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Myelographic Applications in Newborn Healthy and Paraplegic Calves

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ABSTRACT

This study was undertaken to establish a protocol for myelography in the healthy and paraplegic neonatal bovine calf. The study material will be composed of 30 calves, 10 of which are normal and 20 of which are paraplegic, brought to Adnan Menderes University, Faculty of Veterinary Medicine. The contrast medium used was Iopamidol, which was introduced through the foramen magnum under general anesthesia . In order to diagnose the atlantooccipital space, this region was tried to be diagnosed with the help of an ultrasound. Myelography revealed changes in the spinal canal and assisted in a definite diagnosis. It has been observed that myelography applications made with this method described by Braun are extremely useful and practical. Bleeding was observed in only two of the cases after puncture. No complications were observed after myelography. While a narrowing of the subarachnoid space was observed in the cervical region in 2 of 20 calves with paraplegia, a lesion was observed in the lumbar region in 5 of them. In 10 cases, narrowing of the cauda equina segment was observed. In 3 cases, paraplegia was observed in the patient it has been concluded that the prognosis can be determined more accurately by myelography.

Introduction

In recent years, significant increases have been recorded in the number of calves brought to our clinic.. Paraplegia, mostly occurs when the calf is stuck in the birth canal due to difficult births or during the removal of the calf by applying excessive force inappropriately.[1,2] In newborn calves, trauma may cause paraplegia it is rare.[3]

Myelography is a specialized examination method routinely performed in small animals with spinal cord lesions. Myelography is an invasive method, nowadays it is tried to be used less. MRI is a suitable alternative to myelography .Myelography in large animals is used in horses with suspected cervical spine anomalies.[4] Myelography was used in 2 calves with spinal epidural abscess.[5] There are no reports in the literature describing myelography in newborn healthy and paraplegic calves due to dystocia.

In this study, it was aimed to evaluate the anamnesis, signalments, clinical examination and myelography results of calves with paraplegia, also the effects of treatment and survival rate of the animal were evaluated.

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Materials and Methods

Research and Publication Ethics

All experiments were approved by Adnan Menderes University Local Board of Ethics Committe for Animal Experiments (Number-64583101/2021/087).

Study Material

The study material will be composed of 30 calves, 10 of which are normal and 20 of which are paraplegic, brought to ADU Faculty of Veterinary Medicine clinics. Table 1 was used for grading paraplegia.

Radiological Examination

Two different techniques have been described for myelography in calves. In this study, contrast material was administered via the atlantooccipital or cisternal route and was performed as described below. In this technique; preanesthetic medication was provided by giving xylazine 0.05 mg/kg IM. Anesthesia was then provided by intravenous administration of 5 mg/kg of ketamine. After the regioatlanto-occipitalis area of the animal under general anesthesia is shaved and disinfected (Figure 1). In order to diagnose the atlantooccipital space, this region was tried to be diagnosed by using the color Doppler ultrasonography device (Esaote, MyLab 30 Vet-Italy) The atlantooccipital space is identified using 5-7.5 Mhz Convex or a linear probe ultrasound. A 16 gaug puncture needle;first passes the intervertebral ligament below this is the dura mater. As soon as the dura mater is passed, a chill is very often felt on the skin. By pulling the chuck of the needle, an amount of cerebrospinal fluid equal to the contrast material to be injected is withdrawn (approximately 8-10 ml) (Figures 1 and 2). Iopamidol (Iopamiro 300, Türkiye) was used as a contrast agent. The dose of iopamidol was adjusted to be 1 ml /2.5-3 kg. Then, radiographs of the cervical, thoracic and lumbar regions were taken in the lateral position at 0, 10, 20, and 30, 45, and 60 minutes. Ventrodorsal shots were taken at the same minute intervals. Then, the radiograph was evaluated and the patient was treated and the surviving animals were noted. Likewise, if possible, autopsies were performed for post-mortem investigations on dead animals.

Treatment

The basis of treatment in paraplegic calves is vitamin B1 injections (100 mg/day IM, Nervit)

Table 1. Determining the severity of the lesion.

Severity	Lesion	Characteristic
5	Severe paraplegia	Lack of deep senses and purposeful movements
4	Paraplegia	Inability to stand, immobility in the legs, urinary incontinence, deep sense perception even when supported from the tail and under the abdomen
3	Severe paraparesis	Ability to stand with assistance, trips and falls, incontinence
2	Mild paresis-ataxia	Ability to stand still, move voluntarily, but stagger frequently
1	Minimal paresiataxia	Ability to stand and move voluntarily, especially ataxia when turning the animal
0		Normal

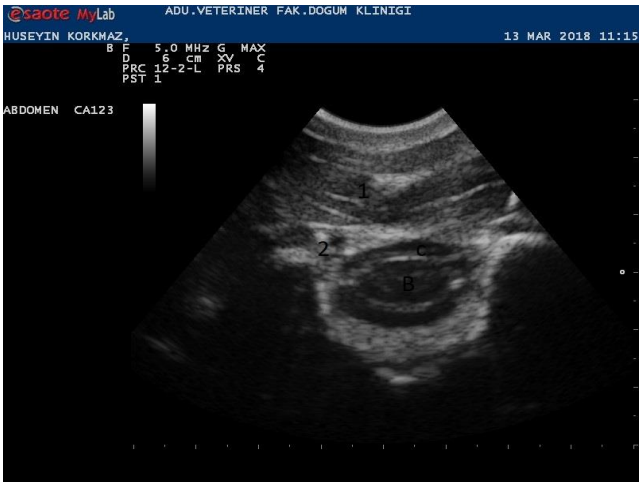

Figure 1. Transverse ultrasonogram and schematic representation of the vertebral canal at the level of the AO space (1) Nuchal ligament, major and minor rectus capitis muscles; (2) AO membrane; (B) Depth of the subarachnoid space dorsal to the spinal cord; (C) Diameter of the spinal cord.

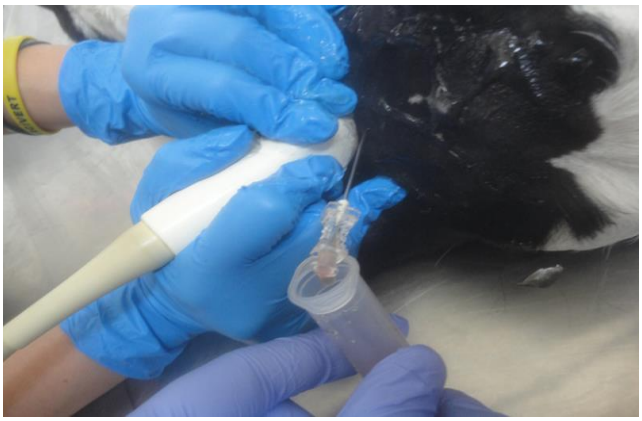

Figure 2. Collection of the CSF from the paraplegic and sedated calves.

combined with corticosteroids (10 mg/day IM, Vetacort). Since pneumonia and diarrhea are frequently observed in patients, a broad-spectrum antibiotic must be included in the treatment.

Results

Of 20 patients with paraplegia, 5 were grade 5, 2 were grade 4, 4 were grade 3, 6 were grade 2, and the rest were grade 1. While 6 of 10 healthy calves were female, 12 of 20 paraplegic calves were female. All of the cases had the Holstein Friesian race. While 18 of the calves with paraplegia were observed as a complication due to difficult delivery, 2 of them had a history oftrauma, as a result of normal delivery. While only one of the cases had twin births, the others were born as a single normal offspring. Diarrhea was detected in the first week in 12 of the paraplegic cases, while diarrhea and pneumonia were observed in 2 of them. These 2 cases died within the first month following myelography. The other 5 cases of 5 degree paraplegia died within the first 2 months. All of the cases with 1st and 2nd degree of paraplegia followed-up survived and responded positively to the treatment. While there were femur fractures in 2 cases of third-degree paraplegia and patellar luxation was present in the other 2 cases.

It has been observed that myelography applications made with this method described by Braun are extremely useful and practical.[6] Bleeding was observed in only two of the cases after puncture. No complications were observed after myelography.

The time between contrast application and complete filling of the spinal cord segments was, 10 minutes for the cervical segment, 40 minutes for the thoracic, 20 minutes for the lumbar and sacral, and 25 minutes for the cauda equine (Figures 3, 4, and 5).

While a narrowing of the subarachnoid space was observed in the cervical region in 2 of 20 calves with paraplegia, a lesion was observed in the lumbar region in 5 of them. In 10 of the cases, narrowing of the cauda equina segment was observed (Figures 6, 7, and 8). In 3 cases, paraplegia was observed in the patient without any abnormality, and all of these patients responded positively to the treatment.

Discussion

Contrast agents such as iopamidol and iohexol used for myelography, no superiority of these two contrast agents was observed and it was reported that these two contrast agents would be used in myelography in calves.[7] We used iopamidol in this study and it was found to be satisfactory for myelography.

Figure 3. Myelographic image of the calf spinal column 20 minutes after contrast administration. Cervical segment. The contrast medium has dissipated in all segments of the spinal cord.

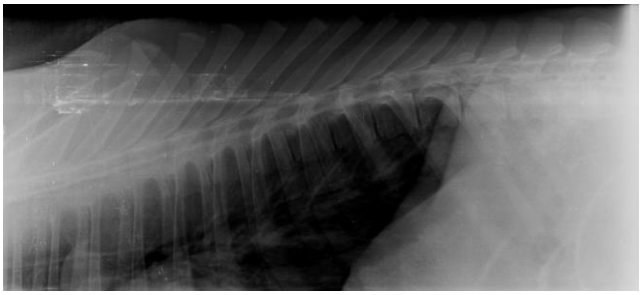

Figure 4. Myelographic image of the healthy calf spinal column 40 minutes after contrast administration. Thoracic segment. The contrast medium has dissipated in all segments of the spinal cord.

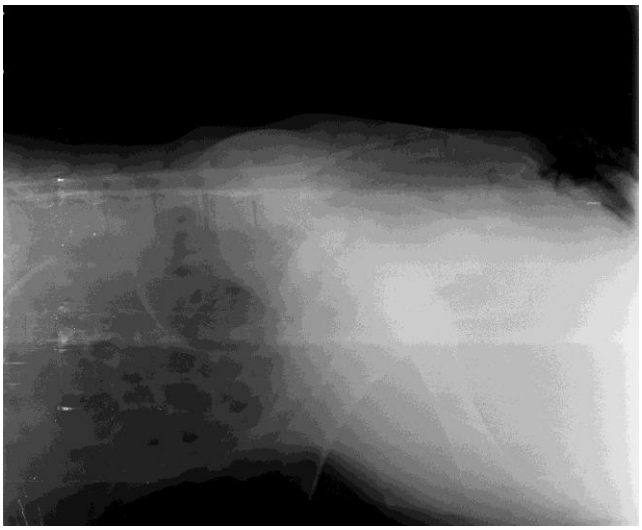

Figure 5. Myelographic image of the calf spinal column 60 minutes after contrast administration. Lumbar and sacral/caudae equina segments. The contrast medium has dissipated in all segments of the spinal cord.

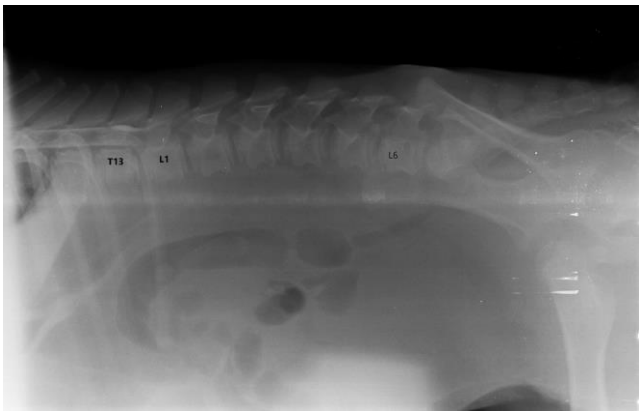

Figure 6. Myelographic view in a grade 5 paraplegic calf. Narrowing of the last thoracal and first lumbar segment of the spinal cord and obstruction of the contrast medium after L1.

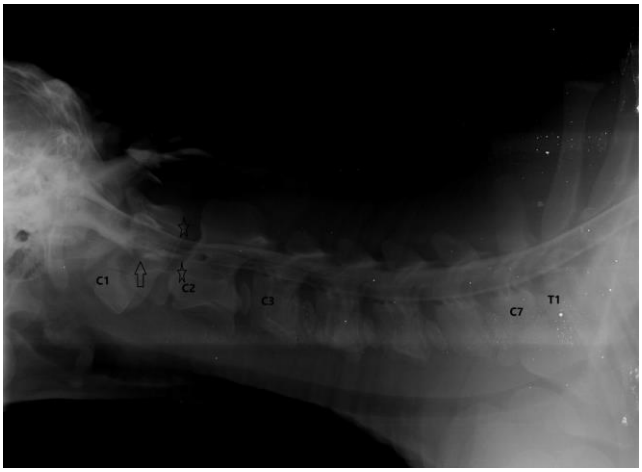

Figure 7. Myelographic appearance in a grade 4 paraplegic Holstein calf. Narrowing observed in the vertebral segment between C1-C2.

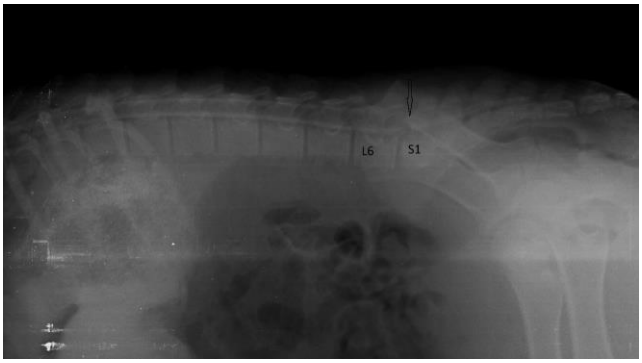

Figure 8. Myelographic appearance in another degree 2 paraplegic calf. Contrast obstruction from the last lumbar and first sacral segment.

Deep sedation and general anesthesia is recommended for the myelography procedure. While Bargai *et al*.[8] recommended 1.2 mg/kg xylazine for myelography, In a study performed by Bueno *et al*.[7] after sedation and induction with xylazine and propofol, animals were intubated and anesthesia was maintained with isoflurane. In our study, we successfully performed the procedure by providing adequate anesthesia with the combination of xylazine and ketamine. In the same study,[7] the best imaging time of the cervical spinal segment was noted 6-8 minutes after the injection, while this time increased to 20 minutes for the lumbarsacral and cauda equina segments, and 80 minutes at the latest in the thoracic segmentPrognosis in paraplegic animals is highly variable. The reason for this is the disruption of the immune system due to trauma in animals and the fractures observed during excessive extraction.[8-12] Among these fractures, especially femur fractures worsen the picture and negatively affect the prognosis. While the prognosis was unfavorable especially in 4th and 5th degree paraplegic calves, it was observed as positive in first and second degree paraplegic calves.

As a result, myelography has been observed as an important tool for the diagnosis of paraplegic calves in calves it has been concluded that the prognosis can be determined more accurately by diagnosing the localization and severity of the lesion.

Conflict of Interest

The authors declare that they have no competing interests.

Acknowledgement

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