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Case Report

Spina bifida in three dogs

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Abstract

Spina bifida is a congenital bone malformation with incomplete closure of the dorsal vertebral arches that may occur in association with protrusion of the meninges or spinal cord and meninges due to the vertebral defect. The aim of the present paper is to describe the occurrence of spina bifida in two mongrel and an English Cocker Spaniel dogs. In first and third cases spina bifida were diagnosticated by clinical examination and myelography. First and second dogs were macerated and examined macroscopically. In the first case, we observed that besides spina bifida in the lumbosacral vertebrae and meningomyelocele, there were other congenital alterations such as thoracic block vertebrae and incomplete closure of some vertebral bodies. The second dog also presented open spina bifida in the sacrocaudal region, and a closed spina bifida in both the caudal cervical and initial thoracic vertebrae. In the third case, spina bifida in the lumbosacral region was associated with meningomyelocele.

Key words: Spina bifida, congenital malformation, diseases of dogs

Introduction

Spina bifida is a congenital bone malformation of unknown etiology and in which an incomplete closure or fusion of the dorsal vertebral arches occurs (1,4,6, 7,8,12,16,18), with or without protrusion or dysplasia of the spinal cord or its membranes or both (22), so in spina bifida manifesta or cystica, this disorder occurs in association with protrusion of the meninges (meningocele) or spinal cord and meninges (meningomyelocele) (2,12,16,20,21). These meningeal or spinal cord protrusions can adhere to the subcutaneous tissue where the neural ectoderm failed to separate from the other ectodermal structures and may produce a small external visible depression (14,16).

The etiology of spina bifida is not completely determined but can be related to genetic, teratogenic, nutritional and maybe racial factors, because English Bulldogs have higher incidence of spina bifida than any other canine breed (1,8,15,22). Congenital abnormalities of the lower spine and spinal cord are well known in Manx cats (4). Although the embryonic pathogenesis of this disorder has not been totally elucidated (3,8,12), hyperplasia of the cells from the dorsal neural tube that affects fusion of neural tube and vertebral arches or a vascular defect that restricts blood flow to the dorsal region of the vertebral column have been suggested as possible causes (3,5,22). Spina bifida can be induced by exposing pregnant females early in gestation to a variety of chemical substances or environmental changes (22). Spina bifida and meningomyelocele have also been observed in

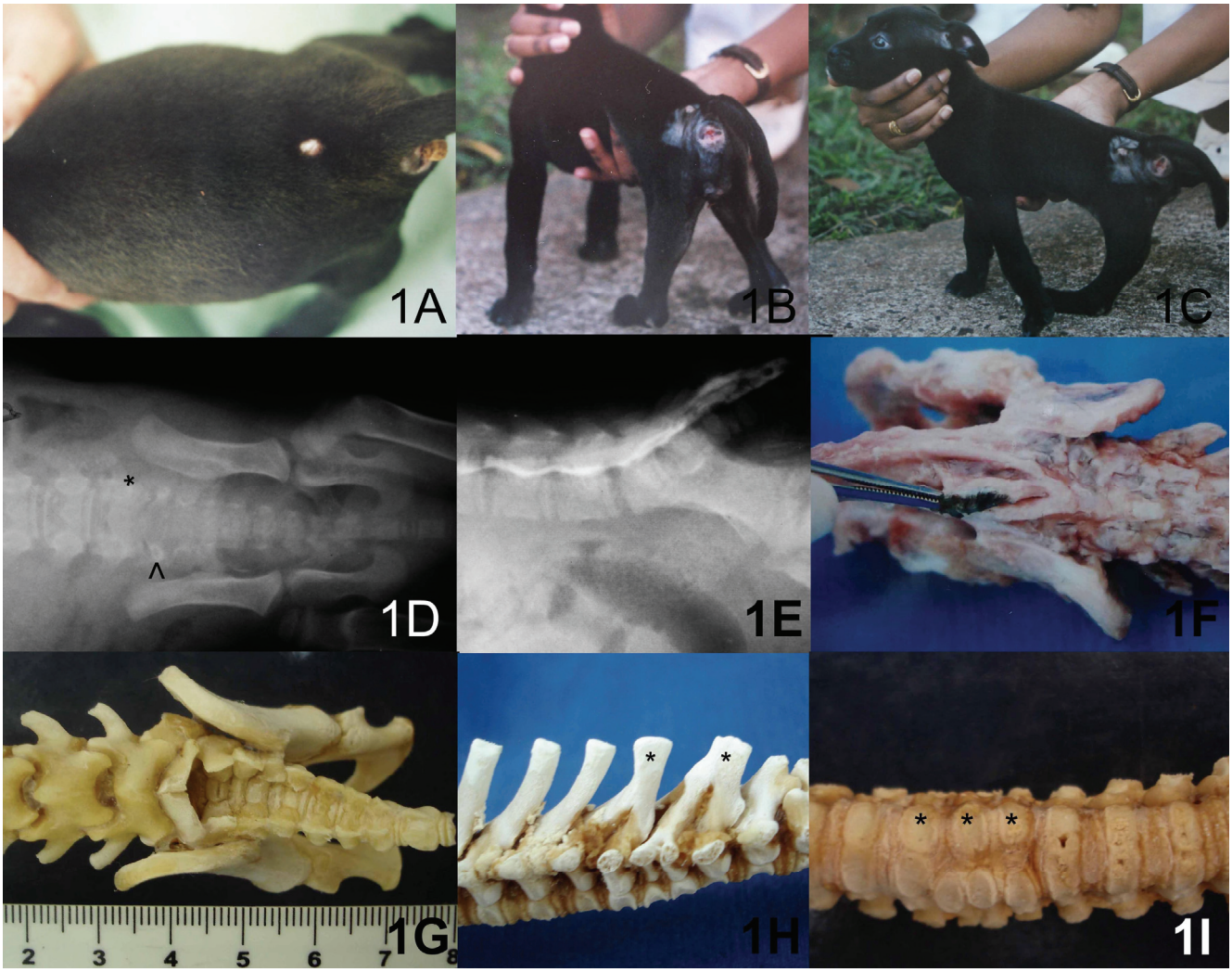

Figure. 1. Case 1. A. Aspect of skin on sacrocaudal region before shaving dog's hair in this region. B and C Contracture in the hind limbs and aspect of the cyst after shaving. Anal sphincter with no muscle tone. D. Ventrodorsal plain radiographs of the vertebral column revealed a small L7 vertebra (*) and defect in the fusion of the dorsal spinous processes of the sacral vertebrae (>). E. Myelography performed through the cyst confirmed the presence of meningocele. F. View of the cyst and dural sac passing through the opening in the sacral and coccigeal vertebrae after parcial dissection. G. Dorsal view of sacrocaudal region and ileum after maceration. Incomplete closure of the dorsal vertebral arches in the sacral and coccigeal vertebrae. H. Lateral view of thoracic vertebrae, after ribs removal. Incomplete separation of the spinal process in thoracic vertebrae T5-T6 and T7-T8 (*). I. Ventral vies of thoracic vertebrae after ribs removal. Incomplete formation of vertebral bodies (*) of thoracic vertebrae T5, T6, T7 and T8.

kittens following methylmercury and ethylenethiourea toxicity studies in pregnant queens (10).

The aim of the present paper is to describe the occurrence of spina bifida and their complications in an English Cocker Spaniel and in two mongrel dogs.

Case report

Case 1: A two-month-old male mongrel dog was examined at the Veterinary Hospital of the Universidade Estadual de Londrina (HV-UEL) due to impaired locomotion. The patient presented fecal and urinary incontinence and a small cyst was found over the sacrocaudal region. The cyst was soft and there was no leaking of cerebrospinal fluid through this cyst (Figure 1A). Clinical evaluation showed the anal sphincter with no muscle tone (figure 1B and 1C), contracture of the knee joint and decreased perineal sensation. Ventrodorsal plain radiographs of the vertebral column revealed a small L7 vertebra and a defective fusion of the dorsal spinous processes of the sacral vertebrae (Figure 1D). A myelography performed through the cyst confirmed the presence of meningocele (figure 1E), but three days later, the animal died with signs of meningitis. Dissection confirmed meningomyelocele and was possible to see communication between the skin and the dural sac (Figure 1F). After maceration, we observed incomplete development of L7 vertebra, which was smaller than other vertebrae, and incomplete closure of the dorsal vertebral arches in the lumbosacral and coccygeal regions (Figure 1G). It was observed incomplete separation of the spinous

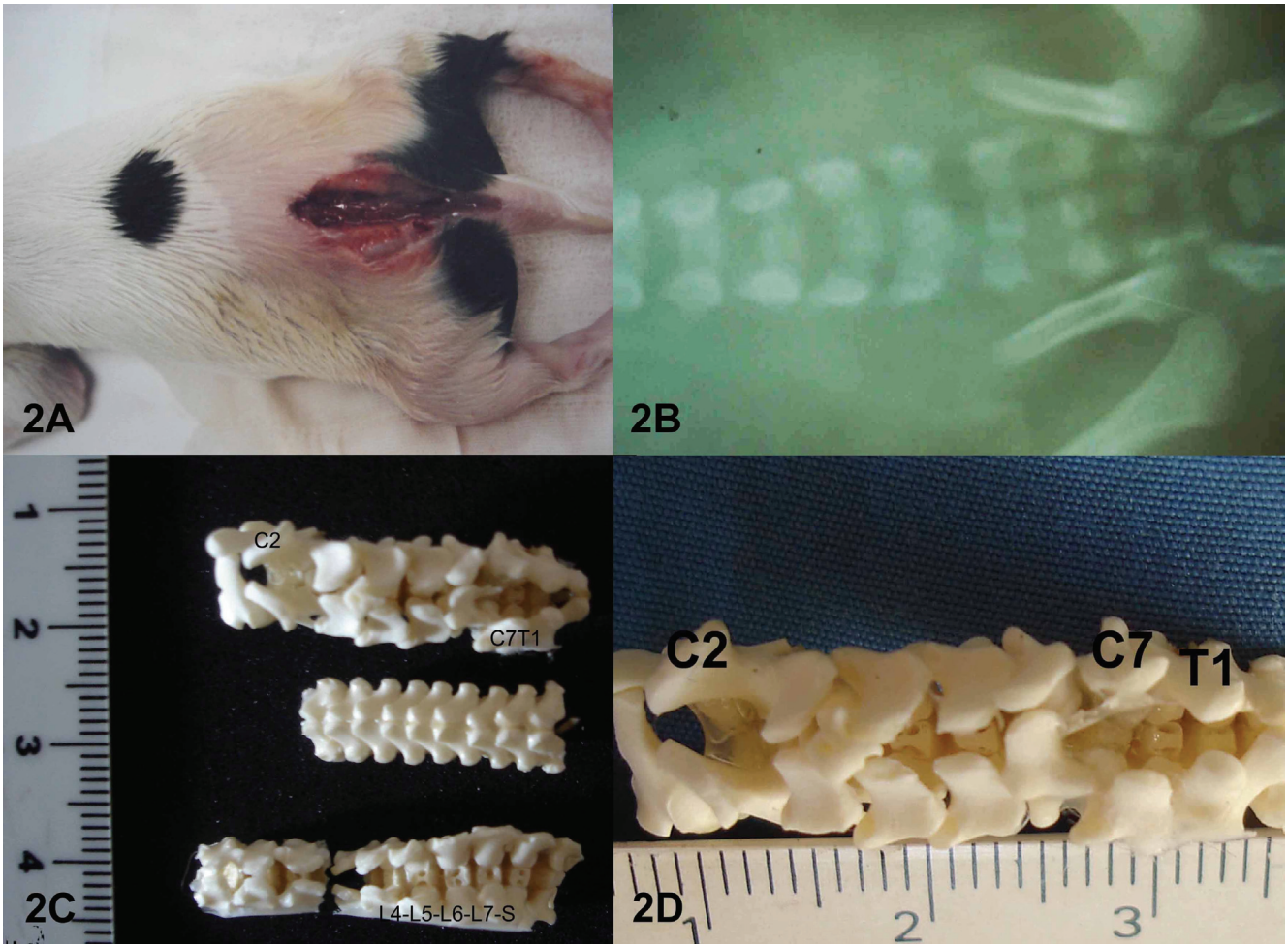

Figure 2. A.Fissure consistent with open spina bifida in the entire lumbosacral region in a still born mongrel dog. B. Ventrodorsal plain radiographs of the vertebral column revealed a defect in the fusion of the dorsal spinous processes of the L4, L5, L6 L7 and sacral vertebrae. C and D. Dorsal view of vertebral column after maceration. Vertebral arches of C2, C7 and T1 were partially open. Opening in the lumbar and sacral vertebrae was confirmed.

process of thoracic vertebrae T5-T6 and T7-T8. (Figure 11H). There are incomplete formation of vertebral bodies of T5-T6 and T7 (Figure 1I). Histopathology of the spinal cord was not done.

Case 2. The second mongrel dog was born at the HV-UEL during a caesarian procedure and died shortly after. A fissure consistent with open spina bifida (figure 2A) was found across the entire lumbosacral region. Ventrodorsal plain radiographs of the vertebral column revealed a defect in the fusion of the dorsal spinous processes of the L4, L5, L6 L7 and sacral vertebrae (Figure 2B). After maceration it was detected that vertebral arches of C2, C7 and T1 were also partially open, and the opening in the lumbar (L4 to L7) and sacral vertebrae were confirmed (Figure 2C and 2D). Histopathology of the spinal cord was not done.

Case 3. A five-month-old male English Cocker Spaniel was evaluated at the HV-UEL showing fecal and urinary incontinence since weaning. The owner complained that the dog sometimes had a bunny-hopping gait. A neurological examination showed mild hind limb ataxia, absent anal and bulbocavernosus reflexes, discomfort on palpation of a dimple in the lumbosacral region (figure 3A) and decreased perineal sensation. Radiography of the lumbosacral column revealed incomplete closure of the caudal portion of the seventh lumbar vertebra (L7) (figure 3B). Mielography was proposed, but the owner did not allow the procedure to be made. After four months, the patient's penis was protruding from the prepuce, with necrosis and bone exposure. As a result, complete penile amputation and scrotal urethrostomy was performed. Forty days after surgery, a cerebrospinal fluid analysis and a myelography were performed. The blood count and the spinal fluid showed no abnormalities, but spina bifida with meningomyelocele (figure 3C and 3D) could be seen in the myelography. Surgery was not done because of the reserved prognosis. To control urinary incontinence pseudoephedrine (Actifedrin; Farmoquímica) was administered with partial success.

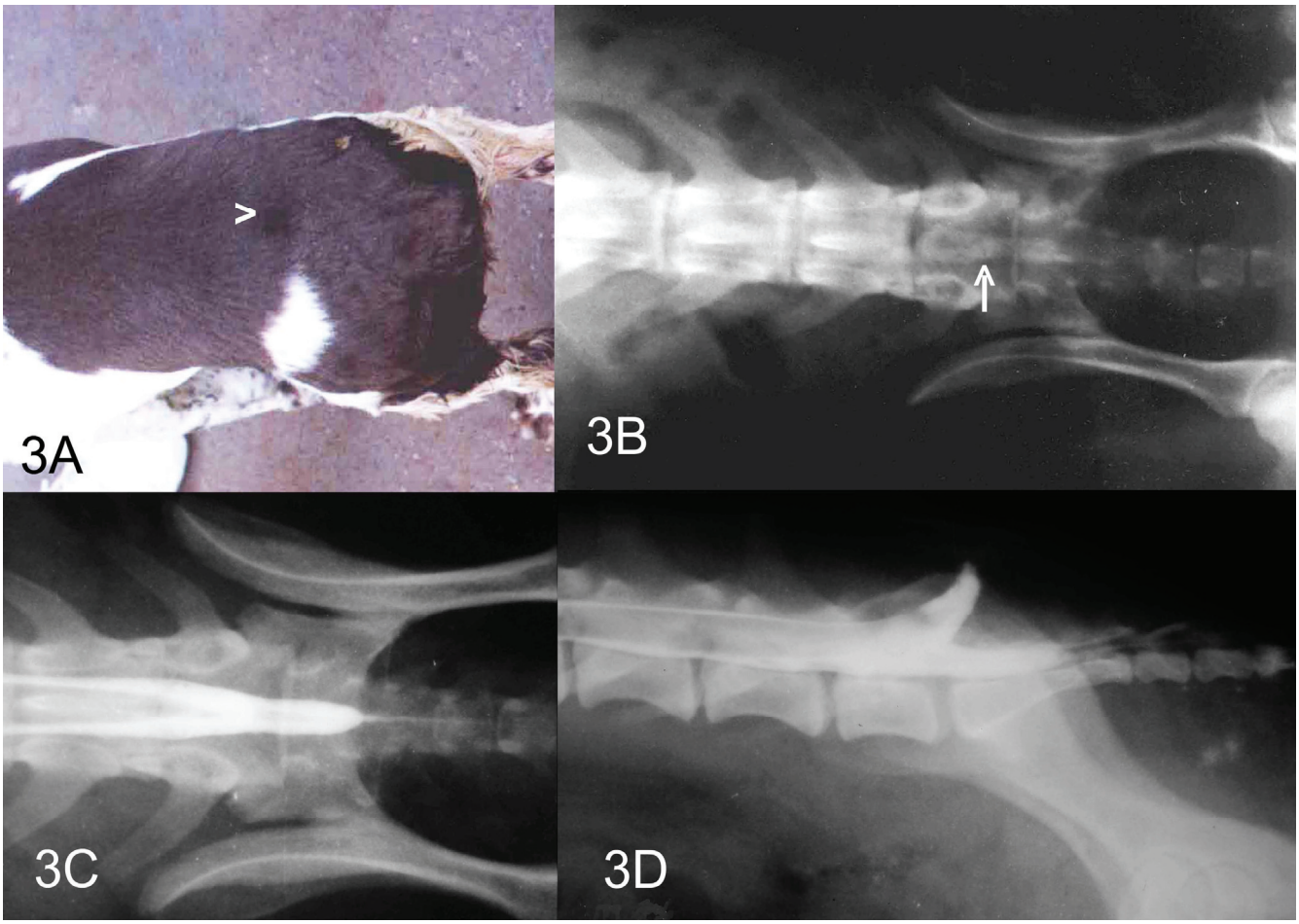

Figure 3. A. Lumbar region of an English Cocker Spaniel with a dimple (>) in the lumbosacral region. B. 3. A. Ventrodorsal plain radiography showing incomplete closure of the caudal portion of the seventh lumbar vertebrae (arrow). C and D. Ventrodorsal and lateral plain myelography of the lumbosacral vertebral column. D. In the lateral view it is observed dorsal spinal cord deviation between L7 and S1 and an enlarged subarachnoid space ventral to the cord.

Discussion

In puppies showing neurological abnormalities compatible with lumbosacral syndrome, the clinician should suspect congenital alterations like lumbosacral stenosis, lumbar vertebral sacralization, hemivertebra, block vertebrae, spina bifida and associated abnormalities such as meningocele, meningomyelocele and spinal dysraphism (1,21). Most spina bifida and associated meningoceles/meningomyeloceles occur in the lumbosacral area and mainly involve nerve roots and spinal nerves of the cauda equina rather than the spinal cord itself (8,10), producing a lumbosacral syndrome as seen in the three dogs described here.

Spina bifida manifesta, cystica, and operta are synonymous subclassifications indicating defective closure of the dorsal vertebral arches and presence of a meningocele, myelocele or meningomyelocele (22), and one of these classifications were identified in the three cases. Spina bifida occulta was diagnosed in the thoracic and cervical vertebrae in case two. Unfortunately, the histologic study of spinal cord was not performed in any of the cases, but in case 1, due to the protrusion of a small sac in the skin through the defect in the vertebral arches of and the myelography performed through this place, a diagnosis of meningocele could be done. In case 3, a diagnosis of spina bifida and meningomyelocele was done due to the myelographic image, where an enlarged subarachnoid space ventral to the cord was seen (12). The defect in the dorsal vertebral arch could be observed during radiographic evaluation.

In these three cases, a diagnosis of spina bifida and possible associated meningocele/meningomyelocele was based on clinical presentation, radiographic findings in all cases and myelography in two. In veterinary medicine, when magnetic resonance imaging is unavailable, myelography is an important procedure to visualize the contour of the spinal cord and vertebral canal (8,11) and it should be done to confirm the diagnosis.

Other anomalies, such as hydrocephalus, multiple thoracic and/or sacral hemivertebrae, may also be present in affected animals (10). During necropsy of the first case, we observed that besides open spina bifida and meningomyelocele, there were other congenital alterations

such as thoracic block vertebrae and incomplete closure of some vertebral bodies. The second dog also presented more than one congenital alteration i.e. open spina bifida in the sacrocaudal region and spina bifida occulta in both the caudal cervical and initial thoracic vertebrae. Spina bifida occulta is limited to the absence of one ore more vertebral arches and the spinal cord may be grossly normal but dysplastic microscopically (14), but unfortunately histopathology was not done in these case.

Surgical correction of spina bifida cystica has been seldom performed in animals (8), however in some cases, the vertebral canal can be surgically closed and the skin sutured (1,8). In case 1, the patent communication between the subarachnoid space and the skin allowed penetration of microorganisms into the cerebrospinal fluid resulting in meningitis before surgery could be done. However, this dog hardly would show any improvement if surgery was performed, because of clinical signs associated like urinary and fecal incontinence and deformations in all four limbs. In some animals with a fistulated meningomyelocele, surgical ligation of the meningocutaneous tract can correct problems associated with loss of CSF and surgical untethering may reverse some of the neurological dysfunction caused by the tethered cord syndrome and prevent further deterioration of the motor, sensory and urinary functions (10).

A partially successful surgical intervention was performed in an English Bulldog with open spina bifida but the patient didn't improve from fecal and urinary incontinence (8,19). In case three, pseudoephedrine, an α-agonist that increases the urethral sphincter tonus (13), was administered to help decrease urinary incontinence and improve the patient's quality of life.

Treatment of open spina bifida and meningomyelocele in humans is performed upon birth to avoid meningitis and additional lesions to the exposed spinal cord, but the neurological signs are permanent both in animals and humans. Nowadays, surgical treatment in humans before birth seems to be the more reasonable choice and many intra-uterine techniques are being developed (17). In human medicine spina bifida with spinal dysraphism is a public health concern and the frequency of this neural tube defect was reduced by the daily intake of folic acid during pregnancy (9).

This condition has been described in many species, however it is a prevalent congenital condition of English Bulldogs, so this report aims to contribute to the incidence of spina bifida in mongrel and a Cocker Spaniel dogs, without inference on the etiology of this abnormality. Because spina bifida is a late diagnosis disorder of uncertain etiology, unfortunately the veterinary medicine is limited to solving or mitigating the clinical signs.

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