/191) of the cases showed "unsatisfactory" results, as a permanent lameness persisted which had, however, improved after surgery in 14 of the 54 joints.

General improvement of the pre-operative lameness was observed in 79.1% (n = 151). In 15.7% (n = 30), the lameness did not improve and got worse in 5.2% (n = 10) of the cases.

In dogs with "good" results after surgery the lameness of the treated limb disappeared after an average of eight weeks.

## Arthroscopy

Out of 271 joints treated arthroscopically, a total of 238 (87.8%) were re-evaluated after an average of 21 months (6 - 59 months). The results are shown in Table 4, broken down by the type of disease (FCP, FCP/OCD) and the type of follow-up examination.

In 60.1% (143/238) of the cases the result was "good" and "satisfactory" in 29.4% (70/238). Ten point five percent (25/238) of the cases showed "unsatisfactory" results, as a permanent lameness persisted which had, however, improved in four of the 25 joints after surgery.

Among the patients classified as "unsatisfactory", one was found to be suffering from a malignant lymphoma in the elbow area; after initial improvement of the lameness a relapse occurred, and the patient was euthanatized at the owner's request.

An improvement of the pre-operative lameness was observed in 91.2% (n = 217). In 5.9% (n = 14) lameness was not improved and got worse in 2.9% (n = 7) of the cases. The number of patients in which an improvement of lameness was achieved was

significantly different (p = 0.023) in the group treated by arthroscopy when compared to the group which underwent arthrotomy. In the dogs without lameness following surgery the lameness of the treated limb disappeared after an average of four weeks.

**Table 6** Comparison of post-surgical development of arthrosis after conventional surgery (n = 103) and arthroscopic (n=135) treatment of a FCP or FCP/OCD (percentages in brackets)

| Method of surgery | Increase of arthrosis by | | | | Total no. |
|---|---|---|---|---|---|
| | 0 degree | 1 degree | 2 degrees | 3 degrees | |
| Arthrotomy | 29 (28,2) | 47 (45,6) | 21 (20,4) | 6 (5,8) | 103 (100) |
| Arthroscopy | 43 (31,9) | 59 (43,7) | 27 (20,0) | 6 (4,4) | 135 (100) |
| **Total** | 72 (30,3) | 106 (44,5) | 48 (20,2) | 12 (5,0) | 238 (100) |

## Development of arthrosis after arthrotomy or arthroscopy

The development of arthrosis could be evaluated in 103 joints treated by arthrotomy and 135 joints treated by arthroscopy. Except for three joints treated arthroscopically and two joints treated by arthrotomy, all of the joints of both groups showed secondary arthrosis during follow-up examination (Table 5). Forty-seven of the joints (45.6%) treated by arthrotomy showed an increase of arthrosis by one degree, 21 (20.4%) by two degrees and six (5.8%) by three degrees. In 28.2% of the cases (29/103) arthrosis did not change (Table 6). In the cases treated arthroscopically, an increase in arthrosis was observed in 59 joints (43.7%) by one degree, in 27 joints (20.0%) by two degrees and in six joints (4.4%) by three degrees (Table 6). Thirty-one point nine percent of the cases (43/135) did not show any change compared to pre-surgical arthrosis. Comparing the development of pre- and post-surgical arthrosis, a significant difference between the two methods was not observed (p = 0.687).

## Discussion

Studies directly comparing surgical treatment of FCP by arthrotomy or arthroscopy are not evident in available literature. Therefore, in our study the results of both of these methods of therapy were compared using unified assessment criteria. Considering the functional results of the arthrotomy cases, a total of 42.4% (81/191) were not lame. In the literature, both better and worse results are described after arthrotomy. Worse results were achieved by Read et al.(27) and Tobias et al. (29), who reported only 35% and 32.4% of their patients to be sound, respectively. In comparison, better results were achieved by Groendalen (11), Mason et al. (20), Winhart (35), Meyer-Lindenberg et al. (21), Brunnberg and Allgoewer (7) or Gutbrod and Festl (12) with, respectively, 48.3%, 65.8%, 55.0%, 56.1%, 60% and 60.2% of their cases which were not lame. The reason for these different results remains unclear. The probable reason is that the studies were based on different conditions, investigations and assessment criteria: breed, group size, surgical access, age at surgery, severity of arthrosis present before surgery, number and the experience of the operating surgeons, time and nature of follow-up examination, etc. These details are not always mentioned in the individual studies above. Therefore, direct comparison of the results is difficult or even impossible, a fact that is also criticised by Morgan et al. (23). Moreover, the description of results, in the studies mentioned, varies greatly. For example some of the authors do not mention "free of lameness" in their results but rather describe a "change in pre-operative lameness" (6, 15, 29). Viewed from this angle Huibregtse et al. (15) achieved an improvement in the previously existing lameness of 77.3% in 13 patients which underwent arthrotomy. Under the same criteria, Tobias et al. (29) and Bouck et al.(6) achieved improvement of 70.6% and 70% of the cases, respectively. Comparatively, the results of this study based on the same criteria showed that improvement of lameness was achieved through arthrotomy in 79.1% of the cases.

Results after arthroscopic treatment of FCP or OCD are presented in literature only in the study of van Bree and van Ryssen in 175 elbow joints (30). The treatment result appears to be better after arthroscopic treatment than after conventional surgery. In 90% of 120 cases presented during follow-up examination a lack of, or only temporary, lameness was observed (30). In the present study the results after arthroscopic treatment were rated similarly as "good" or "satisfactory" in 89.5% of the cases. Unfortunately, it is not possible to gather the real number of dogs that were not lame from the study of van Bree and van Ryssen or in how many dogs an improvement of lameness was actually seen (30).

Comparing the two surgical methods of the study presented herein, it is noticeable that the result of arthroscopic surgery of 60.1% of cases rated "not lame" was significantly better than the conventional surgical method (42.4% of cases without lameness). Even when taking into account those dogs that were affected by temporary lameness, the result after arthroscopic surgery (89.5% of the cases classified as "good" and "satisfactory") is clearly superior to the result of cases treated with conventional surgery (71.7% of the cases being "good" and "satisfactory"). If only the improvement of lameness is considered, the group treated by arthroscopy (91.2% improvement) is also better than the group treated by arthrotomy (79.1% improvement). This shows that arthroscopy, with its minimal invasive character, is clearly superior to arthrotomy; even when viewing functional results from different angles. But it is uncertain whether the reduced soft-tissue trauma during arthroscopy is the only reason for these better results. The manipulation of cartilage and bone is the same in both measures. It is probably due to the fact that arthroscopy allows a better overview and examination of the joint than it could be achieved

through arthrotomy. Therefore, some changes in the joint could be better visualised and treated more precisely and this could explain the better arthroscopic treatment results.

In patients not showing any lameness after arthroscopic surgery, the lameness disappeared after an average of only four weeks, which is significantly earlier than in those patients which underwent arthrotomy (average of eight weeks). This is most probably due to significantly less tissue trauma caused by arthroscopy.

The disadvantage of any surgical treatment of a joint is the more or less significant development of arthrosis. Besides the type of tissue trauma, the cause and duration of the disease are important to be considered (28). Although, apart from the extent of the treatment, all other circumstances such as breed, weight and age distribution, were almost the same in each group within the present study; a significant difference was expected regarding the formation of arthrosis. However, the surprising result of this study was that, regarding the formation of arthrosis, a difference in either method of therapy was not established. After both arthroscopy and arthrotomy, arthrosis continued to develop in the majority of cases (68.1% and 71.8%, respectively). This is an observation that was also made by other authors both after arthrotomy (4, 11, 15, 21, 24, 26, 29, 35) and after arthroscopy (30). Therefore, in this respect, an advantage is not observed in the minimally invasive method of arthroscopy when compared to conventional arthrotomy. This is probably due to the fact that manipulation of cartilage and bone in the joint is similar in both methods. Only soft-tissue trauma is reduced in arthroscopy.

In this study, the simultaneous existence of FCP and OCD did not have a negative effect upon the results of the treatment by conventional arthrotomy. In 23 joints with both conditions, the results were "good" and "satisfactory" in 16 cases (69.6%) compared to 72.0% (121/168) of the joints with FCP having only "good" and "satisfactory" results. In other studies, too, significant differences after a simultaneous treatment of both conditions were not observed (21, 35). Denny and Gibbs (8), Bennett et al. (4) and Lewis et al. (18), however, give a significantly poorer prognosis when both diseases occur simultaneously. According to the study of Mason et al. (20), the healing process of the joints with FCP/OCD is surprisingly better (90.9% of cases not being lame, 10/11 joints) than of those joints with FCP only (65.8% of cases not being lame, 25/38 joints). However, in this study a "reversed result" emerged after arthroscopic therapy. Joints with FCP only showed significantly better results (92.5% rated "good" or "satisfactory", 185/200 joints) than those with both conditions (73.7% being "good" or "satisfactory", 28/38 joints). However, considered in total, the small number of cases with both FCP and OCD in this study, as in the other studies as well, has to be taken into account.

In conclusion, it was possible in this study to demonstrate that in a large number of patients with FCP, considering various aspects using the same assessment criteria, arthroscopy is superior to arthrotomy. After arthroscopic surgery, considerably more dogs showed a regression of their lameness and recuperated very quickly after surgery. However, both methods have the disadvantage that arthrosis continues to progress.

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As an exercise in diagnosis, V.C.O.T. intermittently publishes a radiograph or image "puzzle". The diagnosis and a short description is published on page 222.
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# What is it?

## Number 45 – Question

**History and signalment:** A seven year old intact male Shetland Sheepdog was admitted with a history of bilateral plantar-grade stance. There was some evidence of crepitus in association with the tarsus on physical examination. Figs. 1a and 1b represent lateral and dorsoplantar projections of the left tarsus.


Fig. 1