INCIDENCE OF OSTEOCHONDROSIS IN DOGS AND ITS LATE DIAGNOSIS

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Abstract

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An incidence of osteochondrosis in dogs from the total number of 38 126 patients treated in the Clinic of Surgery and Orthopedics at University of Veterinary and Pharmaceutical Sciences in Brno from 1989 till the end of October 1998 is reviewed. A total of 112 dogs (i.e., 0.3% of the patients) were diagnosed and treated surgically for osteochondrosis. The incidence of osteochondrosis in individual joints was as follows: 85 dogs with osteochondrosis in the shoulder joint (i.e., 75.9% of patients suffering from osteochondrosis), 18 dogs (16.1%) with osteochondrosis in the stifle joint, 5 cases (4.4%) in the hock and 4 cases (3.6%) in the elbow joint. Bilateral affections of the shoulder, hock, and stifle joints were found in 24.7%, 20.0% and 16.7% of patients, respectively. There were no cases of bilateral affections in the elbow joint. Special attention has been given to the age of patients at the time of disease diagnosis. An alarming percentage of late diagnosis of affections in the stifle joint (55.6% of patients older than 12 months) and the shoulder (20.0% of dogs older than 1 year) was found, as well. The highest age, at which osteochondrosis had been diagnosed, was 90 months. The most frequently affected breeds in our study were: Bouvier des Flandres (15.8%), Irish Wolfhound (8.9%), English Setter (7.1%), Retriever (4.7%), Rottweiler (4.4%), Brazilian Fila (3.7%), Bernese Mountain Dog (3.6%), Dalmatian (2.2%), Boxer (1.7%) and Great Dane (1.7%). The breed predisposition was confirmed statistically using c^2-test ($p < 0.01$). In contrast to published data, breed predisposition of German Shepherd to osteochondrosis has not been confirmed at 5% level of significance (c^2-test).

Osteochondrosis, dog, incidence, shoulder, elbow, stifle, tarsus

Though some veterinary surgeons and radiologists in the USA and Europe had encountered symptoms of osteochondrosis (OC hereinafter in the text) in dogs in the mid-fifties and the early sixties, the real turning point with respect to knowledge of this disease was the year 1964, when Mostosky reported results of his five-year clinical study of nine osteochondrosis cases at Michigan State University (Leighton 1998). It was followed by publication of many papers concerning the possible etiology and pathogenesis of osteochondrosis, improvements in its diagnosis and therapeutical procedures for treating individual OC changes (Olsson 1975; Robins 1970). Better acquaintance of practitioners with the OC enabled early and precise diagnosis and resulted in less numerous complications caused by secondary degenerative changes in joints. Early intervention (Gál 1999ab), and as possible minimally invasive method of surgical management (Gál and Macháček 1999), represent current trends of fracture treatment in children. Similar situation concerns the OC cases, in which it is necessary to perform surgery as soon as possible. Joint resurfacing (Nixon 1995; McIlwraith 1995) remains a challenge for future scientific research in this field.

Osteochondrosis is a multifocal disease of epiphyseal (growth) cartilage affecting both the articular-epiphyseal cartilage complex (immature joint cartilage covering the ends of growing long bones) and the growth (physeal) plate of bones (Ekman and Carlson 1998). It is a disturbance of endochondral ossification which causes problems both in the human medicine and in various animal species (pigs, horses, dogs, cattle, poultry) (Olsson 1993). The OC of the humeral head was described in the cat, as well (Peterson 1984). Up to the present there

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are differing views on the definition and pathogenesis of osteochondrosis and this disease has several synonyms such as osteochondritis dissecans, osteochondrosis dissecans or dyschondroplasia. Although, according to the latest knowledge, the term "osteochondrosis" is somewhat innacurate, because the early subclinical lesion does not involve bone (Ekman and Carlson 1998), it is commonly used in human and veterinary medicine. The etiology of osteochondrosis is polyfactorial (Ekman and Carlson 1998; Probst and Johnston 1993), while trauma, ischemia, hereditary factors, rapid growth and nutrition of the individual are taking part. Lesions of blood vessels in the cartilage (Kincaid et al. 1985) causing local ischemia (Carlson et al. 1991) play probably the key role. The coefficient of heritability varies from 0.25-0.45 (Olsson 1993). Contribution of heredity to the etiology of osteochondrosis in dogs is supported by a tendency to predisposition in breeds weighing as adults more than 20 kg (Ubbink et al. 1992). Large and giant breeds of dogs belong to typical cases (Johnston 1998). Considering large and giant dogs, such breeds as Dobermann, Collie and Siberian Husky (Rudd et al. 1990) are relatively of low risk with regard to the occurrence of osteochondrosis.

The first clinical symptoms are seen in the period of rapid growth of animals (Probst and Johnston 1993; Robins 1978). Predilection sites for osteochondrosis are the shoulder, elbow, stifle and hock joints. The OC of the femoral head, described in the Pekingese (Johnson et al. 1985), is rare.

Materials and Methods

In this clinical study we concentrated on the incidence of osteochondrosis in dogs from the total number of 38 126 patients treated in the Clinic of Surgery and Orthopedics, University of Veterinary and Pharmaceutical Sciences, Brno, Czech Republic, from 1989 till the end of October 1998. Evaluating our sample of patients we studied the incidence of osteochondrosis in typically affected joints (shoulder, elbow, hock and stifle) and the dependence of the OC symptoms on the breed and sex. The breed predisposition was tested using the c^2-test. For the statistical analysis we used Stat plus program (1.10 version) (Matoušková et al. 1992). Our main attention was paid to the mean age of patients at the time of diagnosing the symptoms of osteochondrosis in order to warn of the late OC diagnosis by our practitioners. Our patients were divided into four age categories (I-IV) for practical reasons. The OC diagnosis at 4-8 months of age (the onset of the first clinical signs of osteochondrosis = category I) was considered as early; the diagnosis at 8-10 months of age was considered regular (the mean age for the OC diagnosis is 7-9.5 months = category II) (Smith and Stowater 1975). Patients in which the OC was diagnosed at 10-12 months of age (moderately late diagnosis) were classified as category III and those ones older than 12 months at the time of the OC diagnosis were classified as category IV (late diagnosis).

Diagnostic procedures in the OC patients included evaluating the signalment, history and complete orthopedic examination. The suspected diagnosis was then confirmed by survey or contrast radiographic examination of the affected joint. Considering the possibility of bilateral affections, survey radiography of contralateral clinically asymptomatic joint was routinely performed, as well. For radiographic examination of the shoulder joint we used mediolateral views. The elbow joint was radiographed using mediolateral views with the joint in neutral or flexed position, and craniocaudal or oblique anterio-posterior projections. The radiographic diagnosis of the OC in the stifle joint was based on views in craniocaudal and mediolateral projections. The hock joint was examined using mediolateral and craniocaudal projections and in some indicated cases oblique craniomedial-caudolateral, oblique craniolateral-caudomedial and flexed dorsoplantar projections.

Searching for necessary data we used clinical records on outdoor and hospitalised patients.

Results

A total of 112 dogs showing symptoms of the joint osteochondrosis were diagnosed and operated on out of 38 126 dogs treated in our clinic from 1989 till the end of October 1998. This number represents 0.3% out of the total number of surgical patients. There were differences in the OC incidence in individual joints. The shoulder joint was affected in 106 cases (21 bilateral lesions) in 85 dogs (i.e., 75.9% of dogs with osteochondrosis); the stifle joint in 21 cases (3 bilateral ones) in 18 patients (i.e., 16.1%); the hock joint in 6 cases (one bilateral affection) in 5 patients (i.e., 4.4%) and the elbow joint in 4 dogs (i.e., 3.6%). Bilateral affections of the shoulder, hock and stifle joints were diagnosed in 24.7%, 20.0% and 16.7% of dogs, respectively. In our sample the patients suffering the OC of the medial humeral condyle were not affected bilaterally. All lesions of osteochondrosis in the shoulder joint covered the caudomedial surface

of the humeral head and the lesions in the elbow joint affected the medial humeral condyle. The OC lesions of the stifle joint were localised on the lateral femoral condyle in 15 cases and on the medial condyle in 3 cases. Lesions of the hock joint affected in 4 cases the medial trochlea of the talus and in one case the medial surface of the talus adjacent to the medial malleolus.

Table 1 shows the frequency of occurrence of individual dog breeds in our sample of patients suffering from osteochondrosis. Considering the total number of individual dog breeds in our

Table 1
Incidence of osteochondrosis in individual breeds in our collection of patients

Breed	Number of individuals of the breed affected with the OC (n = 112)	Number of cases of the OC (including bilateral affections) (n = 137)	Total number of individuals of thebreed in the collection of patients of our clinic (n = 38 126)
Boxer	16	20	932
Rottweiler	15	19	343
German Shepherd	12	14	3 706
Retriever	10	13	214
Great Dane	9	11	543
Dalmatian	8	10	361
Irish Wolfhound	4	4	45
Dobermann	4	4	1 123
English Setter	3	5	42
Bouvier des Flandres	3	3	19
Brasilian Fila	3	3	82
Bernese Mountain Dog	2	4	55
Bullterrier	2	2	215
Newfoundland Dog	2	2	136
Leonberger	2	2	77
Berges Belges	2	2	95
Rhodesian Ridgeback	1	2	31
Kuvasz	1	2	56
Bloodhound	1	2	33
Schnauzer	1	1	67
Caucasian Shepherd Dog	1	1	25
Hungarian Greyhound	1	1	1
Malamute	1	1	131
Mastiff	1	1	11
Mastin	1	1	89
Pitbullterrier	1	1	123
Russian Terrier	1	1	28
Cocker Spaniel	1	1	1 576
Mongrel	1	1	4 159
Pointer	1	1	66
Greater Swiss Mountain Dog	1	2	1

patients, the following breeds were most frequently affected by the osteochondrosis: Bouvier des Flandes (15.8%), Irish Wolfhound (8.9%), English Setter (7.1%), Retriever (4.7%), Rottweiler (4.4%), Brazilian Fila (3.7%), Bernese Mountain Dog (3.6%), Dalmatian (2.2%), Boxer (1.7%) and Great Dane (1.7%). The breed predisposition to osteochondrosis was proved statistically by the c^2-test (p < 0.01). Evaluating the breed dependence of the OC in large dog breeds, we did not confirm such a relationship at the 5% level of significance in the German Shepherd and Dobermann. The distribution of osteochondrosis in individual joints is presented in Table 2.

Table 2
Distribution of osteochondrosis in individual breeds

Breed	Dogs with OC of the shoulder (n=85)	Dogs with OC of the elbow (n=4)	Dogs with OC of the stifle (n=18)	Dogs with OC of the tarsus (n=5)
Boxer	16	–	–	–
Rottweiler	12	1	–	2
German Shepherd	8	1	3	–
Retriever	5	2	2	1
Great Dane	7	–	2	–
Dalmatian	7	–	1	–
Irish Wolfhound	4	–	–	–
Dobermann	–	–	4	–
English Setter	3	–	–	–
Bouvier des Flandres	3	–	–	–
Brasilian Fila	–	–	2	1
Bernese Mountain Dog	2	–	–	–
Bullterrier	–	–	2	–
Newfoundland Dog	2	–	–	–
Leonberger	2	–	–	–
Berges Belges	2	–	–	–
Rhodesian Ridgeback	1	–	–	–
Kuvasz	1	–	–	–
Bloodhound	1	–	–	–
Schnauzer	1	–	–	–
Caucasian Shepherd Dog	–	–	–	1
Hungarian Greyhound	1	–	–	–
Malamute	1	–	–	–
Mastiff	–	–	1	–
Mastin	1	–	–	–
Pitbullterrier	1	–	–	–
Russian Terrier	1	–	–	–
Cocker Spaniel	1	–	–	–
Mongrel	1	–	–	–
Pointer	1	–	–	–
Greater Swiss Mountain Dog	–	–	1	–

The ratio of males and females in our sample of patients with osteochondrosis was 74.1% (83 males) to 25.9% (29 females), i.e., 2.9 to 1. Considering individual joints, the sex ratios are as follows: 75.3% (64 males) to 24.7% (21 females), i.e., 3 to 1 in the shoulder joint; 61.1% (11 males) to 38.9% (7 females), i.e., 1.6 to 1 in the stifle joint; 80.0% (4 males) to 20.0% (1 female), i.e., 4 to 1 in the hock. Osteochondrosis in the elbow joint was found only in males (100%).

The age of patients, at which osteochondrosis was diagnosed, varied from 4 to 90 months, with the mean value being 12.5 ± 6.2 months. In patients with osteochondrosis of the shoulder joint the mean age was 11.2 ± 4.0 months with the total span of 5 to 60 months. Dogs suffering osteochondrosis of the elbow, stifle and hock joints were 5 to 10 months (mean = 8.0 ± 1.5 months), 5 to 90 months (mean = 21.4 ± 14.7 months), and 4 to 11 months (mean = 8.1 ± 2.1 months) old, respectively.

Table 3 presents the number of individuals with the OC diagnosis classified into our four age categories (I-IV). Late OC diagnosis (in dogs older than 12 months) concerned 20% of patients with shoulder affections and even 55.6% of patients with stifle joint lesions. There were no late diagnoses in dogs with osteochondrosis in the elbow and hock joints.

Table 3
Number of individual patients with the OC diagnosis classified into four age categories (I-IV)

Joint affected with the OC	Number of dogs with the OC diagnosed at the age of 4-8 months (n=43)	Number of dogs with the OC diagnosed at the age of 9-10 months (n=22)	Number of dogs with the OC diagnosed at the age of 11-12 months (n=20)	Number of dogs with the OC diagnosed at the age over 12 months (n=27)	Total number of dogs (n=112)
Shoulder	31	18	19	17	85
Elbow	2	2	–	–	4
Stifle	8	–	–	10	18
Tarsus	2	2	1	–	5

Discussion

The frequency of occurrence of osteochondrosis in our sample of surgical patients was 0.3%. Rudd et al. (1990) mentioned the occurrence of the OC of the humeral head in 0.22% of male dogs and 0.09% of females. Separating the cases of the OC in the shoulder joint from our sample, we get the occurrence of osteochondrosis of the shoulder in 0.17% of males and 0.06% of females, i.e., results which do not considerably differ from the above mentioned published data.

The highest incidence of osteochondrosis (74%) concerns the shoulder joint (Montgomery et al. 1994), then follows the OC in the elbow, hock and stifle joints. This corresponds to 75.9% of cases of osteochondrosis in the shoulder joint observed in our material. The second most frequently affected joint in our sample, however, was the stifle joint, then the hock joint and the elbow joint was less frequently affected by the OC lesions. The osteochondrosis in the stifle joint, as compared to cases in the shoulder and elbow joints, is considered to occur with very low incidence (Denny and Gibbs 1980; Leighton 1981; Montgomery et al. 1989). Harari (1998) mentions the percentage of the OC occurrence in the stifle joint as 8%. This number was based on a retrospective study of 52 cases of osteochondrosis of femoral condyles diagnosed by radiographic examination or arthrotomy. We found considerably higher incidence of osteochondrosis (16.1%), in all cases confirmed during the surgery of the affected joint, in comparison with published data. The relatively high incidence of osteochondrosis in the stifle joint may be linked to higher

prevalence of the OC in the stifle in dog populations in our breeds. The real number of diagnosed cases may be influenced by geographic factors and popularity of keeping individual breeds. So far the largest collection of 103 patients with the OC affecting femoral condyles diagnosed during 9 years originated in the neighbouring Austria (Arbesser 1974). The hock joint was the third most often affected joint (4.4%) in agreement with published data (Montgomery et al. 1994). Olsson (1993) considers as osteochondrosis in the elbow joint not only the classic dissecting lesion – osteochondrosis dissecans (OCD), but also the fragmented coronoid process (FCP) and the ununited anconeal process (UAP). In this respect the elbow affection by "osteochondrosis" would be three times higher than in the shoulder joint (Olsson 1993). The above-mentioned developmental diseases (UAP, FCP) may have different etiology (Guthrie et al. 1992; Wind 1993). In our study we evaluated only typical lesions of osteochondrosis affecting the medial condyle of the humerus. Their incidence in our collection amounted only to 3.6% and all were accompanied by the FCP in the affected joint. We also excluded such changes in the cartilage of the medial condyle of the humerus as "kissing lesions".

Most frequent bilateral changes were found in the shoulder joint (24.7%). The hock and stifle joints were affected by osteochondrosis in 20.0% and 16.7% of patients, respectively. All the four cases of the OC in the elbow were unilateral. The probability of bilateral affections in the shoulder joint varies greatly from 20 to 85% (Probst and Flo 1987; Robins 1978; Smith and Stowater 1975). The percentage of bilateral affections in the shoulder joint based on our relatively numerous collection of 85 patients with the OC of the humeral head lies near the lower boundary of the above mentioned scale. Regarding the practical aspects, it must be noted that in patients with the bilateral OC in the shoulder there are described only 3-5% clinical symptoms in the contralateral joint (Van Bree 1990). Montgomery et al. (1994) mention in their study of 123 cases of osteochondrosis of the tarsus recorded in the USA and Canada (Veterinary Medical Database) almost 40% incidence of bilateral OC lesions in the hock. Less frequent bilateral affections of the tarsus occurring in our collection may be influenced by paucity of the OC cases of the tarsus. It was probably caused by low popularity of both main breeds predisposed to the OC of the tarsus (Rottweiler, Retriever) in our country. Their relative occurrence in our breeds is also documented by numbers of individuals treated in our clinic (cf. Tab. 1). Comparing the number of bilateral OC findings in the stifle joint (there were 36 cases affected bilaterally, i.e., 63.2%, out of 57 dogs) (Olsson 1993), we get considerably lower percentage. The fact that the elbow joint in our collection of patients was affected exclusively unilaterally must be evaluated with caution because the number of patients with the OC of the medial humeral condyle was low. Another reason for this may be the fact that we considered only typical OC lesions on the medial humeral condyle. In general, 20 to 50% of bilateral changes in the elbow (Boudrieau et al. 1983; Olsson 1983; Probst et al. 1989) are cited.

Following breeds from our dog populations were found to be at risk with regard to the incidence of osteochondrosis: Bouvier des Flandres (15.8%), Irish Wolfhound (8.9%), English Setter (7.1%), Retriever (4.7%), Rottweiler (4.4%), Brazilian Fila (3.7%), Bernese Mountain Dog (3.6%), Dalmatian (2.2%), Boxer (1.7%) and Great Dane (1.7%). There are such breeds as Retriever, Rottweiler, Great Dane, St. Bernard Dog, German Shepherd and Bernese Mountain Dog (Probst and Johnston 1993) cited in literature above all. The rank of breeds may differ in accordance with the joint affected (Harari 1998; Montgomery et al. 1994; Olsson 1993). Other large dog breeds, such as Dobermann, Collie, and Siberian Husky, are relatively at low risk regarding the incidence of osteochondrosis (Rudd et al. 1990). Evaluating the dependence between the OC incidence and large dog breeds, we did not confirm such a relationship at the 5% level of significancy in the Dobermann and German Shepherd. The last mentioned breed, however, is commonly

considered to be predisposed to osteochondrosis (Olsson 1993; Probst and Johnston 1993). Regarding the great number of German Shepherd dogs studied (Tab. 1), we consider this result to be conclusive.

The ratio of males and females affected as found in our study (2.9 : 1) is in agreement with other authorsęresults (Olsson 1993; Probst and Johnston 1993). Rudd et al. (1990) mention that, excepting osteochondrosis in the hock joint, males are more frequently affected than females (the ratio being 2.24:1). From our material of 5 patients with osteochondrosis of the tarsus we see that males were predominantly affected (the ratio of 4:1). This ratio, however, must be evaluated with caution regarding the low number of patients suffering from the OC of the hock joint.

Osteochondrosis manifests itself clinically at the age of 4 to 9 months (Probst and Johnston 1993; Robins 1978). Robins (1978) describes 75% of cases diagnosed at the age of 5 to 10 months. Osteochondrosis in our patients was diagnosed from 4 to 90 months of age (mean = 12.5 ± 6.2 months). The mean age of patients with the OC and thus the number of late diagnosed lesions differed considerably in relation to the disease localisation. As far as the osteochondrosis of the shoulder joint is concerned, the diagnosis was confirmed at the mean age of 11.2 ± 4.0 months within 5 to 60 months. The percentage of 20 % of patients with late diagnosis of the OC of the shoulder (category IV = animals older than 12 months) exceeds the cited value of 17% (Johnston 1998). It may be that the owner, postponing a visit to a veterinary practitioner and examination of the dog, is responsible for this, but there also may be mistakes made by veterinarians not diagnosing the disease or recommending conservative therapy and thus putting the surgical management off. It must be noted in this context that conservative management is not recommended in dogs older than 7 months (Probst and Johnston 1993). We found high mean age in patients showing symptoms of lesions on femoral condyles (mean = 21.4 ± 14.7 months). Considerably late diagnosis of the OC of the stifle joint is documented by 55.6% of dogs older than 12 months. Our oldest patient (90 months) was suffering from the OC of the stifle. It is typical for the OC of the stifle that it starts clinically to manifest between 5 to 7 months of age (Harari 1998). There are several reasons for the late OC diagnosis in the stifle such as wrong diagnosis, overlapping symptoms of common orthopedic problems in young dogs of large and giant breeds (panosteitis, hip joint dysplasia), and ignorance of manifestations of the OC in the stifle, or an assumption that the disease is of sporadic incidence in this joint. In any case, the percentage of late diagnosis of the OC in the stifle joint in our small animal practice is alarming. Contrary to the published 36% of dogs older than 1 year at the time of confirming the diagnosis of the OC of the hock (Montgomery et al. 1994), we did not encounter late diagnosis of this disease. It could be influenced by exclusively primary diagnoses of these five patients with the osteochondrosis of the tarsus made in our clinic. Their age varied from 4 to 11 months (mean = 8.1 ± 2.1 months). Three dogs with the osteochondrosis of the medial humeral condyle were presented at their age from 5 to 10 months (mean 8.0 ± 1.5 months) and there was no case of late diagnosis in these patients.

Incidence osteochondrózy u psů a její pozdní diagnostika

V práci byla sledována incidence osteochondrózy u psů z celkového počtu 38 126 pacientů ošetřených na Klinice chirurgie a ortopedie VFU v Brně od roku 1989 do konce října 1998. Diagnostikováno a operováno bylo celkem 112 psů s projevy kloubní osteochondrózy (0,3% pacientů). Distribuce projevů osteochondrózy v jednotlivých kloubech byla následující: ramenní kloub 85 psů (75,9% psů s osteochondrózou), kolenní 18 psů (16,1%), hlezenní 5 psů (4,4%) a loketní 4 psi (3,6%). Bilaterální postižení jsme v případě ramenního kloubu zaznamenali u 24,7 % pacientů, tarzálního u 20,0 % a kolenního u 16,7 % pacientů. Zvláštní pozornost byla věnována stáří, ve kterém se

onemocnění v praxi diagnostikuje. Zjistili jsme alarmující procento pozdní diagnostiky onemocnění v případě postižení kolenního kloubu (55,6% pacientů starších 12 měsíců) a rovněž vyšší podíl pozdní diagnostiky osteochondrózy ramene (20,0 % psů starších jednoho roku). Nejvyšší stáří, v němž jsme osteochondrózu diagnostikovali bylo 90 měsíců. Nejčastěji postiženými plemeny v našem souboru byly: flanderský buvier (15,8 %), irský vlkodav (8,9 %), anglický setr (7,1 %), retrívr (4,7 %), rotvajler (4,4 %), brazilská fila (3,7 %), bernský salašnický pes (3,6 %), dalmatin (2,2 %), boxer (1,7 %) a německá doga (1,7 %). Predispozici těchto plemen k osteochondróze jsme statisticky prokázali c^2-testem (p < 0,01). Na rozdíl od tradovaných literárních údajů jsme na 5% hladině významnosti nepotvrdili predispozici k onemocnění u německého ovčáka.

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