

RADIOLOGICAL ASSESSMENT OF VERTEBRAL COLUMN AND SPINAL CORD LESIONS IN DOGS: 266 Cases (1993-2002)

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Köpeklerde Columna Vertebralis Ve Medulla Spinalis Lezyonlarının Radyolojik Değerlendirmesi: 266 Olgu (1993-2002)

Özet: Bu çalışma ile, köpeklerde, columna vertebralis ve medulla spinalis’de şekillenen lezyonların, ırk ve yaş dağılımları ile lokalize olduğu bölgelerin belirlenmesi amaçlandı. Bu amaçla, columna vertebralis ve medulla spinalis lezyonu saptanan toplam 266 köpeğin radyografileri değerlendirildi. Olguların, 95’inde intervertebral disk hastalığı, 83’ünde spondilosis deformans, 70’inde kırık, 10’unda luksasyon, 7’sinde subluksasyon, 3’ünde diskospondilitis, 1’inde spondilitis ve 1’inde de ateşli silah mermisine bağlı yaralanma saptandı (bu olguların 3’ünde intervertebral disk hastalığı ve spondilosis deformans, 1’inde de kırık ve luksasyon birlikte gözlemlendi). İntervertebral disk hastalığı bulunan olguların yaş ortalaması 5.7, spondilosis deformans bulunan olguların yaş ortalaması da 8.5 olarak belirlendi. Çalışmada toplam 238 aralıkta intervertebral disk hastalığı tanısı kondu ve bunların, % 1.7’si C₂-C₇, %9.7’si T₁-T₉, % 42.4’ü T₁₀-L₁, % 16.8’i L₁-L₄ ve % 29.4’ünün de L₄-L₇ arasında lokalize olduğu gözlemlendi.

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Spondilosis deformans lezyonlarının % 31.2 oranında torakal, % 68.8 oranında da lumbal vertebralar arasında şekillendiği saptandı. Torakal bölgedeki lezyonların % 71'inin T₉-T₁₃, % 29'unun da diğer torakal vertebralar arasında, lumbal bölgede ise % 49.5' inin L₁-L₄, % 29'unun L₅-L₇ ve % 21.5'inin de L₇-S₁ arasında şekillendiği belirlendi. Kırık, luksasyon ve subluksasyonların sıklıkla torako-lumbal bölge ve lumbo-sakral bölgeye yakın olduğu görüldü. Diskospondilitis olgularının birinde lezyonun L₄-L₅, diğer birinde T₆-T₇, T₇-T₈ ve T₈-T₉, diğerinde ise T₁₁-T₁₂, T₁₂-T₁₃, T₁₃-L₁ ve L₁-L₂ intervertebral aralıklarda şekillendiği saptandı.

Columna vertebralis ve medulla spinalis'de şekillenen lezyonların, ırk ve yaş dağılımları ile çoğu kez lokalize olduğu bölgelerin belirlendiği bu çalışmanın, nörolojik hastalıkların tanısına ışık tutabileceği kanısındayız.

Anahtar kelimeler: Columna vertebralis lezyonları, Medulla spinalis lezyonları, Radyolojik değerlendirme, Köpek.

Summary: The aim of this study has been to determine the breed and age distribution and location of lesions occurring in the vertebral column and spinal cord in dogs. To achieve this, radiographies belonging to a total of 266 dogs with vertebral column and spinal cord lesions were evaluated. Of these cases, intervertebral disc disease was observed in 95, spondylosis deformans in 83, fracture in 70, luxation in 10, subluxation in 7, discospondylitis in 3, spondylitis in 1 and firearm injury in 1 case (in 3 of these cases, intervertebral disc disease and spondylosis deformans was seen together and in 1 case fracture and luxation had occurred together). The mean age was 5.7 for cases with intervertebral disc disease and 8.5 for cases with spondylosis deformans. In this study, intervertebral disc disease was diagnosed in a total of 238 intervertebral spaces and their locations were distributed as; 1.7% in C₂-C₇, 9.7% in T₁-T₉, 42.4% in T₁₀-L₁, 16.8% in L₁-

L₄ and 29.4% in L₄-L₇. Spondylosis deformans lesions were seen to occur at a rate of 31.2% in the thoracal vertebrae and 68.8% in the lumbar vertebrae. Of the lesions in the thoracal region; 71% were in T₉-T₁₃ and 29% were in the remaining thoracal vertebrae. In the lumbar region; 49.5% had occurred in L₁-L₄, 29% in L₅-L₇ and 21.5% in L₇-S₁. Fractures, luxations and subluxations were seen to occur frequently in the thoraco-lumbar region and near the lumbo-sacral region. In cases with discospondylitis, the lesion was seen to occur in the intervertebral spaces of L₄-L₅ in one case, T₆-T₇, T₇-T₈ and T₈-T₉ in another case and T₁₁-T₁₂, T₁₂-T₁₃, T₁₃-L₁ and L₁-L₂ in the remaining case.

Our opinion is that this study, in which breed and age distribution of dogs and frequent location of lesions occurring in the vertebral column and spinal cord have been determined, can shed light upon diagnosis of neurological diseases.

Key words: Vertebral column lesions, Spinal cord lesions, Radiological assessment, Dog.

Introduction

In dogs, the vertebral column consists of 7 cervical, 13 thoracal, 7 lumbar, 3 sacral and a varying number of coccygeal vertebrae. Vertebrae are connected to each other via articular processes, intervertebral discs and numerous ligaments (10).

Intervertebral discs are located between the corpus of the vertebrae and as well as acting as shock absorbers for the vertebral column, they also act as amphiarthroidal joints. There are 26 intervertebral discs in dogs, with the exception of the first and second cervical vertebrae and the sacral vertebrae (2, 10).

Each intervertebral disc consists of 3 separate anatomical structures; the annulus fibrosus, nucleus pulposus and cartilaginous growth plates (2). Conditions of protrusion, extrusion or calcification in the intervertebral discs are referred to as “Intervertebral disc disease”. Hansen has classified conditions of protrusion and extrusion as Hansen type I and

Hansen type II. Hansen type I expresses intervertebral disc disease in the form of an extrusion and is usually encountered in chondrodystrophic dog breeds. Hansen type II expresses intervertebral disc disease in the form of a protrusion and this type of disease is usually observed in non-chondrodystrophic dog breeds (2, 6, 14, 16). While the cause of the disease is not known for certain, genetic factors are usually kept responsible. Lumbar length, muscle power and bodyweight are also predisposing factors (18). Direct radiography is usually insufficient for diagnosis. For definitive diagnosis, myelography, computerized tomography and magnetic resonance techniques are used (8, 16, 19, 24).

Discospondylitis is an infectious lesion affecting the intervertebral disc, the growth plates of the adjacent vertebrae and corpus vertebrae. In cases where this infection is limited only to the corpus vertebrae it is known as “spondylitis (vertebral osteomyelitis)”, if it only affects the intervertebral discs this is known as “discitis” (7, 20, 22). The cause of discospondylitis is usually bacteria spread via haematogenous route or rarely fungal factors. This disease is generally seen in middle-aged large breed dogs. It is observed twice as frequently in males, compared to females. It is encountered particularly in German Shepherds and Great Danes (1, 4, 5, 9, 11). Regions where discospondylitis initially occurs are; C₆₋₇, T₅₋₆, T_{13-L₁} and L_{7-S₁} intervertebral spaces (5, 9, 12). In most cases, the disease can be diagnosed using direct radiography. In the initial stage of the lesion, narrowing of the intervertebral space, osteolytic changes in the vertebral growth plates and osteophytic proliferations at the sides of the lesion are detected. Definitive diagnosis is made with cultural and serological testing of the urine and blood (13, 17, 21).

Spondylosis deformans is a degenerative disease encountered coincidentally during routine radiography and post-mortem examinations and is characterized by bone proliferations on the lateral and ventral aspects of the corpus vertebrae. This disease occurs

generally in the caudal thoracic and caudal lumbar regions and particularly in the lumbosacral space. The disease can be easily diagnosed with direct radiography (10, 15).

Fractures, luxations and subluxations of the vertebral column occur as a result of severe traumas, among which traffic accidents occupy first place, and fire-arm injuries. Thoracic vertebrae fractures usually occur in the caudal thoracic region, while lumbar vertebrae fractures occur in regions near the thorax and pelvis. Diagnosis of vertebral fractures can be made with direct radiography in latero-lateral (LL) and ventro-dorsal (VD) positions under general anaesthesia (3, 23).

Aim of this study, radiologically determine the diagnose, localization, distribution of the neurological diseases, which are encountered very often in dogs.

Materials and Methods

The material of the study consisted of a total of 266 dogs of different breed, age and gender, brought to the Clinic of Surgery, Faculty of Veterinary Medicine, Istanbul University between 1993-2002 and radiologically diagnosed with vertebral column and spinal cord lesions.

Following routine clinical and neurological examination of the dogs, which had been brought with neurological complaints, direct radiographs were taken in the standard LL and VD positions. After direct radiography, in order to pinpoint the lesion, myelography was carried out in some cases from cisterna magna under general anaesthesia. For sedation during myelography, Xylazine (Rompun-Bayer-Turkey) was used at a dose of 2 mg/kg i.m. The atlanto-occipital area was shaved and disinfected during sedation. To achieve general anaesthesia, Ketamine (Ketalar-Eczacıbaşı-Turkey) was administered to cases at a dose of either 20 mg/kg i.m. or 10 mg/kg i.v. As the contrast medium in myelography, preparations with the active ingredient Iohexol (Omnipaque-

Nycomed-Ireland) or Iopamidol (Iopamiro 300-Bracco-Italy) were used at a dose of 0.3 ml/kg. For radiography, 300 mAs and 100 kV Toshiba (Japan) and 800 mAs and 150 kV Argostat (Ireland) X-ray machines were used.

Results

In this study, radiological evaluation of lesions in the vertebral column and spinal cord was made in a total of 266 dogs brought to the Clinic of Surgery, Faculty of Veterinary Medicine, Istanbul University.

Breed distributions of the cases in the study were; 112 mixed breed, 35 Terrier, 23 Pekingese, 14 German Shepherd, 13 Anatolian Sheepdog, 9 Cocker Spaniel, 9 Boxer, 8 Dachshund, 7 Rottweiler, 7 Poodle, 5 Collie, 4 Doberman Pinscher, 4 Setter, 4 Bulldog, 3 Tibet Spaniel, 2 Siberian Husky, 2 Pinscher, 1 Great Dane, 1 Weimeraner, 1 St. Bernard, 1 Pointer and 1 Chow chow.

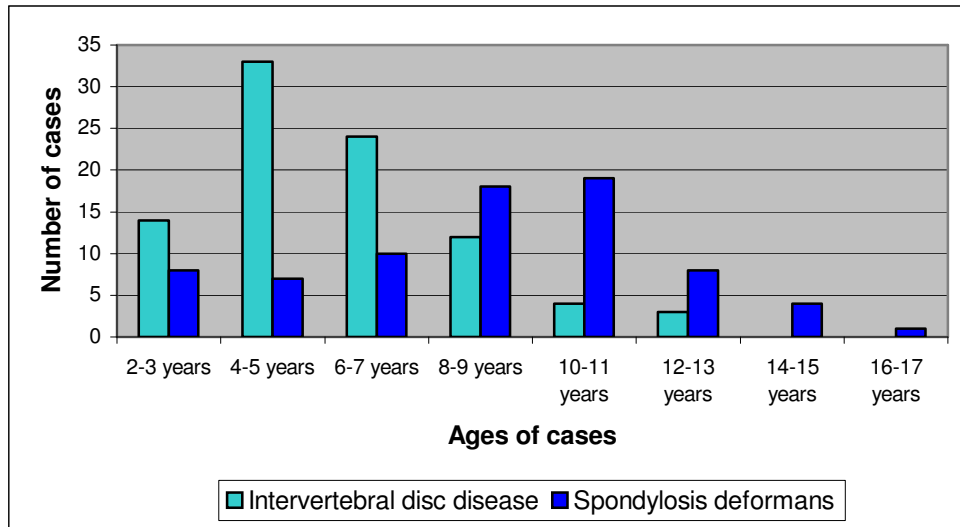
Of the cases, 152 were male and 114 were female. Ages varied between 1 month and 15 years.

Distribution of lesions was as follows: intervertebral disc disease in 95 cases (Figure 1-2), spondylosis deformans in 83 (Figure 3), discospondylitis in 3 (Figure 4), fracture in 70 (Figure 5), luxation in 10 (Figure 6), subluxation in 7, spondylitis in 1 and firearm injury in 1. Intervertebral disc disease and spondylosis deformans were seen together in 3 cases and fracture and luxation were seen together in 1 case.

Distribution of the intervertebral disc disease according to breed was; 27 Terrier, 23 mixed breed, 18 Pekingese, 8 Dachshund, 7 Cocker Spaniel, 3 Anatolian Sheepdog, 3 Poodle, 3 Tibet Spaniel, 1 Setter, 1 Bulldog and 1 Pinscher.

Ages of the cases with intervertebral disc disease varied between 2 and 13 years. The ages of 5 cases were unknown. Mean ages of cases with this lesion was found to be 5.7.

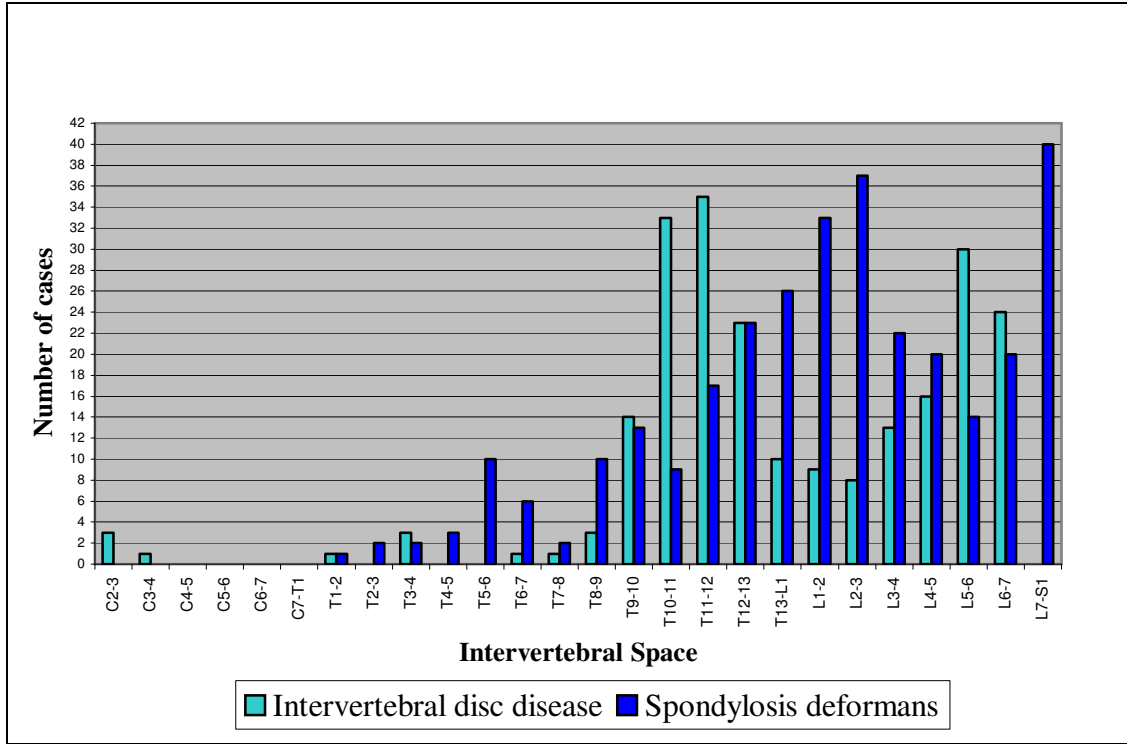
Cases with spondylosis deformans were distributed as; 29 mixed breed, 11 German Shepherd, 8 Anatolian Sheepdog, 8 Boxer, 6 Terrier, 5 Pekingese, 5 Rottweiler, 2 Collie, 2 Doberman Pinscher, 2 Setter, 1 Cocker Spaniel, 1 St. Bernard, 1 Poodle, 1 Pointer and 1 Chow chow. Ages of the cases changed between 1.5 and 16 years. The ages of 8 cases were unknown. Mean age of cases with spondylosis deformans was found to be 8.5. Age distribution of cases with intervertebral disc disease and spondylosis deformans is shown in Graphic 1.



Graphic 1. Distribution of cases according to their age.

Grafik 1. Olguların yaşlarına göre dağılımı.

Location of intervertebral disc disease and spondylosis deformans lesions in regions are shown in Graphic 2. It can be seen that intervertebral disc disease is seen particularly in the thoracic region and spondylosis deformans in the lumbar region.



Graphic 2. Distribution of cases according to their location.

Grafik 2. Olguların lokalize oldukları bölgelere göre dağılımı.

Fracture, luxation and subluxation cases were seen to occur mostly as a result of traffic accidents or falls from a height. The location of these lesions were found as; cervical in 5 cases, thoracal in 37 cases and lumbar in 45 cases.

Diagnosis of 2 of the discospondylitis cases was made by radiography and one case was diagnosed with radiography as well as microbiological examination. On radiographs, narrowing in the intervertebral spaces and osteophytic changes in the vertebral growth plates were observed. Diagnosis of the spondylitis case was made by radiography and histopathological examination of bone biopsy.

Discussion

Radiological assessment of 266 cases with vertebral column and spinal cord lesions revealed; intervertebral disc disease in 35.2% of the cases, spondylosis deformans in 30.7%, fracture in 25.9%, luxation in 3.7%, subluxation in 2.6%, discospondylitis in 1.1%, spondylitis in 0.4% and fire-arm injury in 0.4%.

While intervertebral disc disease is usually encountered in chondrodystrophic and semi-chondrodystrophic dogs, it can also be seen in non-chondrodystrophic dogs and be classified as Hansen type I and Hansen type II. It has been reported that Dachshunds have a predisposition to this disease and that they form 45-70% of all cases (**2, 6, 14**) As a result of this radiological evaluation, the disease was found to occur at a rate of 70.5% in chondrodystrophic and semi-chondrodystrophic dogs (Dachshund, Pekingese, Terrier, Cocker spaniel, Poodle, Tibet spaniel and Pinscher) and at a rate of 29.5% in non-chondrodystrophic dogs (mixed breed, Anatolian Sheepdog, Setter).

In chondrodystrophic and semi-chondrodystrophic dogs, intervertebral disc disease has been reported to originate from the chondroid degeneration of the discs and that this degeneration occurred at 1 year of age or earlier; while in non-chondrodystrophic dogs this lesion occurred at 7 years of age and older (**2, 6**). When the ages in this study are examined, the fact that the disease was seen particularly between the ages of 2-7 supports this idea.

In this study, intervertebral disc disease was diagnosed in a total of 238 intervertebral spaces and the location of the lesions were determined as; 1.7% in C₂-C₇, 9.7% in T₁-T₉, 42.4% in T₁₀-L₁, 16.8% in L₁-L₄ and 29.4% in L₄-L₇. These findings support the reports stating that, due to the caudal thoracic and caudal lumbar regions being the most mobile regions of the vertebral column, discs are under much more pressure at these points and disc degeneration is seen more often (**6, 14, 19, 24**).

It has been reported that, spondylosis deformans lesions occur particularly in Boxer and that this condition is usually seen in older animals (7). In this radiological evaluation, 84.3% of the lesions were seen to form in large breed dogs and 15.7% in small breeds such as Pekingese, Poodle, Terrier and Cocker spaniel. When ages of the cases were examined, the lesions were usually identified between the ages of 7-11 years. However, spondylosis deformans lesions were seen in 3 Boxers aged 3 and 4, in 2 Rottweilers aged 2 and 2.5, in an Anatolian Sheepdog aged 2.5, in a German Shepherd aged 2 and in a Pekingese aged 3. When it is considered that spondylosis deformans coincidentally appears on radiographs and rarely causes neurological findings, it can be suggested that these lesions may start forming at an earlier age.

In scientific literature (10, 15), regions for spondylosis deformans to be frequently seen are reported as caudal thoracal, caudal lumbar and lumbo-sacral spaces. In this study, lesions were found to occur at a rate of 31.2% between thoracal vertebrae and 68.8% between lumbar vertebrae. While spondylosis deformans in the thoracal region was seen to occur at a proportion of 71% in T₉-T₁₃ and 29% in the remaining thoracal vertebrae, in the lumbar region this proportion was found to be 49.5% in L₁-L₄, 29% in L₅-L₄ and 21.5% in L₇-S₁. Contrary to literary data, in this study spondylosis deformans was also seen frequently in the cranial lumbar region and it was concluded that these lesions may be encountered in any region of the vertebral column.

In the radiological evaluation of the discospondylitis cases in this study, narrowing of the intervertebral spaces and osteolytic changes in the vertebral growth plates were identified, consistent with literary sources (5, 9, 12, 17). While in literature, location of the lesion is usually reported as intervertebral spaces C₆₋₇, T₅₋₆, T₁₃-L₁ and L₇-S₁ (5, 9, 12), in this study the lesion was found to be in L₄-L₅ in one case, in T₆-T₇, T₇-T₈ and T₈-T₉ in another case and in T₁₁-T₁₂, T₁₂-T₁₃, T₁₃-L₁ and L₁-L₂ in one other case.

Fractures, luxations and subluxations in the vertebral column occur as a result of trauma to the region. Fractures of the thoracal vertebrae usually occur in the caudal thoracal region and fractures of the lumbar vertebrae occur in the thorax or near the pelvis (3, 24). Similarly in this study, the fact that fractures, luxations and subluxations had frequently occurred in the thoraco-lumbar region and close to the lumbo-sacral region supports this view. The reason for lesions to be frequently seen in these regions can be because these are the most mobile regions in the vertebral column and that animals cannot always save their backends during traffic accidents.

As a result, our opinion is that this study, in which breed and age distribution of dogs and frequent location of lesions occurring in the vertebral column and spinal cord have been determined, can shed light upon diagnosis of neurological diseases. It must not be forgotten that in such patients, diagnosis cannot be made only by radiography, but that advanced imaging techniques may also be used.

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Figure 1. Intervertebral disc protrusion between L₄ and L₅ in a 9-year-old Terrier (white arrow).

Şekil 1. 9 yaşındaki bir Terrier’de L₄-L₅ arasında intervertebral disk protrüzyonu (beyaz ok).



A



B

Figure 2. Intervertebral disc calcification between C₂ and C₃ in a 12-year-old Terrier (white arrows); **(A)** Ventro-dorsal view, **(B)** Latero-lateral view.

Şekil 2. 12 yaşındaki bir Terrier’de C₂-C₃ arasında intervertebral disk kalsifikasyonu (beyaz oklar); (A) Ventro-dorsal görüntü, (B) Latero-lateral görüntü.



Figure 3. Multiple spondylosis deformans in a 10-year-old Kangal (Anatolian shepherd).

Şekil 3. 10 yaşındaki bir Kangal’da multiple spondilosis deformans.

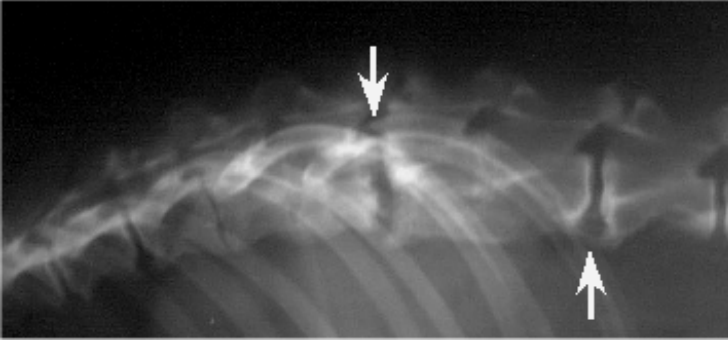


Figure 4. Discospondylitis and spondylosis deformans in a 10-year-old Irish setter (white arrows).

Şekil 4. 10 yaşındaki bir Irish setter’de diskospondilitis ve spondilosis deformans (beyaz oklar).



Figure 5. T₁₃ fracture in a 2-year-old mixed breed dog.

Şekil 5. 2 yaşındaki melez bir köpekte T₁₃ kırığı.



Figure 6. Luxation between T₁₂ and T₁₃ in a 6-year-old mixed breed dog.

Şekil 6. 6 yaşındaki bir melez köpekte T₁₂- T₁₃ arasında luksasyon.