

Medical Management of Acute Spinal Cord Injury with Aspiration Pneumonia in A Kid

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Abstract

A two-month-old, non-descript female goat kid was brought to the Medicine Unit of Veterinary Clinical Complex, Veterinary College and Research Institute, Orathanadu, with a history of continuous high-pitched bleating, respiratory distress, and forelimb paresis over the past two days. The animal has appeared lethargic with an abnormal gait. Neurological examination revealed sluggish sensory and motor reflexes in the forelimbs and palpation elicited pain in the thoracic and dorsal spinal areas (C₇-T₂). Auscultation revealed exaggerated heart sounds and prolonged expiration. Radiographic examination ruled out spinal involvement but revealed left lung consolidation with pulmonary infiltration. Cerebrospinal fluid analysis showed an increase in neuron-specific enolase (NSE). The condition was tentatively diagnosed as acute spinal cord injury with aspiration pneumonia. Inj. Progesterone and intranasal Budesonide were administered along with a Progesterone patch applied to the lateral neck region. Successful medical management led to gradual clinical improvement observed from the seventh day and completely recovered after 15 days of treatment.

Keywords: Acute spinal cord injury, Aspiration pneumonia, Progesterone, Kid

Introduction

Spinal cord injuries frequently occur in small ruminants, particularly goats, due to factors like degenerative changes, accidental injuries or trauma, idiopathic and any infectious causes. Lesions in different spinal segments result in noticeable signs such as difficulty walking, staggering gait, urine and faecal incontinence and relaxed anal tone leading to severe consequences (Jubb *et al.*, 2017). Diagnosis involves assessing spinal reflexes, including deep pain and withdrawal reflexes, conscious proprioception, wheelbarrow reflexes, placing reflexes etc. and also by utilizing advanced techniques like X-rays, MRI, or CT scans for lesion localization. Steroids were usually preferred in any neurological disorder. Nowadays, hormone progesterone usage has been increased among the veterinary fraternity in neurological conditions like myasthenia gravis with great success (Ramkumar *et al.*, 2023).

Case History and Clinical Observation

A two-month-old non-descript female goat kid was brought to Medicine Unit of Veterinary Clinical Complex, Veterinary College and Research Institute, Orathanadu, presented with continuous high-pitched

bleating, respiratory distress and forelimb paresis for the past two days. The animal was appeared dull with mild dyspnoea. Although there was no orthopaedic involvement, the forelimbs showed flaccid paresis and mild rigidity of hindlimbs (Fig .1) with “two-engine gait” (Foss *et al.*, 2013). Pain was observed during palpation of the thoracic and dorsal spinal areas (C₇ – T₂ vertebrae). Auscultation revealed exaggerated heart sounds with prolonged expiration. Neurological examination indicated sluggish and exaggerated deep pain and withdrawal reflexes in the forelimbs and hind limbs respectively, while the cutaneous trunci reflex was sluggish behind the dorsal thoracic region.

Radiographic examination showed no spinal vertebral involvement but indicated pulmonary infiltration and left lung consolidation. To confirm neurological involvement, cerebrospinal fluid was collected for Neuron-Specific Enolase (NSE) estimation (Hatfield *et al.*, 1992) by ELISA, revealing levels of 32 ng/ml, exceeding the normal range. Hematobiochemical parameters were normal except for neutrophilia. The confirmatory tool for Spinal cord injuries is usually made by X- ray and advanced imaging techniques like CT or MRI. However, because of the non-availability of such diagnostic tool, the clinical examinations along with the elevated NSE Values, made us to arrive at a confirmatory diagnosis as Acute Spinal Cord injury.

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Initially, the condition was treated with Inj. Clindamycin (@ 10 mg/kg, i/m), Inj. Prednisolone (@ 1 mg/kg, i/m) and Tribivet (@ 2 ml, i/v, diluted with normal saline) for three days of treatment, no clinical improvement was noticed. On the fourth day, Inj. Progesterone (@ 6 mg/kg, deep i/m) along with intranasal Budesonide was administered. To maintain plasma progesterone concentration, Progesterone patch

(PROSYNC – NF) @ 30 mg was applied to the lateral aspect of the neck after proper clipping (Fig. 2). Notable clinical improvement was observed after 7 days and complete recovery was achieved by the 15th day (Fig. 3). Post-treatment radiographic examination revealed a significant reduction in pulmonary infiltration and cerebrospinal fluid NSE value was decreased to 10.21 ng/ml.

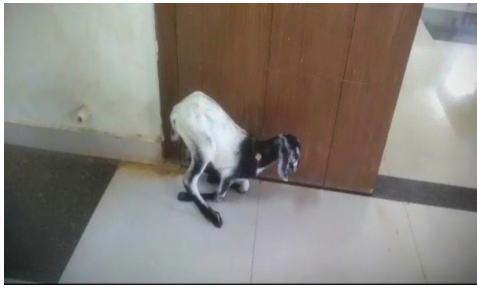


Fig. 1. “Two-engine gait” in a female kid



Fig. 2. Progesterone patch at lateral neck region.



Fig. 3. Complete clinical recovery after 15 days.

Discussion

Acute spinal cord injuries were prevalent in small ruminants, particularly goats, often linked to spinal luxation or fractures. Besides the primary mechanical injury, damage to the spinal cord involves secondary pathological changes like oedema, haemorrhage, demyelination, and necrosis. Biochemical alterations, including the release of free radicals, leukotrienes, and prostaglandins, contribute to further injury and compromise blood flow to the spinal cord (Thomas, 2021). Assessing ataxia or paralysis in neurologically disordered patients is challenging but can be facilitated with a systematic approach. A comprehensive physical and neurological examination aids in lesion localization within the spinal cord segments (C_1 - C_6 , C_7 - T_2 , T_3 - L_4 , and L_4 - S_3). By correlating specific clinical signs such as upper motor neuron (UMN) tetra paresis, lower motor neuron (LMN) paresis of forelimbs, UMN paresis of hind limbs, UMN bladder and faecal incontinence, reduced anal tone, and flaccid tail, lesions in different spinal segments can be identified through careful clinical

and neurological examination (Ronaldo *et al.*, 2010). In the current case, the lesion was predominantly localized in C_7 - T_2 , presenting distinct signs of LMN paresis in the forelimbs and UMN paresis in the hindlimbs.

The diagnostic approach for neurological disorders in small ruminants involves a thorough analysis of history, clinical and neurological examinations, and laboratory tools such as hematobiochemical parameters, urinalysis, and CSF analysis, aiding in lesion localization (Polizopoulou *et al.*, 2016). Neurological disorders are commonly associated with concurrent ailments (Walter *et al.*, 2007; Allen *et al.*, 2013). In the current case, the kid was presented with flaccid paresis of forelimbs, mild hind limb rigidity and mild dyspnoea. Radiographic examination revealed pulmonary infiltration, suggesting alveolar changes, possibly due to aspiration during feeding (Mekibib *et al.*, 2019; Ahsan *et al.*, 2010).

Treatment for acute spinal cord injury was based on the underlying etiology, typically involving antibiotics, steroidal or non-steroidal anti-inflammatory

drugs and vitamin supplements. Prednisolone has been considered as a first-line of treatment for spinal injuries in animals to reduce nerve injury and muscle inflammation (Lu *et al.*, 2016). In this case, the animal received Inj. Prednisolone @ 1 mg/kg to counteract spinal injury and Inj. Clindamycin @ 10 mg/kg for lung involvement. Clindamycin was chosen due to its efficacy against anaerobic bacteria, which are commonly associated with aspiration pneumonia (Schreiner, 1984). Despite of initial drug administration, no clinical improvement was observed, prompting a change in the therapeutic regimen, progesterone and budesonide were added. Progesterone synthesized in glial cells of the peripheral nervous system, has a recognized neurotrophic role, promoting axonal growth, maturation, and repair of damaged nerve fibres (Koenig *et al.*, 2000; El-Etr *et al.*, 2015; Ramkumar *et al.*, 2023). In this case, exogenous progesterone likely accelerated regenerative processes and fostered axonal maturation. The mechanism involves the stimulation of neuronal genes expressed in neurofilaments, microtubules and axolemma (Koenig *et al.*, 2000).

Progesterone was administered as a transdermal patch (PROSYNC – NF 1.2g) at the prescapular region, chosen for its neuroprotective properties and has less complication with high effectiveness (Kajaysri *et al.*, 2017). Budesonide, a locally-acting glucocorticoid with potent anti-inflammatory action, was administered as a nasal spray, reducing airway oedema and inflammation (Mohamed *et al.*, 2017). This multi-faceted approach has shown a marked reduction in pulmonary infiltration and NSE values by progesterone treatment in goat kid with acute spinal cord injury and aspiration pneumonia.

Conclusion

In summary, the acute spinal cord injury in the kid was successfully treated with progesterone which revealed a novel therapeutic approach. Further investigations were required in this field to prove progesterone administration against neurological disorders. Early diagnosis and prompt treatment played a pivotal role, contributing to a better prognosis and complete clinical recovery.

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