



Therapeutic Management of Nutritional Fibrous Osteodystrophy in Goats Using Phosphate Binder, Vitamin-D3, and Calcium Supplementation

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Abstract

Two stall-fed goats, aged eight months and one year from the same flock, were presented with complaints of excessive salivation, bilateral facial swelling, and reduced feed intake for the past 15 days. Biochemical analysis showed elevated serum phosphorus levels (7.5 and 8.3 mg/dl) along with decreased serum calcium levels (4.2 and 5.8 mg/dl). Radiographic evaluation revealed demineralization and bone resorption in the maxilla and mandible. The affected goats exhibited progressive but complete recovery within four weeks following the administration of sevelamer carbonate, vitamin D3 injections, and calcium supplementation.

Keywords: Fibrous Osteodystrophy, Goats, Hyperphosphatemia, Sevelamer, Vitamin D3.

Introduction

Nutritional fibrous osteodystrophy is a metabolic disorder observed in goats, primarily caused by excessive dietary phosphorus intake, especially in young, growing kids. Feeds such as wheat bran and pelleted concentrate mixtures are rich in phosphorus and are often linked to the development of osteodystrophy in goats. This condition is characterized by poor bone mineralization, increased bone resorption, and fibrotic replacement of bone tissue (Mevin et al., 2024). Clinical symptoms commonly include bilaterally symmetrical facial swelling, tongue protrusion, excessive salivation, and decreased appetite. With growing popularity of urban goat rearing in confined spaces and grain-based diets, cases of nutritional fibrous osteodystrophy have been on the rise. This study aimed to evaluate the therapeutic efficacy of sevelamer carbonate, vitamin D3, and calcium supplementation in treating clinical cases.

Case Presentation

Two stall-fed goats, aged eight months and one year from the same flock, of LFC were displaying symptoms of excessive salivation, facial swelling (Fig.1), and significantly reduced feed intake for 15 days. The dietary history revealed a daily intake of over 300 grams of wheat bran and bread per affected goat. Clinical examination indicated bilaterally symmetrical maxillary and mandibular swelling, tongue protrusion, foamy salivation, variable degrees of mouth opening, and a normal rectal temperature with no visible oral lesions (Tejaswani et al., 2018). Treatment was initiated with sevelamer carbonate tablets at a dose of 10 mg/kg body weight daily for four weeks, vitamin D3 injections at 60,000 IU weekly for four weeks, and calcium supplementation at 10 mg/kg body weight for four weeks.

Treatment and Discussion

Over a four-week period, the goats exhibited gradual and complete recovery. The observed bilateral and symmetrical facial enlargement was attributed to the high bone turnover rates in the maxilla and mandible, leading to swelling and bone deformities (Mevin et al., 2024). Hematological values remained within normal reference ranges. Biochemical analysis confirmed high serum phosphorus levels (7.5 and 8.3 mg/dl) and low serum calcium levels (4.2 and 5.8 mg/dl) in the affected goats. The dietary reliance on wheat bran and whole grains contributed to phosphorus overload. In cases of nutritional fibrous osteodystrophy, young animals fed a calcium-deficient, phosphorus-rich diet frequently experience parathyroid gland stimulation, resulting in hypocalcemia. The altered calcium-phosphorus balance is further influenced by prolonged vitamin D3 deficiency and hyperphosphatemia (Bharti et al., 2021). Increased parathyroid hormone (PTH) secretion stimulates calcium resorption from bones, kidneys, and intestines, leading to impaired bone mineralization and fibrous dysplasia. Radiographic examination in the present study revealed significant demineralization and bone lysis in the maxilla and mandible due to osteoclastic bone resorption (Fig. 2).



Fig.1; Facial Swelling



Fig. 2: Radiograph showing lysis of mandible and maxilla

Dietary Modification and Long-Term Management

Misalignment of the upper and lower teeth was observed due to palate widening. The treatment regimen included dietary adjustments, calcitriol (active vitamin D3) administration, and oral phosphate-binding agents. The affected goats were transitioned from a grain-rich to a fiber-rich diet, incorporating jackfruit leaves, and allowed free-range grazing. Sevelamer carbonate, a phosphate binder, was utilized to prevent dietary phosphorus absorption and mitigate bone-related complications (Fathallah-Shaykh *et al.*, 2018). Calcium supplementation aimed to restore calcium-phosphorus homeostasis, while vitamin D3 was administered to enhance intestinal calcium absorption and promote urinary phosphate excretion (Akimbekov *et al.*, 2022). This study concludes that stall-fed young goats on grain-based diets are highly susceptible to nutritional fibrous osteodystrophy. Bilateral symmetrical facial swelling and associated clinical manifestations can be effectively managed with sevelamer carbonate, vitamin D3, and calcium supplementation. Further research is warranted to establish sevelamer carbonate as a standard phosphate binder in goats.

Contribution by Authors

All the authors contributed equally to writing the manuscript. The final manuscript was read by all authors and consented to publication.

Conflict of Interests

There is no conflict of interest.

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