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Veterinary Case Study

A CASE OF ECTRODACTYLY IN A CHOW CHOW DOG

T. Tchaprazov[1], D. Kostov [2], D. Vladova[3]

[1]Department of Veterinary Surgery, [2]Department of Veterinary Anatomy, Faculty of Veterinary Medicine, [3]Department of Morphology, Agriculture Faculty Trakia University, 6000 Stara Zagora, Bulgaria

ABSTRACT

A case of unilateral forelimb ectrodactyly (lobster claw syndrome) in a Chow Chow dog is presented. The clinical and radiological signs, specific for this congenital malformation, are described. A surgical intervention, consisting in soft tissue reconstruction and repositioning of the radius and ulna, was performed. The presented case is unique for our country for this canine breed and, furthermore, one of the first cases of therapeutic intervention via plastics of the skin cleft with additional stabilization of the carpal joint by placing a wire cerclage of the radius and the ulna.

Key Words: ectrodactyly, dog, cleft reconstruction

INTRODUCTION

Ectrodactyly is one of congenital limb malformations in the dog (Mann et al., 1992; Hoskins, 1995; Çetincaya & Olcay, 2006) Ectrodactyly is a generic term describing a rare congenital malformation related to the lack of one or more structural elements of the distal limb parts as a result of impairment during embryonic development (Jubb et al., 1988; Olivera et al , 2002). In later periods, the state is manifested as splitting of hard and soft tissues (Pratschke, 1996; Olivera et al, 2002). In veterinary medicine, the term ectrodactyly is used to describe anomalies in animals with five digits, even when all of them are developed. Very often, ectrodactyly is accompanied by aplasia or hypoplasia of various bones of the carpus, subluxations and luxations of the carpal and elbow joints (Montgomery & Tomlinson, 1985; Jubb et al., 1988). The disease is also known as hypodactyly, oligodactyly, lobster claw syndrome or split-hand deformity (Kogan et al., 2001). Both recessive and dominant forms of the malformation are known. Most commonly, the first and the second digits of the thoracic limbs are affected, predominantly unilaterally (Innes et al., 2001).

This condition was reported in various reptiles, rodent species as well as in mammalians, including dogs (Carrig et al., 1981; Pratschke, 1996; Innes et al., 2001; Olivera & Artoni, 2002; Barrand, 2004). In the veterinary literature, 25 cases of canine ectrodactyly are reported in English. Out of them, two cases were in the Chow Chow breed (Barrand, 2004). The described case is unique for this canine breed in Bulgaria.

The aim of the study was to perform an operative intervention consisting in soft tissue reconstruction , positioning of the radius and ulna with additional stabilization (fixation) of the carpal joint.

MATERIAL AND METHODS

The study was performed in a 3-month old male Chow Chow dog, referred for examination and treatment to the Small Animal Clinic at the Faculty of Veterinary Medicine, Stara Zagora, Bulgaria.

The radiological examination was done on a stationary X-ray unit (TUR–800). The site of deformation, determined by physical examination, was radiographed in mediolateral and dorsopalmar views.

The skin plastics of the severely deformed and mal-positioned second digit and the placement of wire cerclage for fixation of the radius and ulna were done under genera; inhalation anaesthesia. The patient was pre-treated with atropine sulphate (Sopharma, Bulgaria) at 0.02 mg/kg s.c. The induction of

* **Correspondence to**: *T. Tchaprazov, Department of Veterinary Surgery, Faculty of Veterinary Medicine, 6000 Stara Zagora, Bulgaria*
Tz_chaprazov@yahoo.com

anaesthesia was performed with xylazine 2% (*Alfasan International B.V., Werden, Holland*) and 15 min later, with ketamine 10% (*Alfasan International B.V., Werden, Holland*). After endotracheal intubation, the anaesthesia was maintained with halothane (Narcotan®, Leciva, Czech Republic, 2.5-3 vol%), oxygen flow of 2-3 L/min. A semi-open breathing circuit with a Fluotec Mark III vaporizer was used for this purpose.

After routine aseptic preparation of the operation field, the skin cleft was closed by creation of simple opposing skin flaps and non-resorbable suture material. The wire cerclage on the radius and ulna was placed using a medial operative approach. After creation of holes in both bones, a hemicerclage wire was placed. The sutures were removed 10 days after the reconstruction.

In the post operative period, the patient was treated with lincomycin/spectinomycin 5/10 (*Alfasan International B.V., Werden, Holland*) at a dose of 1 ml/5 kg for 5 days and dexamethasone (*Alfasan International B.V., Werden, Holland*) at 0.7 ml daily for 3 days.

RESULTS

The 3-month-old Chow Chow exhibited signs of lameness and an atypical posture of the right forelimb. The owner reported that it was the only puppy with such clinical signs from a litter of 6 newborns.

Clinically, there was a deformation in the distal parts of the forelimb manifested by lack of the first digit, atypical position of an apparently shortened second digit that lay entirely under the footpads (**Figure 1**). The affected limb had only 4 digits and a long interdigital skin cleft. In the region of the right forelimb carpal joint, a marked lateral flexion under an angle of 150° was visible (**Figure 2**). The radiography showed a wide antebrachial space between the radius and the ulna, particularly visible at their distal epiphyses, forming an unclear carpal joint (**Figure 3**).
The characteristic proximal and distal bone rows were absent. The distal radioulnar joint was lacking and this resulted in separation of carpal bones. In the radiocarpal joint, the radius articulates with the intermediate carpal bone, and the latter – with the first carpal bone. At the ulnocarpal joint, the distal ulnar epiphysis is joined with single and atypically positioned carpal bones. The origin of the first digit was absent and this was accompanied with irregular number of phalanges of the second digit.

Figure 1. *Palmar view of affected paw. The first digit is lacking, the second digit is abnormally positioned. 3 months old*

Figure 2. *Dorsal view of the limb with a marked lateral flexion under an angle of 150°. 3 months old*

Figure 3. *Dorsopalmar radiograph of the carpal joint. 3 months old*

After the operative intervention, a satisfactory stability of the carpal joint was achieved. The control examination of the patient, performed at the age of 6 months, showed radiographically a displaced proximal epiphysis of the radius that was positioned in front of the humeral trochlea. Thus, the articular circumference of radius was not joined with the radial notch of the ulna. The

proximal displacement of the radius was most probably related to the absence of ligaments between radius, ulna and humerus that led to a secondary luxation of the elbow after the operation (**Figure 4**). The Ulnar anconeal process and the trochlear notch of the ulna are positioned in a normal manner against the humeral trochlea and the olecranon fossa and ensured the partial motion of the elbow joint.

Figure 4. Mediolateral radiograph of the elbow joint. 6 months old

The results from the repositioning of the deformed digit only, by soft tissue reconstruction in the region, were satisfactory from a therapeutic point of view and no complications occurred during the postoperative period after the manipulation.

DISCUSSION

In the narrow sense, ectrodactyly designates a congenital reduction of the number of digits of the hand, foot or paw. Sometimes, in veterinary medicine, this term is, by exception, used to indicate a skin lesion of the paw because of the inconsistence of using the human medical term “split-hand deformity”.

During embryonic development, the middle and distal parts of the forelimb are formed from three parallel rays.. The medial one forms the radius, the joined carpal bones and the phalanges of the first digit; the central – carpal and metacarpal bones and the phalanges of the second digit; and the lateral ray forms the ulna, the carpal bones joined to it and the phalanges of the III, IV and V digits. In the dog, the malformation is primarily due to abnormalities in the medial and central ray (Carrig et al., 1981; Barrand, 2004). Many of the described clinical cases however present different findings, thus confirming the heterogeneity of the disorder.

Frequently, ectrodactyly develops independently or as a syndrome related to other defects, such as ectrodactyly-ectodermal dysplasia and cleft palate syndrome (Roelfsema & Cobben, 1996).

In the human and some laboratory animal species, the unilateral ectrodactyly could be caused by teratogens (Collins et al., 1991; Sanders & Stevens, 1991; Aulthouse & Hitt, 1994).

Similar to the described clinical case, canine ectrodactyly could be related to congenital elbow luxation (Carrig et al., 1981; Innes et al., 2001). In breeds with predisposition to congenital elbow dysplasia, ectrodactyly could never be observed (Cook, 2001). In other words, ectrodactyly could provoke shoulder luxation, but the contrary is not true.

The treatment of ectrodactyly in the dog is determined by the severity of clinical signs (Pratschke, 1996). The application of methods used in human medicine is limited because of the functional differences in human hand and animal paw. The conservative therapy in dogs is with limited application (Montgomery et al., 1989). The extremely severe cases require amputation of the affected limb (Pratschke, 1996). Some clinical cases are treated by carpal joint arthrodesis (Guerrero & Montavon, 2005). For the first time, the simple reconstruction of the skin cleft was described by Barrand (2004) in a moderate ectrodactyly in a dog. In this case, the simple reconstruction could be successfully used for restriction of limb deformation

CONCLUSION

The ectrodactyly in the dog is a heterogeneous disorder and the therapy should be in compliance with every single case.

The method applied by us could be successfully used in growing animals whose growth is not yet completed in order to restrict limb deformations due to impaired bone arrangement, but without a marked therapeutic effect. In severe congenital malformations of this type, the medial panarthrodesis of the carpal joint could be an alternative method.

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