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NOTE

Internal Medicine

Hydromyelia in a Japanese Black calf

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ABSTRACT. A Japanese Black calf, manifested by clinical signs of inability to stand and extending hind limbs after birth, was investigated clinically and pathologically. In the neurological inspection, gastrocnemius reflex and patellar tendon reflex of the right hind limb were hyperactive, and gastrocnemius reflex and crossed extension reflex of the left hind limb were also hyperactive. Magnetic resonance imaging (MRI) examination showed a cavity in the cord at the area of the third and fourth lumbar vertebrae in T2-weighted imaging. After the calf was euthanized, necropsy confirmed the swelling of the spinal cord at the third and fourth lumbar vertebrae. The histopathological examination confirmed that the central canal remained open, and the inner surface of central canal was lined with ependymal cells. Therefore, this calf was diagnosed to have hydromyelia of the lumbar cord. This study indicated that MRI was useful for diagnosing myelodysplasia such as hydoromyelia. This is the first report of hydoromyelia in Japanese Black calf.

KEY WORDS: hydromyelia, Japanese Black calf, magnetic resonance imaging

Myelodysplasia is a general term referring to abnormal development of the spinal cord [9]. Hydromyelia is one of the congenital myelodysplasia [1, 3, 9]. In companion animals, clinical diagnosis of the myelodysplasia has been made more commonly while they are still alive [1, 6, 8, 10, 11], and there have been many reports of hydromyelia [6, 8, 11]. However, in calves, many reports of the myelodysplasia were based on histopathological inspection conducted after euthanasia [2, 4, 5, 7]. Diagnosis of the myelodysplasia was infrequently conducted while calves were still alive [12]. Particularly, there has been a very few reports of hydromyelia [4, 7]. It may be because calves with inability to stand or abnormal gaits after birth were classified as weakness of calves, and thus they have not been inspected thoroughly.

Here we report the clinical and histopathological findings of a Japanese Black calf diagnosed with hydromyelia.

A 10-days of age, female, Japanese Black calf was evaluated at the Kagoshima university animal hospital because of clinical signs of inability to stand after birth. The calf received dexamethasone and vitamin B1 from 2 to 5-days old, before referred to us.

On the day of admission, the calf was in lateral recumbency and maintained the ability to raise her head. Fore limbs' mobility was good and intention tremor was not observed, but hind limbs showed no spontaneous mobility with constant extension (Fig. 1). The calf could not stand by herself, but was able to stand with assistance. The calf could not walk voluntarily, but she attempted to walk using only fore limbs with assistance. On clinical examination, respiratory rate was slightly higher (54 breathes/min), pulse and body temperature were normal (132 beats/min and 38.9°C, respectively), and the intestinal movements and feces were normal. Examinations of hematology, neurology, needle electromyography and cerebrospinal fluid and myelography were conducted. Furthermore, examination of magnetic resonance imaging (MRI) (Trillun oval, Hitachi Medical Corp., Tokyo, Japan) was conducted while the calf was alive. At 17-days of age, the calf was euthanized following owner's request. After the necropsy, histopathological inspection was conducted.

The results of hematological inspection were within the normal range and cerebrospinal fluid did not show any abnormal findings. The results of neurology inspection indicated that the calf's mentation, as well as cranial, cervical, and fore limb nerves were normal. However, proprioceptive deficits of both hind limbs were noted. Gastrocnemius reflex and patellar tendon reflex of the right hind limb, as well as gastrocnemius reflex and crossed extension reflex of the left hind limb were hyperactive. Flexion reflex of the left hind limb was normal. The results of needle electromyography inspection confirmed positive sharp waves from the paraspinal muscle between the fourth and the fifth lumbar vertebrae, which indicated denervation with abnormal muscle activity. The myelography showed vague imaging for both dorsal and ventral columns between the third and the fourth lumbar vertebral body (Fig. 2). The results of MRI examination confirmed that a cavity was present in the cord at the area of third and

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Fig. 1. Appearance of the calf. Hind limbs of the calf were constantly extended.

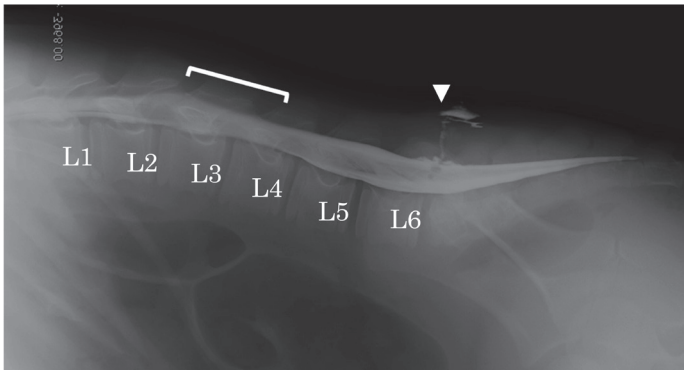

Fig. 2. Myelographic findings of the lumbar cord. The both the dorsal and ventral columns were not visible between the third and the fourth lumbar vertebral.

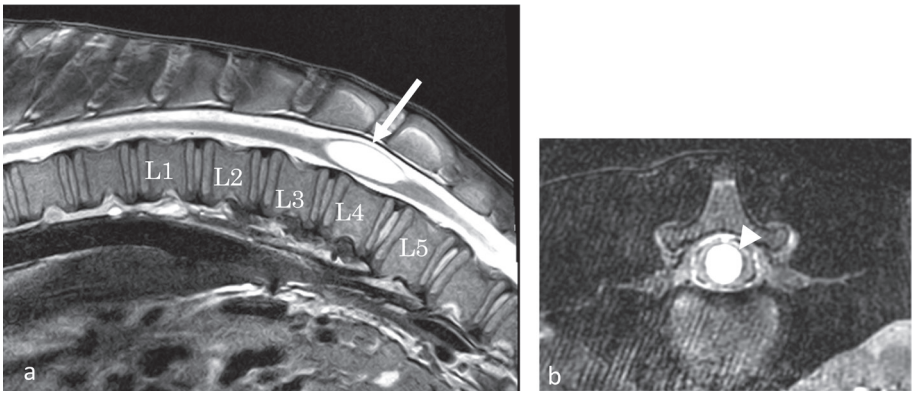

Fig. 3. MRI findings of the lumbar cord in T2 weighted sequence. The examination of MRI was conducted while the calf was alive. Sagittal plane (a). Arrow indicates the cavity in the spinal cord at the third and the fourth lumbar vertebrae area. Transverse plane at the area of fourth lumbar vertebrae (b). Arrowhead indicates the cavity in the spinal cord in T2 weighted imaging.

fourth lumbar vertebrae in T2-weighted imaging (Fig. 3a and 3b). After the calf was euthanized, necropsy confirmed that skeletal muscles of four limbs, cerebrum, cerebellum and other organs did not have significant changes. However, the spinal cord at the area of third and fourth lumbar vertebrae was swollen (Fig. 4). The results of histopathological inspection confirmed that inflammatory cells were not present in the spinal cord. However, the central canal remained open, and the inner cavity surface of central canal was lined with ependymal cells (Fig. 5). As results of these inspection, the calf was diagnosed to have hydromyelia of lumbar tract.

Hydromyelia and syringomyelia are characterized by a cavity within the spinal cord that extends through one or several vertebral segments [1, 3, 9]. The syrinx contains fluid which has characteristics of extracellular and cerebrospinal fluids [1, 3, 9]. Depending on the location of cavity within the spinal cord, the term “hydromyelia” is used for the dilation of the central canal, as determined by the presence of ependymal cells lining the canal. The term “syringomyelia” is used for fluid-filled cavities within the neuroparenchyma usually lined by glial cells. It is difficult to differentiate between hydromyelia and syringomyelia based on the clinical signs and imaging techniques [1, 8, 11, 12]. Thus, histological inspection is generally required for a definitive diagnosis [1, 8, 10, 11]. The hydromyelia in calves was only reported in Holstein [7], and crossbred calves [4]. In the current study, Japanese Black calf was suffering from spastic paralysis, and some hyperactive reflex of hind limbs. Therefore, the calf was suspected to have upper motor neuron disorders of the spinal cord. In the needle electromyography, abnormal electromyogram was observed in the paraspinal muscles between the fourth and the fifth lumbar vertebrae. In the myelography with contrast, both the dorsal and ventral columns were vague between the third and the fourth lumbar vertebral body. These abnormal findings were confirmed by MRI. Therefore, the calf was diagnosed to have hydromyelia or syringomyelia while the calf was alive. In the histopathological inspection, the presence of ependymal cells lining the central canal of lumbar cord was confirmed, and the calf was diagnosed with hydromyelia. This study indicated that MRI was useful for diagnosis of myelodysplasia. This is the first report of hydoromyelia in Japanese Black calf.

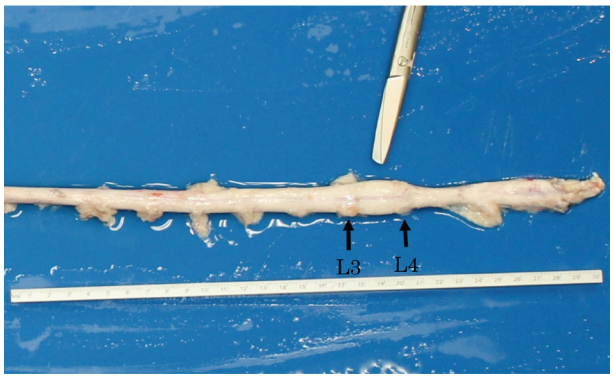

Fig. 4. Macroscopic findings of the spinal cord. Fresh anatomical specimen of the spinal cord. Arrows indicate the third and the forth lumbar nerve.

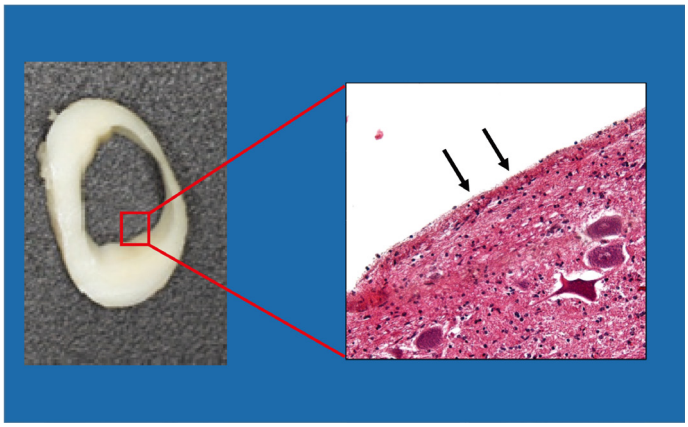

Fig. 5. Histological findings of the spinal cord. Transverse plane of the spinal cord. Cross sectional image of the cord at the fourth lumbar vertebra. Arrows indicate ependymal cells lining the canal.

Further detailed studies are needed to clarify the actual condition of myelodysplasia in calves, which show manifestation of clinical signs such as inability to stand or abnormal gaits.

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