

Cervical spondylomyelopathy (wobbler syndrome) in the Boerboel

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ABSTRACT

The Boerboel is a South African large-breed dog resembling a Bullmastiff. The records of Onderstepoort Veterinary Academic Hospital were searched for dogs that had presented, between 1998 and 2003, with symptoms indicative of wobbler syndrome and had undergone survey radiographic and myelographic studies. Ten cases fitted the inclusion criteria. Dogs presented within the first 2 years of life, often with acute onset of symptoms. All presented with pelvic limb and 6 with concomitant thoracic limb ataxia or paresis. Treatment varied and included none (4), prednisolone (2), and dorsal laminectomy (2). Two dogs were euthanased at the time of diagnosis. The breed appears to be affected with a form of spondylomyelopathy that comprises bony malformation of cervical and/or thoracic vertebrae. In 8 dogs, malformations were evident on survey radiographs and were characterised by enlarged, irregular articular facets and associated medial deviation of the pedicles. These changes resulted in axial compression of the spinal cord best seen on ventrodorsal or dorsoventral myelographic studies. Multiple vertebrae were affected in some dogs and lesions were not confined to the caudal area of the cervical spine. Three dogs were alive and without symptoms at follow-up. Four were euthanased as a result of the disease and 1 died as a result of post-operative complications. Two additional dogs presenting with wobbler clinical signs are also described. One had medial deviation of the T5 and T6 caudal pedicles and 1 dog suffered from multiple cervical articular facet synovial cysts.

Key words: boerboel, canine, cervical spondylopathy, CVMM, synovial cysts, wobbler.

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INTRODUCTION

‘Wobbler syndrome’ is a term used to describe dogs presenting with typical symptoms resulting from compression of the cervical spinal cord caused by vertebral malformation, malarticulation, and/or degenerative disease of the surrounding soft tissues. It is most prevalent in Dobermans and Great Danes, but has also been reported in other breeds^{4,19}. Symptoms include thoracic and pelvic limb ataxia and paresis with or without neck pain. Dogs with severe bony deformities of the cervical vertebrae tend to present earlier (usually less than 2 years old) whereas those with more subtle bony or as yet unidentified abnormalities, perhaps leading to instability, generally present in middle age as a result of degenerative disc protrusion. Surgical treatment may be by ventral slot decompression, dorsal laminectomy, or a variety of distraction/fusion techniques^{1–4,13,14,18,21,27}. Despite surgery, the prognosis remains guarded. This paper describes wobbler

syndrome in a series of Boerboels, a popular, large, heavy set South African breed that most closely resembles the Bullmastiff.

MATERIALS AND METHODS

The records of the Department of Companion Animal Clinical Studies at the Onderstepoort Veterinary Academic Hospital (OVAH) were searched for Boerboel dogs that presented with symptoms of cervical cord compression between January 1998 and April 2003. Only cases where the diagnosis was confirmed by diagnostic imaging and with complete records regarding signalment, history, clinical presentation, radiographic findings, and treatment, were included in the study. Referring veterinarians and/or owners were contacted telephonically to ascertain the final outcome or current status if not apparent from the hospital records. In addition, 1 case was included from a private practice where all of the above criteria were available from their records.

Radiographic studies had been carried out in a similar manner for all cases. Sponges were placed under the neck and nose to ensure correct positioning for lateral views. Survey radiographs were

made under general anaesthesia, followed by a myelogram performed at the cerebello-medullary cistern. A dose of approximately 10 ml (range 6–15 ml) of a non-ionic water-soluble contrast medium, Iohexol (Omnipaque 300, Saphar-Med), was injected into the subarachnoid space after collection of cerebrospinal fluid (CSF) for laboratory evaluation. One case had a lumbar myelogram performed. This was followed by ventrodorsal (VD), dorsoventral (DV) and lateral exposures. To allow the contrast medium to gravitate to the area of interest, VD views were preferred for the cranial cervical region (C4 cranially), while DV views were made for caudal cervical and cranial thoracic areas. In some cases oblique (45°) cervical as well as dynamic (traction, flexion and extension) views were made under fluoroscopic guidance.

Magnetic resonance (MR) imaging of the brain and cervical spine was performed with a 1.5 Tesla unit (Siemens Symphony – Ehrlangen, Germany) under deep sedation in 1 dog. For the cervical region, T1 and T2 weighted images were acquired followed by intravenous injection of gadoteric acid contrast agent (Dotarem, 1 mmol/kg) and further acquisition of T1 weighted images. Contiguous sagittal, transverse and dorsal slices were made with a slice thickness of 4 mm in the transverse planes, and 3 mm in the dorsal and sagittal planes.

Diagnostic imaging films were reviewed by all authors and abnormalities recorded for all cases except one, where radiographs were not available and information was obtained from the relevant records.

RESULTS

Ten cases qualified for inclusion in this study. These included 2 atypical cases with lesions that did not fit into the conventional definition of wobbler syndrome. They are described separately. The results are summarised in Table 1.

Typical cases

Five males and 3 females were affected. The oldest dog was presented at 2 years of age. The others were all under 18 months at presentation. Weights varied from

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Table 1: Summary of Boerboels with cervical spondylomyelopathy.

No	Signalment	History	Presentation	Survey radiographs	Myelogram (MR imaging indicated)	Treatment	Outcome
Typical cases (<i>n</i> = 8)							
1	11 months Female 56kg	Intermittent pelvic limb ataxia for 1 month. Stiff neck.	Ataxia and CP deficits – pelvic limbs.	Medial deviation of caudal pedicle of C4 with bulbous facets at C4/5 resulting in 25% narrowing of canal on DV view.	VD = mild, bilateral medial deviation and attenuation of L and R CC over caudal C4 and C4/5 disc space. Lateral = normal.	None	Full recovery
2	12 months Female 43 kg	Acute onset; pelvic limb ataxia; lame L thoracic limb.	Hyperreflexic pelvic limbs. CP deficits L thoracic and pelvic limbs.	Bulbous facets of C4/5.	VD = medial deviation of both CCs at C4/5. Lateral = marked attenuation of dorsal column and mild attenuation of ventral column C4/5.	Dorsal laminectomy C4/5	Full recovery
3	24 months Male 52 kg	'Odd' gait since birth. Episodes of neck pain. Occasionally fell over.	Ataxia thoracic and pelvic limbs. Head carriage low. Reflexes within normal limits.	Bulbous facets from C4–7. Medial deviation of the pedicles which result in caudal coning of canal over these spaces.	VD = mild medial attenuation and deviation of both CCs over C4–7. Lateral = normal.	Prednisolone	Euthanasia 4 months later
4	11 months Male 31 kg	Acute onset, quadriparesis.	Ataxia of thoracic and pelvic limbs. CP deficits all limbs.	Mild medial deviation of pedicles C3–4. Mild bulbous facets C3–5.	VD = mild bilateral medial attenuation of CCs C2–4. Lateral = some attenuation of C2/3 dorsal CC as well as dorsolaterally in oblique views.	None	Euthanasia 2 months later
5	11 months Male 38 kg	Acute onset, intermittent paraparesis/ataxia for 3 weeks.	Hyperreflexic in the pelvic limbs. Proprioceptive deficits R hind limb.	No obvious abnormalities.	VD = medial deviation/obliteration of L & R contrast columns at C2/3. Lateral = some attenuation of C2/3 dorsal CC Oblique = mild R dorsolateral attenuation and deviation of the CC.	None	Euthanasia in hospital
6	9 months Female 47kg	Acute cervical pain. Ventroflexion of neck.	Cervical pain, pelvic limb ataxia. Normal reflexes.	Caudal narrowing of canal C2 giving cone effect, bulbous facets at C2/3 causing marked stenosis of canal.	VD = marked medial deviation of L & R CCs at C2/3. Lateral = normal.	Dorsal laminectomy, partial facetectomy.	Post-operative respiratory failure. Died
7	10 months Male 45 kg	Off balance and scraping nails L thoracic limb. Progressively worse.	Ataxia L thoracic and both pelvic limbs, falling down.	Medial deviation of cranial and caudal pedicles of C5 with bulbous facets on L at C4–6.	VD = marked medial deviation of left CCs at C4–6 disc areas with minor deviation on right side. Lateral = normal.	Prednisolone	Full recovery
8	17 months Male 45 kg	Pelvic limb ataxia, lame L forelimb, progressively worse.	Quadriparetic, non-ambulatory, hyperreflexic in pelvic limbs.	Marked medial deviation of the pedicle of C5. Caudal medial coning of C2, Bulbous facets at C4–6.	VD = medial deviation of L CC C3/4. Medial deviation of both CCs at C5/6. (Lumbar myelogram).	None	Euthanasia in hospital.
Atypical cases (<i>n</i> = 2)							
9	4 months Male 20 kg	Pelvic limb ataxia, difficulty rising.	Pelvic limb ataxia, Pelvic limb CP deficits.	Medial deviation of the pedicles at T5 and T6.	Scalloped appearance C3–7 CC. Circumferential attenuation and obliteration of CC over T5 and T6.	Prednisolone	Full recovery
10	5 years Male 54kg	Progressive ataxia and paresis in thoracic and then pelvic limbs.	Quadriparesis, Hyperreflexic in thoracic and pelvic limbs. Non-ambulatory.	No obvious abnormalities.	No obvious abnormalities. MR imaging: multiple fluid filled structures associated with cervical articulation facets throughout cervical spine. Largest at L C2/3.	Resection of the C2/3 cyst by dorsal laminectomy	Full recovery

CP = conscious proprioception; VD/DV = ventrodorsal/dorsoventral; CC = contrast column; R = right; L = left.

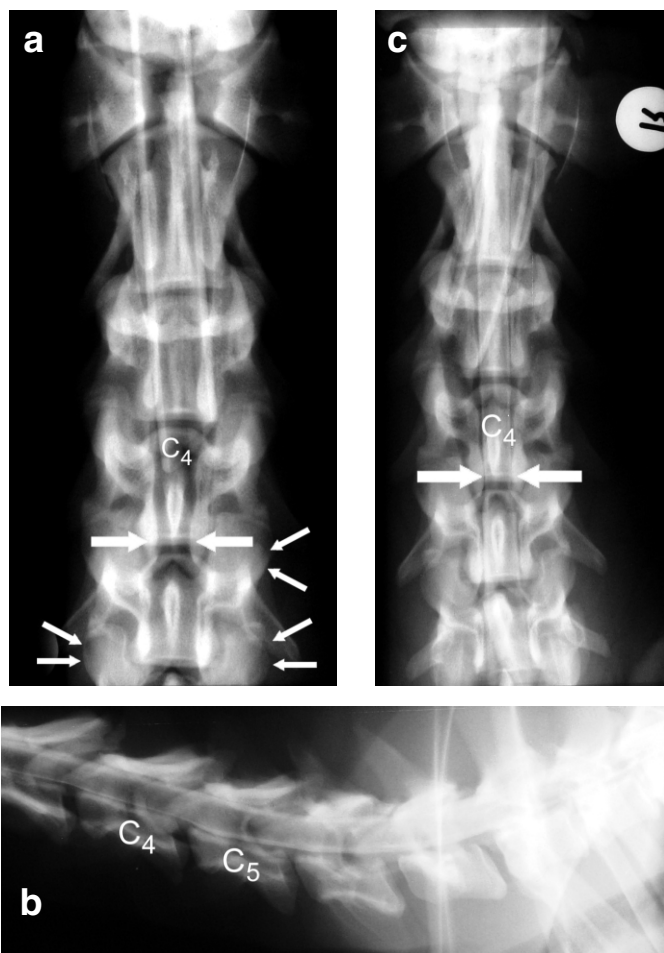


Fig.1: Case 1. a: DV survey view showing medial deviation of the caudal pedicle of C4 (thick arrows) with bulbous facets at C4-6 (thin arrows). Endotracheal tube present; b: lateral myelogram showing no column attenuation or deviation; c: VD myelogram view with medial deviation of both contrast columns over caudal C4 and C4/5 intervertebral space (arrows).



Fig. 2: Case 5. a: Medial deviation of left and right contrast columns at C2/3; b: oblique myelogram showing mild right dorsolateral attenuation and deviation of the contrast column over C2/3.

31–56 kg, which is considered to be normal for the breed. Four dogs showed acute onset of symptoms according to the owners. All presented with evidence of pelvic limb and 5 with concomitant thoracic limb ataxia or paresis. Two dogs showed evidence of cervical pain. Seven of 8 dogs showed bony changes on survey radiographs. The most marked changes were on the VD/DV views, where one or more of the vertebrae showed narrowing of the vertebral canal due to medial deviation of the pedicles that was usually caudal and often associated with flared and bulbous articular facets. The C4/5 region was affected most often (Fig. 1a). Lateral views showed bulbous articular facets in most dogs, although changes were considered mild in some. The facet changes could be seen at a single or multiple vertebral junctions. Their location ranged from C2/3 to C6/7 and they were uni- or bilateral.

Myelographic studies usually showed no (Fig. 1b) or mild changes on lateral views. The VD/DV views reflected the changes seen on survey films with medial

deviation and attenuation of the contrast columns adjacent to the medially deviating pedicles (Fig. 1c) and bulbous articular facets (Figs 1c & 2a). Single or multiple (Fig. 3) sites were involved.

Bulbous articular facets appeared to be the direct cause of compression in the C2/3 region, possibly due to the short pedicle length of C2 and wide intervertebral foramen found at this space (Fig. 2a). Oblique views, especially in the C2–3 region, showed dorsolateral contrast column attenuation indicative of a direct articular facet cord compression in some cases (Fig. 2b). Results of CSF analysis were within normal limits for all 5 cases in which it was evaluated.

Two dogs were discharged without treatment at the owner's request: 1 recovered spontaneously and was considered normal at 18-month telephonic follow-up; the other was euthanased by the referring veterinarian 4 months later due to

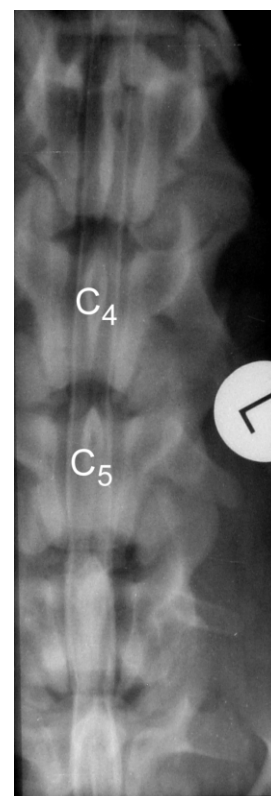


Fig. 3: Case 3. VD view showing mild medial attenuation and deviation of both CCs over C4–7.

a progression of symptoms. A dorsal laminectomy was performed on 2 dogs: 1 showed rapid improvement with complete recovery and was reported to be symptom-free at 18-month telephonic follow-up; the other died as a result of post-operative respiratory failure.

Two dogs were treated with oral prednisolone (1 mg/kg, duration not recorded); 1 was euthanased 2 months later by the referring veterinarian due to a progression of symptoms; the other had apparently completely recovered at 11-month telephonic follow-up. Two dogs were euthanased at the owner's request after the diagnosis was made.

Atypical cases

One case was a 4-month-old dog that presented with a history of progressive pelvic limb ataxia. Clinical evaluation showed bilateral pelvic limb hyperreflexia and conscious proprioception deficits. On the myelogram multiple sites of mild dorsal and ventral contrast column deviation over the intervertebral spaces (Fig. 4a) were seen. However, the contrast initially stopped abruptly at T5 (Fig. 4b). Medial deviation of the vertebral pedicles of T5 and T6 was believed to be the cause of the clinical signs. The dog was treated with oral prednisolone (1 mg/kg, SID, 7 days) and was reported by the owner to have made a full recovery at 18-month telephonic follow-up.

The 2nd dog was presented at 5 years of age with a history of thoracic limb ataxia that had progressed to include the pelvic limbs. At presentation he was quadriparetic and non-ambulatory with pelvic limb hyperreflexia. No lesions were detected on survey radiographs and myelogram. On MR imaging, the cervical region showed multiple cystic structures (hyperintense on T2 weighted and hypointense on T1 weighted images) associated with the articulation facets of C2–7 with no post-contrast enhancement of these lesions (Fig. 5a–c). The largest lesion was seen at the left C2/3 articulation facet, and measured 10 × 0.7 mm in the dorsal plane. The lesions became progressively smaller further caudally.

A provisional diagnosis of multiple cervical intraspinal articular cysts causing extradural cervical cord compression at several sites was made. The largest cyst (at C2/3) was excised surgically following a dorsal laminectomy. Histopathology confirmed this to be a synovial cyst. The dog made a swift and full recovery despite the fact that only the largest lesion was resected and was reported to be without symptoms at 18-month telephonic follow-up.

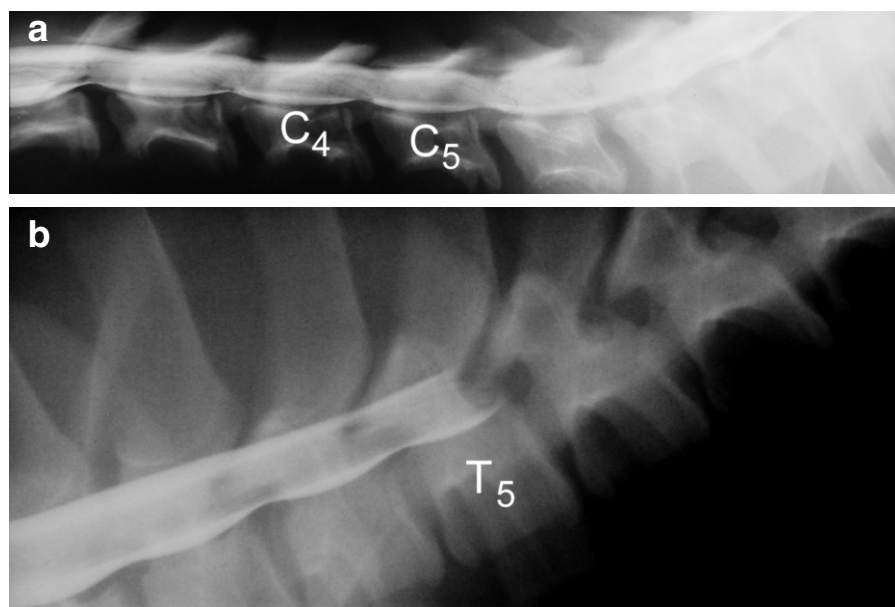


Fig. 4: **Case 9.** a: Lateral myelogram showing multiple sites of cervical dorsal and ventral contrast column deviation; b: contrast column terminates at caudal T5.

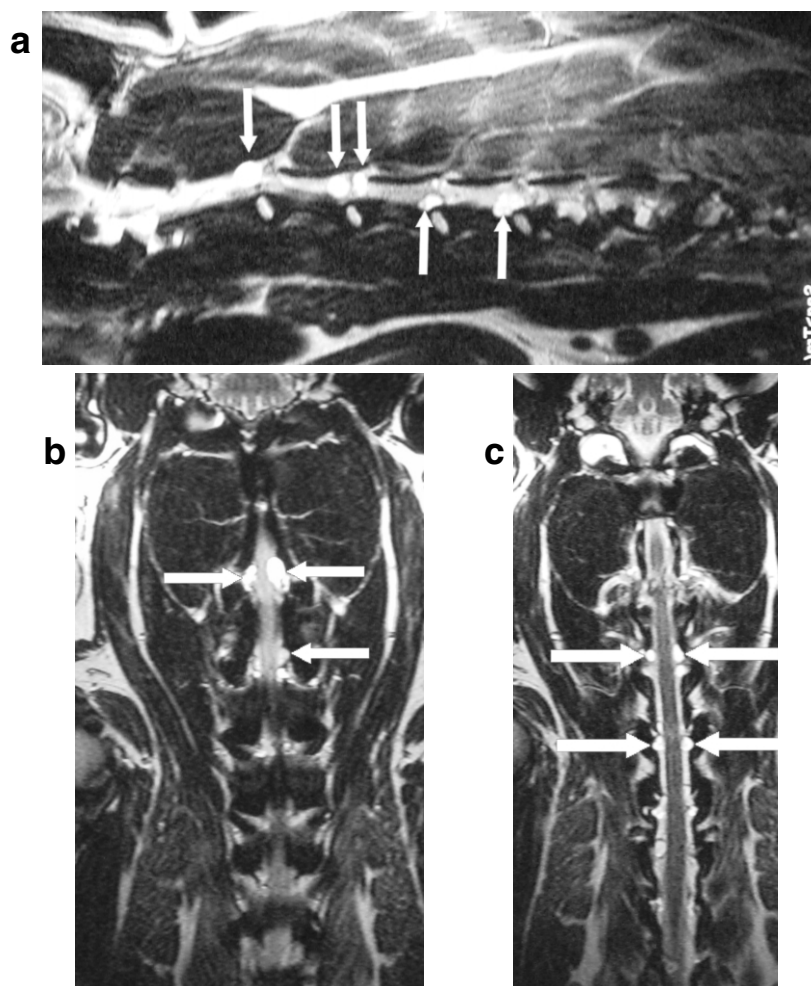


Fig 5: **Case 10.** a: Left parasagittal T2 weighted MR image showing the focal hyperintense, cyst-like lesions at C2–6 (arrows). All are associated with the left articulation facets. Note that the lesion is located dorsally at C2/3, laterally at C3/4 and ventrally at C4–6 relative to the cord. This is most likely due to slight obliquity of the image slice. C3/4 has 2 apparent cysts on either side of the facet joint; b): dorsal T2 weighted image showing bilateral hyperintense, cyst-like lesions associated with the articulation facets of C2/3 dorsolaterally and C3/4 laterally. The lesions (arrows) were dorsolaterally and laterally located at this level; c: dorsal T2 weighted image made in a plane 6 mm ventral to the image in Fig 5b. Bilateral hyperintense, cyst-like lesions (arrows) associated with the articulation facets of C3–5 are seen. The C2/3 cysts identified in Fig 5(b) are outside the imaging plane.

DISCUSSION

The Boerboel is a popular and established South African large-breed dog of mixed ancestry. It has been exported to the United States, Netherlands and some other countries. Boerboel is an Afrikaans word and directly translated means 'farmer bull'. Jan van Riebeeck, who arrived from Holland in the Cape in 1652, brought with him a 'bullenbijter' and this, together with many other large breeds such as bulldogs and mastiff types brought to South Africa by British settlers probably contributed to its ancestry¹¹. There is some variation in the size and conformation, but they are generally heavyset dogs weighing between 35 and 55 kg at maturity. The appearance of wobbler syndrome in this breed appears to be a fairly recent phenomenon and is thought to have become quite common. The 8 confirmed cases over a period of 5 years were fewer than expected considering the popularity of the breed. This may reflect the severity of symptoms and poor prognosis offered by veterinarians that results in euthanasia rather than referral, success with conservative management, or failure to diagnose the condition.

Wobbler syndrome has been classically defined as the typical symptoms of ataxia and tetraparesis that result from compression of the caudal cervical spinal cord caused by malformation/malarticulation and/or degenerative disease¹⁴. The variation in lesions encountered and the uncertainty that surrounds the aetiopathogenesis has led to many names for this condition, including cervical vertebral malformation/malarticulation (CVMM), and cervical vertebral instability^{3,8,14,18,23}. Lesions occurring as far cranially as C2/3 and C3/4 have been included in studies using the name 'caudal cervical spondylomyelopathy (CCSM) or spondylopathy'^{5,8}. Cervical spondylopathy or spondylomyelopathy^{7,17,19,22} are terms preferred by the authors for malformation-associated wobblers (see below) since they do not make reference to the position in the cervical column, allowing a broader definition that can also include recently described conditions causing similar symptoms, such as synovial cysts. The cases reported here had lesions that were not limited to the caudal cervical area. The term 'wobbler syndrome' has been widely accepted because it is descriptive of the symptoms without implication of a single aetiology^{14,26,27}.

Genetic predisposition is likely, given the preponderance of certain breeds⁷. Those most often quoted as being predisposed to wobbler syndrome are the Doberman and Great Dane^{20,26}. The syndrome has, however, been diagnosed in

many others, including Basset Hounds, Rottweilers, Boxers, Rhodesian Ridgebacks and English Mastiffs^{7,8,30}. It has been proposed that bony malformations may be a response to early vertebral instability²⁶. Other factors that have been implicated include over-nutrition, over-supplementation with calcium and head weight/carriage^{12,13,30}. The diagnosis is suspected on the basis of signalment, clinical signs, and neurological examination, and confirmed using diagnostic imaging studies such as myelography and MR imaging. The presenting symptoms are usually pelvic limb paresis and/or ataxia with or without thoracic limb involvement²⁶. Some individuals show signs of neck pain. The acute onset of symptoms reported in the current study is consistent with previous reports, and is probably due to a relatively minor traumatic incident that causes marked cord compression as a result of the compromised space within the canal¹⁴. Neurological symptoms may include limb hyperreflexia and proprioceptive or postural deficits. Evaluation of CSF is performed to rule out infectious or inflammatory disease.

It is usually possible to identify lesions such as spondylosis, collapse of the disc space, vertebral tipping/malalignment, degenerative changes or malformation of the articular facets, vertebral stenosis, malarticulation, proliferation of bone around synovial joints, and malformed vertebrae on survey radiographs^{14,27}. These can mostly be diagnosed from lateral views. Pedicle malformations can only be seen on DV/VD views and these are thus essential for diagnostic purposes²¹. This is well illustrated in the current study where medial deviation of pedicles was seen in 5 of the 8 typical cases. Lesions identified on survey radiographs do not always correlate with the site of compression, so myelography is essential to confirm the diagnosis and localise the lesion^{14,20,26}. One of the 8 typical cases reported here showed no abnormalities on survey films. It is possible that the cord compression evident on myelogram in this case was due to soft tissue pathology such as intraspinal articular cysts (see atypical cases) as neither surgery nor MR imaging was performed.

Myelography will define extradural compression(s) that results from disc extrusion or protrusion, ligamentum flavum hypertrophy and vertebral malformation or malalignment^{26,27}. Myelographic traction studies can also be performed to determine whether the lesion is traction-responsive or not, since this may influence the type of surgery performed. It is interesting to note that, in this study, 5 of 8 typical cases showed no

abnormalities on lateral myelographic view, highlighting the need to make VD/DV views. Oblique projections provide valuable additional information in circumferential lesion localisation and oblique myelographic views are now performed routinely at the OVAH when performing large-breed myelograms to more accurately describe the pathological site.

Multiple lesions (50 % of dogs in this series) may be missed if sufficient contrast does not bypass the initial site/s of compression. Elevating the head will assist the flow of contrast medium caudally. Failing this, a lumbar myelogram should be considered. No cervical myelographic study is thus complete unless the whole cervical region, and preferably the cranial thoracic region, is adequately opacified with contrast medium and lateral, VD/DV and oblique views have been made.

Attempts to classify wobblers into well-defined clinical categories is complicated by considerable overlap. Myelopathy can result from any one or combination of the aforementioned lesions. It is useful to simplify the classification into 2 major groups that are usually quite distinct¹⁴:

1. Immature dogs that have structural bony malformation leading to stenosis of the vertebral canal (malformation-associated wobblers)²⁶. Great Danes and Dobermans are most frequently affected^{14,23,26}. There appears to be an overall decrease in the incidence of this type of wobbler, perhaps due to their early identification and removal from the gene pool^{24,27}. Where wobbler syndrome affects other breeds, they also usually fall into this category.
2. Middle-aged or older dogs that have degenerative cervical disc disease with acquired compression of the cervical spinal cord (disc-associated wobblers).

This group is largely represented by middle-aged Dobermans. Stenosis of the bony part of the canal is often present but is mild and symptoms are thought to be due to subsequent instability and degenerative changes of the supporting structures, such as the ligamentum flavum and intervertebral discs that undergo a Hansen type 2 disc protrusion^{14,17,27,30}.

The Boerboels in this limited study clearly fit into the 1st group. All typical cases were 2 years of age or younger when presented. Most showed similar bony deformities on survey radiographs, with the exception of the single case in which no abnormalities were detected. The vertebral canal was narrowed by

medial deviation of the pedicles, which was associated with bulbous articular facets. These changes are similar to those described in young Great Danes^{14,21,26,29,30}. The abnormal vertebral body conformations reported in the Doberman and Great Dane were, however, not evident in this series, and the 'hourglass' compression that results from ligamentum flavum and dorsal annulus hypertrophy, hyperplasia, or redundancy was only evident in 1 case^{3,23,26,30}. The lack of dorsoventral compression on the myelographic studies suggests that shortened pedicles were not a feature of the current series. Inter-vertebral discs showed no obvious signs of degeneration. Cord compression appeared to originate from the medially deviated pedicles and enlarged articular facets described above. It was worse at the caudal extent of the vertebrae and over the intervertebral disc spaces. Multiple cervical vertebrae were affected in 4 dogs.

Although bony abnormalities may result in narrowing of the vertebral canal, other studies have shown that it is not uncommon to find that the compression of the cord is dynamic in nature^{17,23}. Traction studies were not carried out in this series, but intuitively it would seem unlikely that lesions causing lateral stenosis of the type described here would be traction responsive.

Two cases that would traditionally not be considered wobblers were included in the study because they presented with symptoms indistinguishable from classic wobblers. The one case was diagnosed with cervical synovial cysts, a condition affecting mainly large and giant-breed dogs^{9,16}. Dickinson *et al.*⁹ identified 2 groups in a series of 9 dogs: (1) young, giant-breed dogs with multiple cysts involving one or more levels of the cervical spinal cord; and (2) older, large-breed dogs with a solitary cyst involving the thoracolumbar spinal cord. The synovial cysts constituted the major compressive lesions in 4 of the 9 dogs. Despite being presented at 5 years of age, the case described in this article would best fit into the 1st group, with severe compression at the C2–3 site. It is interesting to note that 3 of the 4 dogs diagnosed with cervical synovial cysts described by Levitski *et al.*¹⁶, and 3 of the 6 dogs described by Dickinson *et al.*⁹, were mastiffs.

Synovial cysts are believed to be associated with degeneration of the articulation facet joints and articular facet spondylarthrosis is considered to be an important sentinel radiological sign of synovial cysts¹⁶. In the current case, no degenerative changes of the facet joints were noted on survey radiographs and no compression was seen on lateral and DV/VD

myelographic views. The dorsolaterally located lesions were only seen with MR imaging even though oblique myelographic views were performed.

Two types of intraspinal articular (facet joint) cysts have been described in dogs: synovial cysts and ganglion cysts²⁸. Synovial cysts have a synovial-like cell lining and communicate with a joint, whereas ganglion cysts do not⁶. Webb *et al.*²⁸ recommend that these cysts should be referred to as intraspinal articular cysts until histological confirmation. It is quite possible that cases diagnosed with dorsal compressive spinal lesions on myelography (and attributed only to facet changes or ligamentous and soft tissue hypertrophy), may in fact have synovial cysts contributing significantly to the compression⁹. Synovial cysts must be considered as a differential diagnosis in any large-breed dog presenting with cervical myelopathy and MR imaging should be considered as the primary diagnostic tool to identify these cases¹⁶.

The other atypical case was diagnosed with lateral cord compression by medially deviating pedicles in the cranial thoracic region at T4–5 and T5–6. It is the authors' experience that these lesions tend to be challenging to diagnose, even on good quality VD survey radiographs, due to the superimposition of the soft tissues of the epaxial muscles and cranial mediastinum. They are easily missed if not specifically sought, but myelography is very useful in demonstrating the cord compression. In this case the lateral compression was severe enough to result in an initial halt to contrast flow at the cranial compression site, followed by poor subarachnoid contrast filling over the sites of compression on the lateral views. Unfortunately, oblique myelographic views were not performed in this dog.

Treatment of wobbler syndrome is dependent on the cause and location of the compression and whether the lesion is dynamic or static. There are few reports on the success of conservative therapy, which may be attempted for mild cases and includes the use of cage rest, neck braces, and corticosteroids^{3,7,10,15,20,23,26}. Nineteen of 25 dogs that were not treated in one study were euthanased due to progression of symptoms⁷. Ventral slot decompression and distraction/fusion techniques are most commonly employed for single ventral lesions^{1,2,5,10,22,30}. Dorsal laminectomy is best suited to multiple lesions or bony deformities such as those described in this report^{23,30}. This technique has been associated with varied success^{3,20}. A recent report⁸, however, recorded a good or excellent result in 19 of 20 dogs that underwent dorsal

laminectomy, with a return to optimal neurological status within 2 weeks to 12 months. The minimum follow-up time was 7 months, with 3 dogs having recurrence of symptoms. In the same study, 5 of 8 young dogs with congenital osseous malformation or hourglass compression made good or excellent recoveries, with no relapse at follow-up, which ranged from 1–9 years. All 5 were ambulatory preoperatively. Of the other 3 dogs, 1 made a good initial recovery but suffered a relapse 4 months after surgery and was managed successfully by conservative means, 1 was euthanased after an initial recovery as a result of suspected recurrence, and 1 was worse after surgery and did not regain pre-surgical status⁸. Another study recorded a good or excellent recovery in 16 of 19 cases that underwent dorsal laminectomy for cervical malformation/malarticulation²⁵. The small number of cases and variability in management does not allow for prognostication in the current study. The fact that only 2 dogs were treated surgically may reflect the guarded to poor prognosis offered to owners and/or the high cost involved. Small numbers in other studies also make evaluation difficult, but surgery may offer a somewhat better prognosis than is generally perceived⁸.

Wobbler syndrome should be placed high on the differential diagnosis list when a Boerboel is presented with suggestive signalment and symptoms. Cervical synovial cysts or 'wobbler' lesions in the cranial thoracic spine should also be considered. In addition to survey radiographs, further diagnostic imaging is mandatory. Myelography should include lateral, DV (caudal cervical), VD (cranial cervical), oblique, and traction views. The study should extend at least to the cranial thoracic vertebrae. A computed tomography or MR imaging study may be performed instead of myelography and should be considered when a myelogram shows no cord compression. Dynamic studies using these modalities have been described¹⁹.

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