Metaphyseal Osteopathy in a Caucasian Shepherd Crossbred Dog

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SUMMARY

A six-month old, 24 kg, intact male Caucasian Shepherd crossbred dog was presented at the Sokoine University of Agriculture Teaching Animal Hospital with a history of difficulty standing and walking, and bilateral swelling of the distal antebrachial and crural metaphyeal region. The owner also reported prior calcium supplementation in form of dietary tablets. Upon physical examination; the animal was lethargic with fever, bilateral ocular discharge, tachypnea and reduced appetite. Hard painful bilateral swelling of the distal antebrachial and crural metaphyseal region was observed. Differential cell count showed neutrophilia and monocytosis. Sclerosis and paracortical cuffing of the distal antebrachial and crural metaphyseal region were seen on radiographic examination. Similar changes were also visualised in the proximal crural metaphyseal region. Further, cranial bowing of the radius with lateral deviation of the foot (carpal valgus) were also observed. Metaphyseal osteopathy was diagnosed based on the history, clinical and radiographic findings. The exact cause of metaphyseal osteopathy is unknown, however there have been reports linking it to breed predisposition and mineral over supplementation. Administration of corticosteroids and supportive care are recommended in dogs with metaphyseal osteopathy. However, a bony change that is paracortical cuffing requires several months for resorption.

Keywords: *Dog, Hypertrophic osteodystrophy, Metaphyseal osteopathy, Radiography*

INTRODUCTION

Metaphyseal osteopathy or commonly referred to as hypertrophic osteodystrophy was first reported in the 1930's (Lenehan and Fetter, 1985; Ö̈zer and Altunatmaz, 2004; Safra *et al.,* 2013). It is a developmental disease affecting young rapidly growing dogs (Woodard, 1982; Ö̈zer and Altunatmaz, 2004; Safra *et al.,* 2013; Greenwell *et al.,* 2014). The disease has been reported in domestic dogs (Ö̈zer and Altunatmaz, 2004; Safra *et al.,* 2013; Greenwell *et al.,* 2014) and in other animals such as the domestic cat (Adagra *et al.,* 2015), red wolf (Gjeltema *et al.,* 2015) and captive Iberian lynx (Martinez *et al.,* 2013).The condition has been reported to occur mainly in large and giant breed dogs (Stander and Cassel, 2016). Breeds such as the German shepherd, Great Dane, Boxer, Irish wolfhound, Weimaraner, and Irish Setter have been reported to be predisposed to metaphyseal osteopathy (Safra *et al.,* 2013; Greenwell *et al.,* 2014; Stander and Cassel, 2016). Recently, a breed predisposition to metaphyseal osteopathy has been reported in the Australian Kelpie, a medium-sized breed (Greenwell *et al.,* 2014; Stander and Cassel, 2016). The disease frequently affects metaphyses of long bones distal to the elbow and stifles (Lenehan and Fetter, 1985). However, other long bone metaphyses can be affected including the femur and humerus (Lenehan and Fetter, 1985; Stander and Cassel, 2016). Other bones, which have been reported to be affected with metaphyseal osteopathy, are the mandible, metacarpals, maxilla, scapula and costochondral junctions of the ribs (Rendano *et al.,* 1977; Lenehan and Fetter, 1985; Safra *et al.,* 2013). The underlying pathogenesis of metaphyseal osteopathy is unclear and most likely it is multifactorial (Rendano *et al.,* 1977). This report describes

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a case of metaphyseal osteopathy in a young Caucasian Shepherd crossbred dog.

CASE PRESENTATION

A six-month-old, 24 kg, intact male Caucasian Shepherd crossbred dog was presented at the Sokoine University of Agriculture Teaching Animal Hospital with a history of difficulty standing, difficult walking and bilateral swelling of the distal antebrachial and crural metaphyseal regions. The animal was initially treated but his condition was not improving. The owner also reported prior calcium supplementation in form of dietary tablets. At referral, the dog was lethargic with fever (40.5^0C) and anorexic. Other clinical findings includes tachypnea (44 breaths/minute; reference: 18-34 breaths/minute) and bilateral ocular discharges were also observed. Bilateral swelling of the distal antebrachial and crural metaphyseal region was seen, which was hard and painful on palpation (Figure 1). Abnormalities detected on haematology were neutrophilia and monocytosis. The dog was sedated with xylazine hydrochloride (Alfasan®, Holland) at the dosage of 2mg/kg intravenous for radiographic examination of the fore and hind limbs. Roller 30 (Smam X-ray Equipments®, Italy) X-ray machine was used at a source to image distance of 100 cm. Radiographic images were obtained using Colenta HighCap Xr (Fujifilm Corporation, Tokyo 106-8620, Japan) computed radiography system.

Radiographic examination revealed sclerosis and paracortical cuffing of the distal antebrachial and crural metaphyseal region (Figures 2 and 3A). Similar changes were seen in the proximal crural metaphyseal region (Figure 3B). Additionally, cranial bowing of the radius with lateral deviation of the foot (carpal valgus) was also visualized (Figure 2). A diagnosis of metaphyseal osteopathy was made based of history, clinical and radiographic findings. The dog was treated with corticosteroid (dexamethasone sodium sulphate) and intravenous fluids.

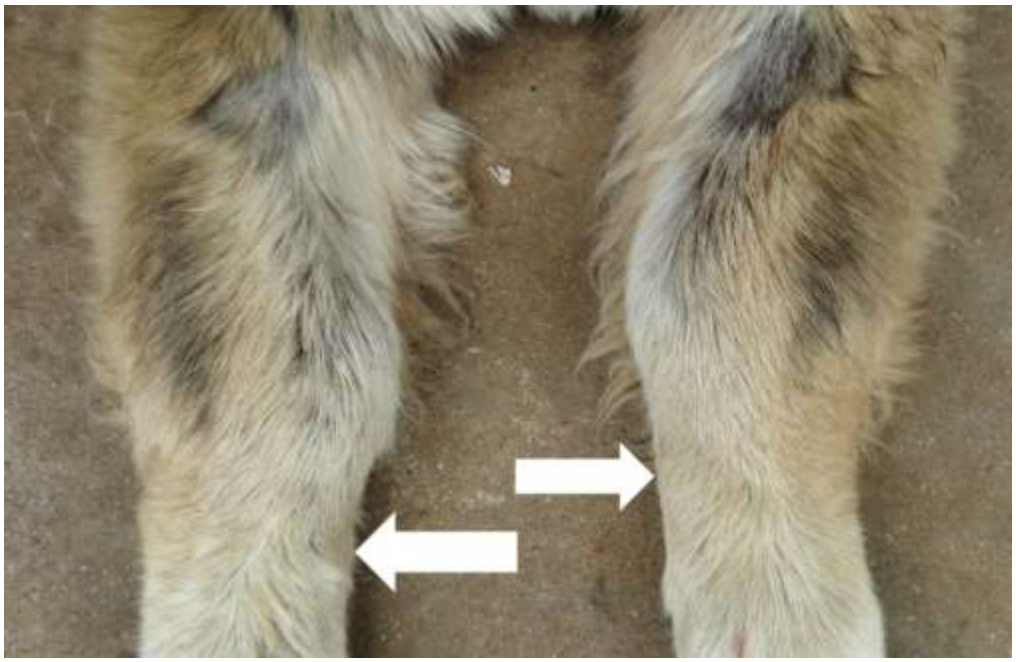

Figure 1. Dorsal photographic view of the forelimbs of a six-month-old male Caucasian Shepherd crossbreed dog with metaphyseal osteopathy. Note the presence of bilateral swelling of the distal antebrachial metaphyseal region. Lateral deviation of the foot (carpal valgus) is also seen (white arrows).

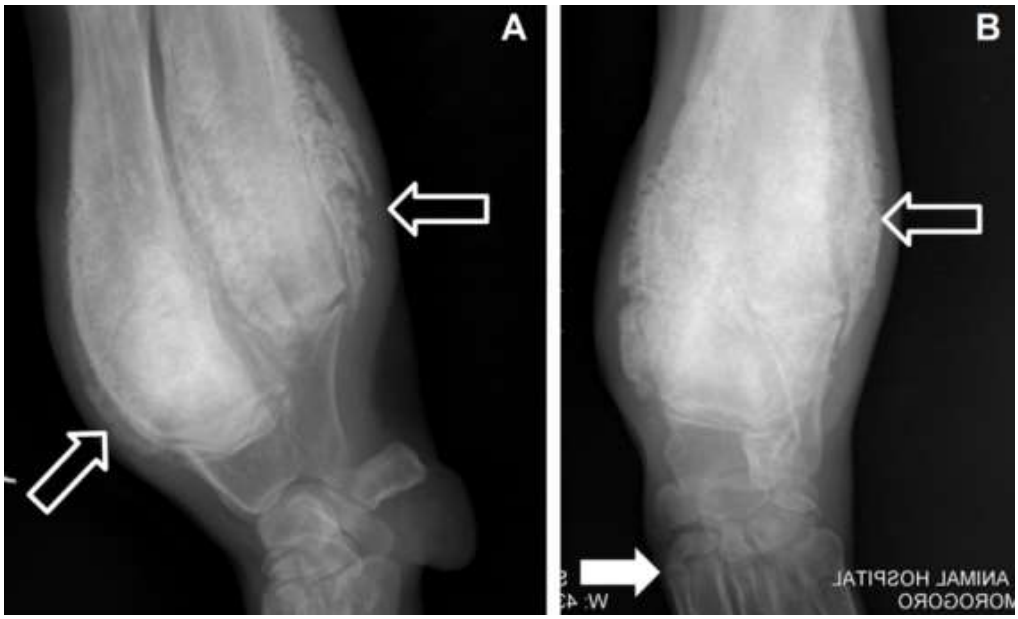

Figure 2. Mediolateral (**A**) and craniocaudal (**B**) radiographic views of the distal radius and ulna of a six-month-old male Caucasian Shepherd crossbreed dog with metaphyseal osteopathy. There is sclerosis and paracortical cuffing (open white arrows) of the distal metaphyseal region of the radius and ulna. Note the presence of the radiolucent line separating the cortices from linear mineralised opacities. Note also the cranial bowing of the radius (**A**) and lateral deviation (white arrow) of the foot (carpal valgus) (**B**).

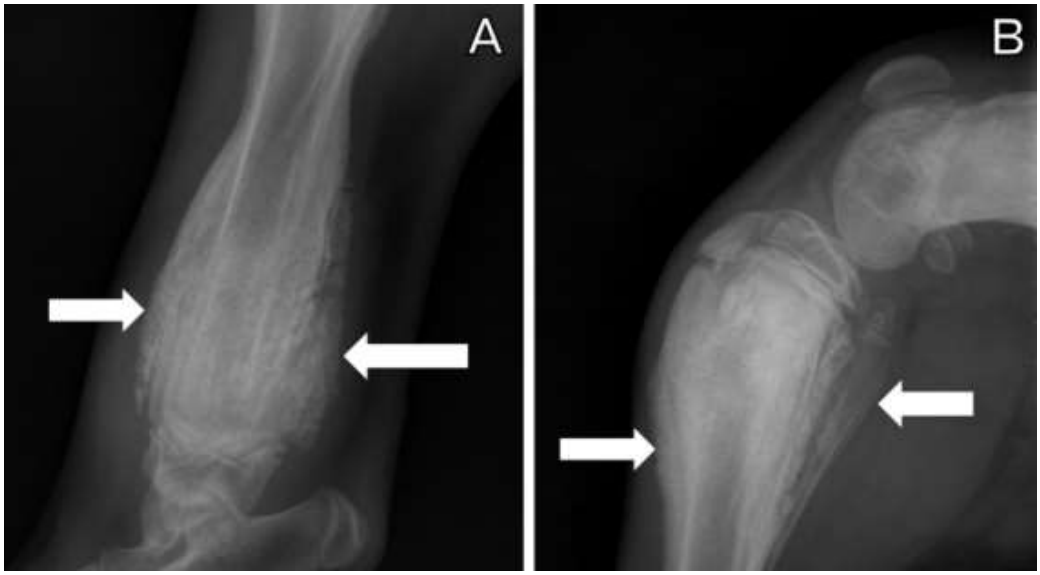

Figure 3. Mediolateral radiographic view of the distal tibia and fibula (**A**) and stifle joint (**B**) of a six-month-old male Caucasian Shepherd crossbreed dog with metaphyseal osteopathy. Sclerosis and paracortical cuffing are present in the distal metaphyseal region of the tibia and fibula (**A**) and proximal metaphyseal region of the tibia and fibula (**B**). Note the presence of fusion between the metaphyseal collar and the underlying cortex giving a cortical thickening appearance. The distal femur is also affected (**B**).

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DISCUSSION

In domestic dogs, metaphyseal osteopathy is frequently seen in large and giant breeds mainly at the age of three to eight month (Ӧzer and Altunatmaz, 2004; Safra *et al.*, 2013; Greenwell *et al.*, 2014) and males are affected more often than females (Lenehan and Fetter, 1985; Ӧzer and Altunatmaz, 2004; Camplesi *et al.*, 2013) as it was seen in this case. The clinical signs observed in this dog such as fever, anorexia, bilateral ocular discharges, and hard painful bilateral swelling of the distal antebrachial and crural metaphyseal regions have also been reported in other dogs with metaphyseal osteopathy (Grondalen, 1976; Woodard 1982; Ӧzer and Altunatmaz, 2004; Safra *et al.*, 2013; Greenwell *et al.*, 2014). Further, neutrophilia and monocytosis, which were detected on haematology, have also been encountered in other dogs with metaphyseal osteopathy (Woodard 1982; Safra *et al.*, 2013; Greenwell *et al.*, 2014). Gastrointestinal and neurological signs have also been documented to occur in dogs with metaphyseal osteopathy (Ӧzer and Altunatmaz, 2004; Greenwell *et al.*, 2014). However, they were not observed in this case.

Metaphyseal paracortical cuffing, increased in opacity of metaphyses, and angular deformities, which were observed on radiographic examination, have also been seen in other cases of metaphyseal osteopathy (Grondalen, 1976; Lenehan and Fetter, 1985; Stander and Cassel, 2016). Increased in opacity of the metaphyses is the result of superimposition of paracortical cuffs on the metaphysis (Stander and Cassel, 2016). Further, angular deformities observed in this case are believed to be the result of growth rate discrepancies between the radius and ulna (Lenehan and Fetter, 1985). Radiological signs of metaphyseal osteopathy are divided into three phases; early, late and inactive stages (Stander and Cassel, 2016). The early stage is characterised by the presence of an irregular radiolucent line in the metaphyses of long bones, parallel and adjacent to the radiolucent physis/ growth plate (Stander and Cassel, 2016). It may also accompanied by swelling of the surrounding soft tissues (Stander and Cassel, 2016). In the late stage, there is formation of metaphyseal paracortical cuffing, characterised by linear mineralised opacities parallel to the cortices separated from them by a radiolucent line (Stander and Cassel, 2016). Fusion of the metaphyseal collar with the underlying cortex giving a cortical thickening appearance is usually observed during the inactive stage (Stander and Cassel, 2016). Visualisation of the metaphyseal paracortical cuffing with some areas of fusion between the metaphyseal collar and the underlying cortex in this case most likely indicates an intermediate phase between the late and inactive stages.

Several theories have been proposed on the aetiology and pathogenesis of metaphyseal osteopathy in dogs (Lenehan and Fetter, 1985; Safra *et al.*, 2013; Greenwell *et al.*, 2014) including a multifactorial cause (Rendano *et al.*, 1977; Safra *et al.*, 2013). However, the exactly aetiology remains unknown (Rendano *et al.*, 1977; Lenehan and Fetter, 1985). Factors including overnutrition, hypovitaminosis C and infective agents such as canine distemper have been proposed as aetiological factors (Ӧzer and Altunatmaz, 2004). Fever, bilateral ocular discharges and neutrophilia observed in the present case suggests the presence of an infective agent.

Therefore, the latter should be considered as one of the aetiological factors in the present case. It is most likely the presence of an infective agent, breed predisposition, and over supplementation of mineral have played a role in the development of the disease in this case (Lenehan and Fetter, 1985; Stander and Cassel, 2016; Safra *et al.*, 2013; Greenwell *et al.*, 2014). Treatments for metaphyseal osteopathy are non-specific (Safra *et al.*, 2013). Administration of corticosteroids and supportive care such as fluid therapy and broad spectrum antibiotics are recommended to alleviate pain, pyrexia

and malaise (Safra *et al.*, 2013) as it was done in this case. However, a bony change that is paracortical cuffing requires several months for resorption (Piermattei *et al.*, 2006). Breeds at high risk of developing metaphyseal osteopathy, if presented with lameness, metaphyseal pain and fever at a young age, metaphyseal osteopathy should be considered as a differential diagnosis. Further, radiographic examination is recommended for early diagnosis and to rule out other conditions, which can result in similar clinical signs such as nutritional secondary hyperparathyroidism, septic polyarthritis, retained cartilaginous cores and hypertrophic osteopathy (Greenwell *et al.*, 2014). Moreover, repeated radiographs at a 72-hour interval from the onset of clinical signs are recommended and may be necessary to confirm a diagnosis of metaphyseal osteopathy (Rendano *et al.*, 1977; Safra *et al.*, 2013).

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