SHORT COMMUNICATION

Nutritional Secondary Hyperparathyroidism in the Equines of Jammu Region

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Abstract

A study was undertaken on 29 equines with a history of lameness, difficulty in mastication, reduced feed intake, and swelling of facial bones. Feeding history was recorded and clinical examination of all horses was performed. Radiographs of the head of some horses were taken. Blood samples were collected from 14 osteodystrophic and 6 healthy horses to estimate plasma levels of Ca, P, ALP, BUN, and creatinine. Urine samples were collected for a routine examination, sulkowitch test, urine calcium, and phosphorus estimation, and fractional urinary clearance of phosphorus was calculated. Mean values of P, ALP and UFCP was significantly higher in NSHP affected horse than healthy horses. Radiographs of the head revealed decreased bone density, loosened teeth in alveolar sockets, and increased osteoid thickening of maxillae and mandible bones. Young horses were more susceptible than older horses. All the animals were treated by supplementation of 40 gm of calcium carbonate orally for 2 months, resulting in the disappearance of lameness and returning animals to normal work.

Keywords: Blood, Horses, Lameness, Radiographs, Urine.

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Introduction

Equine nutritional secondary hyperparathyroidism (NSHP) is a metabolic bone disease that develops due to absolute or a relative calcium deficiency due to excess of dietary phosphorus or deficiency of vitamin D. This disease has been reported from all species of animals, but more common in horses which are fed on ration with improper calcium: phosphorus ratio like rice bran, wheat bran and maintained on pastures of *Steteria spps., Pennisteum spps, Brachiaria spps,* and *Digitaria spps*. (Radostits *et al.,* 2000; Smith, 2002). The disease is characterized by intermittent shifting lameness, stiff and cracking joints, and facial bones enlargement (Rose and Hodgson, 1993). Osteodystrophia fibrosa in the horses and mules of Katra region was reported by Bhardwaj *et al*. (2010). The present communication reports secondary nutritional hyperparathyroidism in equines of the Jammu region.

Materials and Methods

A total of 29 equines included (12 horses presented to Veterinary Clinics and Teaching Hospital of SKUAST-Jammu and 17 horses identified with big head during the study on haemoprotozoan diseases in equines) with a history of lameness, difficulty in mastication, reduced feed intake, and swelling of facial bones. Feeding history was recorded. Clinical examination of all horses was performed. Palpation and percussion were done. Hooves were examined to rule out any abnormalities of hoof structures. Radiographs of head of six horses were taken. Blood samples were collected from 14 osteodystrophic and 6 healthy horses for estimation of plasma levels of calcium (Ca), phosphorus (P), alkaline phosphatase (ALP), blood urea nitrogen (BUN) and creatinine. Urine samples were also collected for routine examination, sulkowitch test, urine calcium and phosphorus estimation. The urinary fractional clearance of phosphorus (UFCP) was determined by David et al. (1997):

The diagnosis of secondary nutritional hyperparathyroidism was made based on history, clinical signs, radiographic findings, biochemical parameters, and fractional urinary clearance of phosphorus.

Results and Discussion

Out of 29 NSHP affected horses, 17 horses had mild to moderate (Fig.1), whereas 12 horses had severe swelling of facial bones (Fig. 2,3,4) leading to difficulty in mastication, loose teeth, and inappetence. Nasal discharge was observed in 4 severely affected horses (Fig. 5 and 6). Young horses

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Figure 1: Mild facial swellings; Figure 2 & 3: Severe facial swellings in NSHP affected horses.

Figure 4,5 & 6: Showing enlarged facial bone, nasal discharge and percussion of NSHP affected horses.

(21/29) of 3-7 years were more susceptible as compared to (8/29) older horses (>9 years). It could be due to the high rate of metabolism in bones of younger animals (Bertone, 1992; Ronen *et al.,* 1992). No sex predisposition could be ascertained as the number of mares was less (8/29) in the present study. Stiff gait or shifting lameness was reported in all horses. Dietary history revealed that animals were mainly fed wheat straw, rice bran, wheat bran and occasionally provided green grasses in the rainy season and berseem in winter season but never supplemented with calcium.

All physiological parameters viz. rectal temperature, respiratory and heart rate were found within normal range. Palpation of premaxilla bone appeared to be cartilaginous, and maxillae and mandibles were bilaterally enlarged, giving the swollen appearance of the face of animals. Percussion of nasal sinuses did not reveal any abnormal sounds. Examination of hooves did not reveal any defect in hoof structure, corium, or frog.

Phosphorus, ALP, and UFCP were significantly higher in NSHP affected horses as compared to healthy horses. Bhardwaj *et al*. (2010) and David *et al.* (1997) also reported higher values of phosphorus, ALP, and UFCP in NSHP affected horses. Low levels of serum Ca and high P and ALP levels have been reported in NSHP affected horses in agreement with Ronen *et al*.(1992) ; Radostits *et al*. (2000) and Smith, (2002).

Table 1: Biochemical parameters of Healthy and NSHP affected horses.

Parameters	*NSHP affected Horses (N=14)*	*Healthy Horses (N=6)*
Calcium (mg/dl)	9.69 ± 0.88	10.30 ± 0.70
Phosphorus (mg/dl)	4.07 ± 0.99*	2.25 ± 0.49
ALP (IU/L)	275.2 ± 89.1*	91.69 ± 19.29
BUN (mg/dl)	16.88 ± 2.53	13.87 ± 2.50
Creatinine (mg/dl)	0.96 ± 0.11	0.77 ± 0.09
UFCP (%)	0.98 ± 0.03*	0.42 ± 0.05

Blood urea nitrogen and creatinine level were in the normal range, ruled out secondary renal hyperparathyroidism (RSHP).

Urine sample examination revealed a normal value of all routine parameters with few calcium carbonate and calcium oxalate crystals. All urine samples were found negative by Sulkowitch test. Radiographs of the head revealed decreased bone density, loosened teeth in alveolar sockets, indistinct premaxilla, and increased osteoid thickening of maxillae and mandible bones. Based on feeding history, clinical signs, radiographic findings, decreased Ca and increased P and ALP, and fractional urinary clearance of phosphorus, horses, were diagnosed as nutritional secondary hyperparathyroidism (Table 1).

All the animals were treated by adding 40 gm of calcium carbonate orally for 2 months along with Syp. calcium +Vitamins A, D, E & K- 100mL orally daily for 30 days. Marked improvement in animals' condition was reported in terms of disappearance of lameness and returning of animals to normal work after one month of treatment, but swollen facial bones remain unchanged. Stewart *et al*. (2010) and Turkar *et al*. (2012) also successfully treated NSHP affected horses with calcium carbonate. All other horse owners were advised to supplement calcium in animals' diet as Calcium carbonate-40 gm orally daily.

Excess P in the diet leads to hyperphosphatemia and lowers the plasma Ca level, which stimulates the production of parathormone, resulting in bone resorption and inhibiting phosphate resorption by the kidneys until calcium and phosphorus levels became normal. Nutritional secondary hyperparathyroidism is a common problem in equidae maintained on brans, grains, and grasses high in oxalate. High P level alters Ca:P ratio, leading to Ca from the bone and dystrophia results. Phosphorus-rich diets also contain phytates that bind with Ca and decreases it's absorption. However, grasses of *Steteria spps, Pennisteum spps, Brachiaria spps,* and *Digitaria spps* are high in oxalates; horses maintained on such pastures have low Ca absorption because of chelation of Ca with oxalates. So, supplementation of Ca:P ratio of 1:1 prevents NSHP in horses. Leguminous fodders like Alfalfa and berseem, which are rich in calcium, should be provided to animals. Supplementation of Calcium carbonate or dicalcium phosphate daily in diet of horses can prevent the incidence of NSHP in horses (Radostits *et al*., 2000; Smith, 2002).

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