

Neonatal Encephalopathy Complicated with Septic Arthritis in a Foal

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Abstract : A 2-day-old Thoroughbred foal weighing 58 kg was admitted to the Equine Hospital of Korea Racing Authority (KRA) Jeju Stud Farm with clinical signs including loss of suckling behavior and barking. Neonatal encephalopathy (NE) was diagnosed based on history and typical clinical signs of NE. The foal seemed to recover in 5 days of intensive care and treatment but then was complicated with the septic arthritis of left hock joint on the 6th day of admission. A course of aggressive systemic antimicrobial therapy with joint lavage for 8 days was conducted and the foal was fully recovered and discharged. The follow up on the patient after 2 years revealed that the patient achieved a great success as a racehorse without any unexpected sequel. This report describes a course of NE complicated with septic arthritis in a foal and the clinical outcome of the intensive care and treatment in detail. To our knowledge, this is the first report which describes NE complicated with septic arthritis in a foal in Republic of Korea.

Key words : neonatal encephalopathy, septic arthritis, foal.

Introduction

Neonatal encephalopathy (NE) is a condition of foals known by many other names including hypoxic ischemic encephalopathy (HIE), neonatal maladjustment syndrome (NMS) and perinatal asphyxia syndrome (PAS) (5,12). NE is one of the most common neurological diseases in newborn foals with a reported incidence of 1-2% of all births (3). The clinical signs of NE in foals include alterations of consciousness, inability to suckle, lack of affinity for the mare, tongue protrusion, star-gazing, abnormal vocalization and localized and generalized seizures (7,8). Diagnosis of NE in foals is based on history and clinical signs combined with exclusion of other differentials such as sepsis, hypoglycemia, prematurity or dysmaturity, bacterial meningitis, hydrocephaly, epilepsy, liver disease, viral encephalitis and toxicosis (12). Despite NE is one of the most common perinatal disorders in foals, the clinical reports regarding NE is extremely sparse. This report describes a course of NE complicated with septic arthritis in a foal and the result of the intensive care and treatment. To our knowledge, this is the first report which describes NE complicated with septic arthritis in a foal in Republic of Korea.

Case

NE

A 2-day-old Thoroughbred foal weighing 58 kg was admitted to the Equine Hospital of Korea Racing Authority (KRA) Jeju Stud Farm with clinical signs including loss of suckling behavior and barking. At presentation, the foal was dull and unable to stand and suckle with intermittent barking and sei-

zures. The owner stated that the foal was born after full term (338 days) pregnancy and uneventful parturition. The foal was able to stand up and was nursing normally on the 1st day of birth but then the suckle reflex and affinity to dam were lost on the 2nd day of birth. The body temperature (BT) upon arrival was 36.9°C but soon after dropped to 34.9°C. Respiratory rate was 72/min but decreased to 44/min with the heart rate dropping from 120/min to 60/min. The mucous membrane was pale pink. There was no sign of dehydration. A thorough physical examination revealed no other specific abnormalities other than CNS related signs. CBC results indicated mild leukopenia owing to mild lymphopenia (Table 1). The chemistry and blood gas analysis with i-STAT EC8+ (Abbott; Abbott Park, USA) results were also within normal values except for mild elevation in TCO₂ (Table 2). With no other signs of congenital or acquired defects involving the central nervous system, a presumptive diagnosis of NE was established based on history and clinical signs. Initial treatment was started with systemic fluid therapy with warm lactated ringer solution mixed with 5% dextrose. An electronic warm blanket was provided along with frequent and vigorous rubbing of the body of the patient to keep the foal warm. The patient was given ceftiofur (Naxcel; Pfizer) to prevent sepsis with navel dip using 2% povidone-iodine (Povidine; Firson) daily. Oxygen therapy was provided via nasal tube at flow rate of 10 l/min while the patient remained recumbent. The patient was fed hand-milked milk from dam via nasogastric tube 4-6 times per day. On day 2, the foal was responsive but still was not ambulatory. The intensive supportive therapy was continued with periodic CBC and i-STAT analysis once or twice daily. On day 3, the foal was alert and able to stand up, walk and run. On day 4, the foal was able to drink from the bottle with good appetite. The following day, BT slightly went up to 38.9°C and the CBC results revealed leukopenia with lymphopenia (Table 1). The foal started to

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Table 1. CBC results of the patient obtained while hospitalized

	Normal values	Day 1	Day 2	Day 3	Day 5	Day 6 morning	Day 6 evening	Day 7 morning	Day 7 evening	Day 8	Day 14
PCV (%)	24-53	35.3	34.5	33.8	35.7	32.6	35.3	30.9	34.1	27.1	32.2
Hb (g/dl)	8-19	13.4	13.3	12.4	13.2	12.3	12.5	11.4	12.6	11.0	11.2
Leukocytes (K/ μ l)	5.4-14.3	5.16	8.48	7.08	3.42	14.08	22.70	25.44	21.72	13.36	8.48
Neutrophils (K/ μ l)	2.3-9.6	3.51	3.85	3.94	2.48	11.95	5.18	17.08	11.17	5.38	5.32
Lymphocytes (K/ μ l)	1.5-7.7	1.05	3.38	2.16	0.70	1.18	8.12	3.02	4.50	3.71	1.77
Monocytes (K/ μ l)	0-1.5	0.51	1.18	0.86	0.23	0.68	9.38	4.96	5.90	4.22	1.35
Platelets (K/ μ l)	90-350	203	218	218	175	152	137	129	130	329	203

Table 2. i-STAT EC8+ results of the patient obtained while hospitalized

	Normal values	Day 1	Day 2	Day 3	Day 5	Day 6	Day 7	Day 8	Day 14
Glu (mg/dl)	62-134	184	87	91	114	140	134	110	98
BUN (mg/dl)	11-27	19	15	10	7	8	6	7	7
Na (mmol/l)	128-142	137	139	136	136	133	134	134	133
K (mmol/l)	1.9-4.1	2.9	2.9	2.9	2.6	3.0	3.9	3.0	2.9
Cl (mmol/l)	100-111	100	100	98	98	97	99	100	98
TCO ₂ (mmol/l)	24-32	37	37	34	34	34	35	34	33
pH	7.35-7.45	7.403	7.443	7.581	7.609	7.402	7.444	7.402	7.400

nurse normally.

Septic arthritis

On day 6, the patient suddenly became lame 3/5 in accordance with the AAEP lameness grading system in left hindlimb with BT of 39.1°C although the foal was alert with good appetite. The left hock joint was swollen and painful at palpation and diagnosed as septic arthritis based on the clinical signs, hematology and radiography. The CBC results revealed severe leukocytosis with neutrophilia and monocytosis (Table 1). The systemic ceftiofur (Naxcel; Pfizer) and flunixin meglumine (Finadyne; MSD) with aggressive through-and-through needle lavage of left hock joint followed by intra-articular amikacin (Akickin; Whanin) administration was conducted for the following 8 days. The leukogram returned to normal on day 8 with remarkable clinical improvement (Table 1). The patient was continued on the same treatment regimen for the next 5 days until the full resolution of the clinical signs. The foal was discharged on the 15th day of hospitalization.

Discussion

The term NE has been used to refer to a noninfectious syndrome of foals primarily characterized by CNS dysfunction with several synonyms including HIE and NMS (12). Foals with NE show clinical signs including loss of suckling reflex, depression, wandering and abnormal vocalization which sounds like barking and seizures. Diagnosis of NE is usually based on the history and clinical manifestations combined with exclusion of other differential diagnoses which may pro-

voke similar CNS related symptoms (7,8,12). Based on history and typical clinical signs of NE, a presumptive diagnosis of NE was established in this case. Foals with NE seem normal right after parturition but the clinical signs start to show within a few hours to a few days later (6,12). In this present case, the foal was normal on the 1st day of birth, but became dull and lost suckle reflex from the 2nd day of birth. Foals with NE may present with history related to complicated parturition which may lead to hypoxia such as dystocia, premature placental separation or maternal illness namely placentitis although many have not had an obvious event resulting in hypoxia (5,6,13). Recently, NE has been termed to encompass newborn foals with clinical signs of neurological abnormalities (5). It should be noted that HIE is a specific type of NE, and not all NE cases are related to hypoxic ischemia (2,5). In this case, there was no recognized antepartum risk factors nor evidence of intrapartum hypoxia thus it remains unclear as to what caused NE of the patient. The dam of the foal was a healthy mare without any history of complicated pregnancy or parturition with the patient being the 5th foal.

Treatment of NE is mainly symptomatic, which includes fluid therapy, correction of metabolic and respiratory abnormalities, control of seizures, maintenance of peripheral, cerebral and renal perfusion. It is also important to maintain nutrition and manage any secondary sepsis (5,6,12). The goal of the treatment in this case was to correct hypothermia, to maintain perfusion, to provide adequate nutrition and to prevent secondary sepsis. The BT warm fluid therapy along with an electronic warm blanket and rubbing of the patient was effective enough to correct the hypothermia. It is imperative to remember that the new born foals do not regulate

their BT very well for the first few days of life not for NE. Although the patient did not show any sign of dehydration or malnutrition owing to adequate nursing from the previous day, the BT warm fluid therapy was provided to maintain peripheral, cerebral and renal perfusion of the patient. Adequate fluid therapy with the right temperature not only helps to keep the patient warm but also to maintain the perfusion of the key organs. Minimizing seizures is important because seizure activity in itself may contribute to ongoing injury although seizures are a consequence of the underlying brain injury (10). Seizure is often controlled with diazepam or Phenobarbital (6). In the present case, intermittent seizures were observed at presentation but resolved quickly without any medical intervention and so did barking. The oxygen therapy per nasal intubation at flow rate of 10 l/min was well tolerated by the recumbent foal. Although the patient did not seem to suffer from suffocation, the authors believed that the patient would benefit from the oxygen supplement with better ventilation and haemoglobin saturation leading to relieving hypoxia if present especially while recumbent when the sternum was on the ground with limited expansion (11). Although CNS dysfunction is the most obvious clinical sign in foals with NE, other organ systems are often involved and must be considered when managing these cases (6,12). Foals with NE often show signs of abnormal gastrointestinal and renal function, which are gastric reflux, feeding intolerance, bloat, meconium retention, colic and persistent increases in creatinine concentration (12). Nutritional requirement for a normal foal is approximately 25% of the body weight in kilograms (6). About 1.5 l of hand-milked milk from dam was fed every 4-6 hours per nasogastric tube for the patient and there was no related gastrointestinal discomfort observed in this case.

Septic arthritis is defined as the invasion of a synovial joint with pathogenic microorganisms being a major cause of morbidity and mortality in young foals (1,4). The causative organism is spread haematogenously, once localized within a joint, an inflammatory response occurs, resulting in destruction of articular cartilage. To eradicate infection and restore joint condition, an early diagnosis and application of appropriate therapy in timely manner are essential (1). The patient was on systemic broadspectrum antibiotic, ceftiofur, continuously while hospitalized to prevent secondary sepsis to NE. However, sudden onset of septic arthritis of left hock joint was observed on day 6 of the hospitalization. The greatest risk factor for bacteraemia is failure of passive transfer of colostral immunoglobulins (9). Given that the foal was nursing normally on the 1st day of birth and fed with milk from dam, the foal was believed to be established with passive immunity from dam. Neither systemic antibiotic nor passive transfer of colostral immunoglobulins was sufficient to prevent secondary sepsis in this case implying that measurement of serum IgG of the foal with equine plasma supplementation should be considered in cases with NE. Although it failed to prevent septic arthritis, systemic ceftiofur combined with through-and-through needle lavage of the joint followed by intraarticular amikacin injection was efficacious against the septic arthritis in this case. One weakness of this

report is that there was no diagnostic effort made to elucidate the aetiological agent of the septic arthritis due to urgency although the empirical antibiotic treatment regimen worked successfully for this case. Bacterial culture along with antibiotic susceptibility test should be conducted in cases of septic arthritis to establish better treatment regimen.

At least 80% of foals with NE survive and detectable, long-term neurologic deficits seem to be rare and athletic performance is not expected to be affected in most cases (12). The follow up on the patient after 2 years revealed that the patient achieved a great success as a racehorse in the KRA Seoul Race Course without any unexpected sequel.

Conclusion

A patient with NE complicated with septic arthritis was successfully treated with intensive course of therapies including fluid therapy, oxygen therapy, systemic broadspectrum antibiotic and through-and through needle lavage of the joint followed by intraarticular amikacin injection. Two years of follow up revealed that the patient achieved a great success as a racehorse without any unexpected sequel. The authors expect that this report would help clinicians to establish treatment regimen and to anticipate the prognosis of foals with NE complicated with septic arthritis.

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