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*Original article*

# Assessment of treatment of Osteochondrosis dissecans (OCD) of shoulder joint in dogs – the results of two years of experience

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## Abstract

Osteochondrosis is a common and clinically important joint disorder that occurs in human and many species of animals such as pigs, horses and dogs. The aim of this article is to present the results of conservative and surgical treatment of Osteochondrosis dissecans (OCD) and to compare the recovery time in relation to race, age and extent of cartilage damage.

The study was performed on 36 dogs of both sexes, aged from 4 to 24 months, weighing 12-70 kg, of different breeds (predisposed and non-specific for this disease). All patients underwent clinical, orthopedic and radiological examination through which the location of OCD changes in the shoulder joint and the degree of this problem were established.

Based on the examinations the patients were qualified for particular treatment procedures. Control tests were performed after 14, 30 and 60 days, which allowed for a precise evaluation of the progress of therapy.

Achieved results indicate that dogs age and the lesions extent in the shoulder joint have an impact on the outcome of treatment. Studies showed that the best therapeutic effects were obtained in dogs aged 6-10 months, which underwent surgery. The study proved that the early diagnosis of OCD strongly influence the recovery rate and may inhibit the development of degenerative changes in the joint (DJD).

**Key words:** dog, osteochondrosis, shoulder joint, cartilage

## Introduction

The term “osteochondrosis” is used to identify a wide range of changes that may occur in different animal species. The terminology of this disease distinguishes three modifiers: latens – changes are limited to the epiphyseal cartilage, the manifesto – change is accompanied by inhibition of intracartilage ossification, and dissecans – gaps within the articular cartilage (Ytrehus et al. 2007).

Osteochondrosis dissecans (aseptic necrosis of cartilage and bone) refers to the growing long bones and begins with the appearance of irregularities in the process of intracartilage ossification of humeral head. On the basis of these changes, problems with proper compaction and thickening of cartilage occur. The increased thickness of the cartilage leads to necrosis of chondrocytes which in the deeper layers disrupts the normal bone structure (Carlson et al. 1991, Ekman and Carlson 1998). Loss of chondrocytes in the

deeper layers of cartilage leads to the formation of cracks in places where calcified and non-calcified tissue are in contact. Due to the cracks in the cartilage, the free cartilage fragments known as “joint mice” are formed (Harari 1998, Kuroki et al. 2005, Ytrehus et al. 2007). The above mentioned free cartilage fragments and inflammatory mediators enter the synovial fluid and are causing arthritis and DJD (degenerative joint disease). The exact reason of OCD occurrence is unknown, but there are evidences that some factors are essential for the emergence of OCD, such as heredity, rapid growth, anatomical structure, injuries, poor diet (LaFond et al. 2002, Ytrehus et al. 2007).

The disease occurs mainly in large breeds dogs between 4 and 10 months of age (LaFond et al. 2002, Kuroki et al. 2005, Adamiak 2007). The aim of our study was to evaluate the conditions in terms of race, age and gender during two years of observation and to compare the conservative and surgical methods of treatment in the context of the clinical effects.

## Materials and Methods

The study group comprised 36 dogs including 34 animals aged 4 to 14 months, and 2 at the age of about 24 months. Body weight of treated animals ranged from 12 to 70 kg. The study group consisted of the following dog breeds: Cocker Spaniel – 1; Border collie – 5; Labrador – 10; Golden retriever – 9; Great Dean – 3; German Shepherd – 3, a Tibetan mastiff – 1, mongrel – 4. The group consisted of 11 females and 25 males. Owners of all dogs came to the Department of Surgery, University of Environmental and Life Sciences in Wrocław in the period from January 2007 to December 2009. The reason lameness, pain and gait abnormalities which occurred in their dogs. Based on the clinical, orthopedic and radiological examination, the osteochondrosis dissecans of the shoulder joint was diagnosed in all 36 dogs.

During the anamnesis the owners were asked about the nature of the dog, the occurrence of lameness, the type of lameness, physical activity, presence of pain, visible anatomical abnormalities of the animal.

During the clinical examination – flexion and extension, the pain reactions in the shoulder joint were evaluated especially during hyperextension of the limb. Additionally, the test of limb abduction, internal rotation in the shoulder joint, palpation of the biceps brachii aponeurosis were performed.

X-ray's examination was performed in all dogs in three projections:

- medio-lateral,

- medial-lateral with the proximal segment of the limb rotated in the cranial direction,

- medial-lateral with the proximal segment rotated in the caudal direction.

Due to the fact that OCD changes frequently have bilateral nature and in order to compare two joints, X-rays of both shoulder joints were performed. Additionally, in 5 youngest dogs contrast arthrography was performed. The ultrasound examination was helpful in confirmation of the diagnosis in 6 patients (Harari 1998, Kealy and McAllister 2005).

The study was focused on the evaluation of conservative and surgical treatment – arthrotomy. In the case of 12 dogs, the conservative treatment was applied before surgery – in 6 animals passive method by administration of the hyaluronic acid and carprofen 50 mg/kg was used. Moreover, reduced physical activity was advocated. In the other 6, using chondroprotective drugs (glukozaaminoglikan GAG – chondroitinsulfat, hyaluronic acid), were used with a recommendation of an additional intense exercise, bending and straightening, of the affected joint.

In 24 cases decision about performing the surgery was taken immediately after the orthopedic examination. Preparation of the operating field was performed according to generally accepted principles of surgical cleanliness. Dogs which underwent surgery were premedicated with the mixture of the medetomidine (10-20 µg/kg) and midazolam (0.1-0.2 mg/kg) administered in a single intramuscular injection. Induction was performed with propofol (1-2 mg/kg IV). General anaesthesia was maintained with isoflurane. Intraoperative analgesia was achieved by fentanyl (2-5 µg/kg in bolus followed by CRI 5 µg/kg/min). In order to treat the postoperative pain, the buprenorphine (10 µg/kg SC) and meloxicam (0.2 mg/kg SC) were used for two and three days, respectively.

Depending on the location of changes on the head of the humerus two types of approach's to reach the shoulder joint were used:

- caudo-lateral approach – showed about 50% of articular surface of the humeral head and allowed to check the rear and side area of the joint – was used in 25 dogs,

- lateral approach – gave a good insight into the rear structure of the joint and the humeral head, and access to the medial part of the joint – used in 11 dogs.

In all cases treatment consisted of removal of free and pathologically changed parts of cartilage, and the curettage of the damaged articular surface using a Volkman curette.

After the procedure, a soft dressing was used for 10 days and amoxiciline and the non-steroidal

anti-inflammatory drugs were administrated for 7 days. Significant limitation of physical activity for 4-6 weeks was advocated. Control examinations were performed after 14, 30 and 60 days, what allowed for a precise evaluation of the progress of therapy.

## Results

Summary of results of the diagnosis and treatment of OCD are presented in Table 1.

The anamnesis at the beginning of each examination revealed that the most frequently mentioned symptoms were: stiffness of the limbs and sudden or gradually increasing lameness, worsening during intense physical exercise manifested by the abduction of

dog limb. The owners complained that dog was unwilling to play and expressed decreased physical activity. Furthermore, reduced muscle mass in the affected limb was noticed.

In each case during flexion and extension of the shoulder, animals expressed significant pain reaction, especially during hypertension of the limb.

In two dogs in which changes in the shoulder joint were very advanced crepitus was palpable. In four examined animals OCD changes occurred in both shoulder joints simultaneously. In these cases the gait was stiff and abnormal. In case of 12 dogs the atrophy of m. supraspinatus and m. infraspinatus was palpable during a clinical examination.

The radiological examination revealed the following changes:

Table 1. Summary of results of diagnosis and treatment of OCD.

Ordinal number	Dog breed (weight/kg)	Age (months)	Gender	Diagnostic methods, symptoms	Method of treatment	Period of convalescence (days)
1	2	3	4	5	6	7
1	Great Dean (50)	7	female	I; IV; VII	Surgical-caudolateral approach	~21
2	Great Dean (55)	6	male	I; III; IV	Conservative-passive; Surgical-caudolateral approach	40 + ~60
3	Great Dean (70)	24	male	I; III; IV; V	Surgical-caudolateral approach	incomplete
4	German shepherd (45)	14	male	I; III; IV; VI	Surgical-caudal approach	~150
5	German shepherd (36)	12	female	I; IV; VII	Surgical-caudolateral approach	~30
6	German shepherd (40)	11	male	I; IV; VII; IX	Surgical-caudal approach	~30
7	Tibetan Mastiff (38)	10	female	I; IV; IX	Surgical-caudolateral approach	~14
8	Golden retriever (36)	11	male	I; II; IV; VII	Surgical-caudolateral approach	~130
9	Golden retriever (40)	13	female	II; IV; VI	Surgical-caudal approach	~150
10	Golden retriever (42)	23	male	I; III; IV; V	Surgical-caudal approach	incomplete
11	Golden retriever (38)	10	male	I; III; IV; VII	Surgical-caudolateral approach	~50
12	Golden retriever (36)	11	male	I; II; IV; VII	Surgical-caudolateral approach	~130
13	Golden retriever (41)	14	female	II; IV; VI	Surgical-caudal approach	~150
14	Golden retriever (38)	14	male	I; III; IV	Surgical-caudal approach	~50
15	Golden retriever (30)	9	female	I; IV; VII	Surgical-caudolateral approach	~21

cont. Table 1

1	2	3	4	5	6	7
16	Golden retriever (20)	5	male	IV; IX	Conservative-passive; Surgical-caudolateral approach	45 + ~14
17	Labrador (22)	5	female	III; IV; VIII	Conservative-passive; Surgical-caudal approach	50 + ~60
18	Labrador (28)	7	dog	I; IX	Conservative-passive; Surgical-caudolateral approach	40 + ~21
19	Labrador (33)	10	dog	I; III; IV	Surgical-caudolateral approach	~50
20	Labrador (25)	6	dog	I; IV; VIII	Conservative-passive; Surgical-caudolateral approach	50 + ~30
21	Labrador (38)	8	male	I; III; IV; VII	Surgical-caudolateral approach	~40
22	Labrador (20)	6	female	II; VII; IX	Conservative-passive; Surgical-caudolateral approach	40 + ~60
23	Labrador (34)	9	male	I; III; IV	Surgical-caudal approach	~50
24	Labrador (26)	7	male	I; IV; VIII	Conservative-passive; Surgical-caudolateral approach	50 + ~30
25	Labrador (37)	9	male	I; III; IV; VII	Surgical-caudal approach	~40
26	Labrador (21)	5	female	II; IX	Conservative-passive; Surgical-caudolateral approach	40 + ~60
27	Border collie (18)	8	male	I; IV; VII	Surgical-caudal approach	~21
28	Border collie (22)	9	female	I; II; IV; VI	Surgical-caudolateral approach	~120
29	Border collie (25)	10	male	I; II; III; IV	Surgical-caudolateral approach	~150
30	Border collie (21)	8	male	I; III; VII	Surgical-caudolateral approach	~40
31	Border collie (15)	7	male	I; VII; VIII	Conservative-passive; Surgical-caudal approach	30 + ~30
32	Cocker spaniel (13)	8	male	I; III; IV	Surgical-caudolateral approach	~60
33	Mongrel (12)	4	female	IV; VII; VIII	Conservative-passive; Surgical-caudolateral approach	45 + ~50
34	Mongrel (23)	9	male	I; II; IV	Surgical-caudolateral approach	~120
35	Mongrel (43)	9	male	I; II; III; IV; VI	Surgical-caudal approach	~150
36	Mongrel (57)	8	male	I; II; IV	Surgical-caudolateral approach	~60

Legend to table:

I – X-ray-visible subchondral bone loss in 1/3 posterior of the head of the humerus

II – X-ray-visible cartilage flaps superimposed on bone loss

III – X-ray-cartilage flaps in the shoulder joint

IV – X-ray-expanded joint gap

V – RTG – osteofits and the presence of degenerative changes

VI – OCD changes in both shoulder joints

VII – Muscle atrophy in the limbs affected with disease

VIII – Additional test-artrography

IX – Additional test-ultrasonography

- visible bone loss under cartilage in 1/3 posterior of the humeral head (29 dogs);
- visible fragment of calcified cartilage, superimposed on the bone loss (11 dogs);
- free fragments of calcified cartilage around the joint – “joint mice” (14 dogs);
- widening of the articular space (31 dogs);
- osteophytes on the posterior edge of the humeral head and the acetabulum as well as secondary degenerative changes (2 dogs).

Passive and active conventional methods were used in dogs with lack of the free cartilage within the joint and without the osteophytes in the area of the shoulder joint (after radiologic examination). In none of the 12 cases treated by conventional methods symptomatic improvement was achieved. In the control examinations performed 6-8 weeks after the implementation of the treatment the bending and straightening were still painful, and gait was abnormal. At the same time the X-ray monitoring showed no changes in the extent of lesions of the shoulder in relation to those observed before treatment. The negative assessment of the treatment was the basis for the decision to perform an operation in all animals treated conservatively.

In the present study surgery was performed in 36 dogs – in 25 with the caudo-lateral approach and in 11 with the lateral approach. In 28 dogs free fragments of cartilage (“joint mice”), with a diameter of 0.5 cm to 2.5 cm, were removed.

Control examinations carried out in all 36 animals at 14, 30 and 60 days after surgery showed a gradual mobility improvement. In 25 patients return to full motor performance occurred in the period between 7 days and 8 weeks after surgery – lameness and pain symptoms described above ceased. In 7 dogs, in which cartilage loss was significant, physiological burdening of the limbs occurred 4-5 months after surgery.

For the two oldest animals in the research group which showed severe degenerative changes in the joint, complete recovery was not achieved. In further control examinations a gradual reduction in pain and improvement in animal movement were observed. In each examination, clear signs of lameness following vigorous physical exercise were noticed. In 12 dogs initially treated by the conventional method, the treatment was extended for its duration. Their recovery followed between 14 and 60 days after the surgery.

## Discussion

Osteochondrosis is a condition which is rare when considering all orthopedic cases. By analyzing the number of cases of this condition in the Department

of Surgery in the past two years 36 animals have been operated among more than 2000 of all surgeries performed.

According to the literature there are several factors that may cause OCD in the shoulder joint (MacConaill 1951, Slatter et al. 1993, Ekman and Carlson 1998, Necas et al. 1999, Marcellin-Little et al. 2007, Ytrehus et al. 2007). Ytrehus et al. (2007) presented one of the major causes of this condition being the size and weight, when referring to the dog breeds predisposed to the occurrence of OCD, such as a labrador, golden retriever, German shepherd. Ekman and Carlson (1998) argued further that the predisposing factors are also too rapid growth of the animal and improper diet. Our observations confirm those theories (more than 50% of the treated dogs were labradors and golden retrievers) but we were able to observe that in some smaller breeds of dogs (cocker spaniel, border collie) this disease may also occur. Newton and Nunamaker (1985) argued that sex hormones have a significant impact on the development of osteochondrosis – the problem occurs more often in males than in females. Our research confirms this fact – in the research group 30.5% were females dogs and 69.5% were males.

In our patients, for diagnostic purposes we used mainly the clinical and radiological examination, which usefulness was shown by Adamiak (2007). However Debeer and Brys (2005) mentioned that the best method of diagnosis is MRI and CT which require a special equipment. Ultrasound examination was used by us in five cases. Ultrasound is also recommended by the Harari (1998) who thinks that this type of examination provides a more detailed results of the occurrence of OCD in comparison to X-ray examination.

The method of surgical treatment used in our study is recommended by several authors (Slatter et al. 1993, Harari 1998, Adamiak 2007, Marcellin-Little et al. 2007), mainly due to the rapid and complete recovery of treated dogs. Lenehan and Van Sickle (1985) proposed conventional treatment as an effective method, claiming that after 4-10 weeks of treatment there is a 60% chance of healing of the articular surface and return of the dog to normal physical activity. According to our observations conducted in 12 dogs treated with this method, it did not give satisfactory results. Consequently, in these dogs the duration of treatment was longer. Conservative methods based, on the one hand, on the intraarticular and general administration of drugs, and on the other on physiotherapy require regime in physical activity. In addition, it is suitable for dogs that do not have free fragments of cartilage and osteophytes or other degenerative changes in the joint. Probably, the lack of posi-

tive results of treatment resulted from both the severity of lesions as well as inconsistencies in the owners proceedings.

Satisfactory effect of the surgical treatment resulted from the removal of free fragments of cartilage which mechanically irritate articular surfaces and reduce inflammation through the alignment of the damaged articular surface. Regardless of the method (arthrotomy, arthroscopy), implementation of surgical procedure as soon as possible after diagnosis the osteochondrosis of the shoulder is now the most appropriate treatment for this disease in dogs.

### Conclusion

We found out that in our Department the osteochondrosis of the shoulder joint in dogs mainly affected males of medium and large breeds. Clinical, radiological and ultrasound examinations of the shoulder joint in dogs allowed a correct diagnosis of osteochondrosis dissecans in all cases. Conservative (passive and active) treatment of osteochondrosis did not improve the clinical status of sick animals. The most satisfactory clinical effect was achieved in group of dogs up to 10 months of age treated surgically.

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