

Occurrence of ante-brachial deformities in growing dogs

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Deformities of the ante-brachium are frequently reported in growing dogs (Thorp 1994) of large breeds like Great Dane (Ramadan and Vaughan 1978). Trauma to the limb with or without radiographically visible fracture can induce such closures of the physis. The distal ulnar physis is vulnerable for such premature physeal closures leading to reduced growth of the ulna predisposing to carpus valgus, cranial bowing of radius, carpal laxity, and carpal and elbow subluxation. Angular deformities are also seen in association with metabolic bone diseases such as hypertrophic osteodystrophy, retained cartilage core and nutritional secondary hyperparathyroidism (Johnson *et al.* 1995).

Marcellin Little *et al.* (1998) reported 0.74% incidence of angular deformities in dogs. A preliminary study showed as high as 34.82% of growing dogs (aged up to 1 year) with growth defects and attributed it to metabolic bone diseases (Kushwaha 2003). The high incidence of the deformities may be attributed to imbalanced diet provided to the dogs. Balanced canned diet is not available in the market and the dogs are normally fed on the kitchen leftovers. Such growth deformities were also reported in organized dog breeding and training centres at Meerut Cantonment and Takenpur (Aithal *et al.* 2004). The incidence and etiopathology of the bone deformities may vary and depends on the breeds, management and feeding pattern. No systematic study is available on the incidence and etiopathology of the growth deformities, in the Indian subcontinent. Hence, the present investigation was planned to study the occurrence of antebrachial deformities and its correlation with age, sex, breed metabolic/nutritional bone disorders, clinical and radiographically measured degree of limb and bone deviations.

The occurrence of ante-brachial deformities in young growing dogs was studied in the cases presented to the referral veterinary polyclinic of the institute during January 2005 to January 2006, Data were collected regarding the age, sex

and breed of the dogs, economic status of the owner, feeding schedule since birth and litter size, history of previous litter with respect to skeletal abnormalities. About 5 ml blood, about 1 mL was used for estimation of haemoglobin (Sahil's haemoglobinometer method), differential leukocyte count (DLC) and packed cell volume (PCV) by microhaematocrit method. Plasma obtained from 4 mL blood was used for estimation of calcium by Webster's method, inorganic phosphorus by Gomorri's method, total protein and albumin by Biuret method, urea by Dam method, creatinine by alkaline picrate method, and alkaline phosphatase by Kind and King method.

The type of ante-brachial deformities was classified based on inherent functional disorders such as hypertrophic osteodystrophy, premature closure of physis, rickets and retained cartilage core, as revealed by clinical, radiographic and biochemical studies. Classification was also done based on angular deformities like carpus vulgus, carpus varus, relative shortening of ulna, and cranial bowing of radius and elbow subluxation. Clinically measured limb deviation was graded as: 1 (10-25°), 2 (25-40°) and 3 (more than 40°). Similarly, radiographically measured limb deviation was graded as 1 (10-20°), 2 (20-30°) and 3 (30-40°). The relationship between the type of deformity vs age, breed, economical condition of the owner, physical status of the animal, and sex was analyzed using Chi Square test.

Growth disturbances of the canine antebrachium especially of the distal extremity resulting in alignment defects are commonly encountered and are well documented in literature (O'Brien *et al.* 1971, Ramadan and Vaughan 1978, Fox 1984, Fox *et al.* 2006). In the present study we recorded trauma, hypertrophic osteodystrophy, nutritional secondary hyperparathyroidism and retarded endochondral ossification as the main causes of ante-brachial deformities. In present study, 12 cases with closure of distal ulnar physis were recorded. Distal forelimb deformities can be attributed to a variety of etiologies like trauma, hypertrophic osteodystrophy, nutritional secondary hyperparathyroidism, retarded endochondral ossification and genetic causes (Newton 1974). The usual cause of ante-brachial deformity

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is trauma but history seldom suggests injury as a definite cause. The most common forelimb defect is premature or incomplete closure of distal ulnar physis. It can also develop due to incomplete or premature closure of the distal radius but it happens only rarely.

In the present study 23.28% of the young growing dogs of less than 1-year were affected with forelimb growth disturbances leading to limb deformity. In dogs, growth plate closure is completed within the 1st year of life (Carlson 1967). Vaughan (1976) identified trauma due to high activity and the co-existing nutritional bone disorders in some puppies as another reason of injury leading to antebrachial deformities.

In the present population of young dogs, non-descript dogs were maximum (27.25%), followed by Spitz (25.87%) and German Shepherd (22.49%). But the angular deformity of forelimb was encountered in maximum number in German Shepherd (25%, 22/88) followed by non-descript dogs (22.7%, 20/88) and Great Dane (21.5%, 19/88). Our results are in accordance with the findings of Ramadan and Vaughan (1978) who reported that dogs of the large breeds are predisposed to early closure of distal ulnar growth plate. The young dogs of the large breeds due to their weight and vigorous activity predispose them to local bruising and joint sprains in the forelimb. The distal end of the forearm is liable to accept the greatest strain during landing from jumps, trauma, fall from a height and fighting (Ramadan and Vaughan 1978).

Breed-wise occurrence of forelimb deformities showed that 79.2% of the total young Great Danes, 66.65% young Rottweillers, 27.27% young Labradors, 25.8% young German Shepherds and 100% young Dalmatians were affected. This emphasized that puppies of large and active breeds were more prone to growth disturbances of forelimbs (Ramadan and Vaughan 1978).

In present study the time of reporting was when the age of the pups was 4-6 months (42%), when the premature closure of the distal ulnar growth plate usually appears and in most of the cases the owners were unaware of the start of the deformity (Ramadan and Vaughan 1978). Similar findings were recorded by O'Brien *et al.* (1971) who found the average age as 4 months or less.

Nutritional status and presence of metabolic bone disorders in individual dogs may play a vital role in the development of the disease in different breeds. The higher limb deviation in Dobermans could be due to inherent bone weakness (lower cortical index) and more susceptibility to osteopenic bone disorders (Kumar 2003). A higher limb deviation angle in dogs was found, which were reared by lower class owners, fed with kitchen leftover due to poor accessibility to nutritious food deficient in calcium and other minerals required for normal growth and development of bones.

A significantly higher deviation was recorded in 3-6

months of age group. The results are in accordance with the observations of Ramadan and Vaughan (1978). Ramadan and Vaughan (1978) observed a preponderance of males with ante-brachial defect, but they did not find any evidence for a sex predisposition. It may be hypothesized that a higher aggressiveness/activity of male dogs and also preference for male animal make them prone to more trauma and hence the ante-brachial defect.

Dogs with poor general body condition due to weak bones as a result of poor nutrition showed a significantly high limb angulations leading to stress and trauma compared to those with fair and good body conditions, which are resistant to trauma (Ramadan and Vaughan 1978).

It was observed that the degree of limb deviation in the cases of rickets was significantly higher than nutritional secondary hyperparathyroidism (NSH), retained cartilage core (RCC), hypertrophic osteodystrophy (HOD) and physal closure (PC). Barden (1965) reported that bowing of forearm in great Dane puppies could result from excessive feeding of vitamin D and calcium or in deficiency condition (like rickets as found in the present study). Newton (1974) considered hypertrophic osteodystrophy and secondary hyperparathyroidism among the common causes of growth plate disturbances. In the present study also, HOD, NSH and retarded endochondral ossification were some of the conditions, which caused the ante-brachial limb deformities in growing dogs.

No significant relationship was recorded between Hb, PCV, total protein and DLC and the clinically measured angular limb deviation and that could be due to metabolic aberrations rather than trauma. Kushwaha (2003) also reported normal Hb, PCV, slight lower total protein levels in growing dogs with HOD, RCC, and NSH.

Mean value of alkaline phosphatase in mild, moderate and severe angulation groups were higher than the normal physiological limits. Kushwaha (2003) also found a wide variation in ALP activity in dogs affected with different skeletal abnormalities such as RCC but a high or normal ALP level in dogs affected with NSH. In the present study, A significantly higher ALP activity was found in severe angulation group such as rickets as compared to mild angulation group because of an increase in bone specific ALP and increased osteoblastic activity. The observation was also supported by Kushwaha (2003) who also recorded a high ALP activity in rachitic dogs. A significantly high BUN, creatinine, calcium and phosphorus levels, but in normal limits, were found in severe angulation group as compared to mild angulation group. Kushwaha (2003) also observed increased plasma urea concentration in dogs affected with rickets, NSH and other metabolic bone disorders. The increase in calcium and phosphorus reflect drainage of minerals from bone due to NSH. Though the higher BUN levels were found in different groups, a renal disease may not be suspected since the urea levels were in normal limits.

SUMMARY

The ante-brachial deformities were studied in the growing dogs. It was found that the deformity was more in very young age of large breeds of dogs. The deformities were recorded in dogs with poor body condition and reared with kitchen leftover. NSH, RCC, HOD and PC were some of the causes of such deformities. Elevated levels of biochemical indices were recorded in these dogs.

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