

*Clinical Report*

## Ectrodactyly in a Mix Breed Dog

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### Abstract

**Case Description-** A 3-month-old, female mixed breed dog was presented to the Veterinary Teaching Hospital of Ferdowsi University with an obvious deformity in its right forelimb.

**Clinical Findings-** In clinical examination, there was a separation from elbow joint to the end of digits and a long skin cleft between these separated regions was seen. Radiographic examination revealed a wide space between the radius and the ulna with a separated carpal joint. The limb had five digits which three of them were at the ulnar side and the others were at radial side. The characteristic proximal and distal carpal bone rows and distal radioulnar joint were absent.

**Treatment and Outcome-** According to the clinical and radiographic findings the ectrodactyly was diagnosed, but upon to the owner' disagreement, the amputation was not done.

**Clinical Relevance-** Ectrodactyly is a rare anomaly which can usually be treated surgically. In extremely severe cases such as the case described, amputation of the affected limb should be done.

**Key words:** Dog, Ectrodactyly, Lobster Claw Syndrome, Congenital Malformation.

### Introduction

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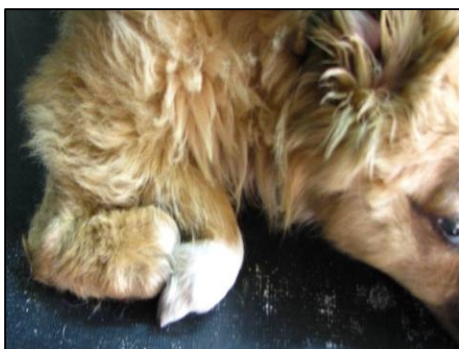
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Ectrodactyly is one of congenital limb malformations in dogs. Ectrodactyly is a generic term referring to a reduction in normal number of digits on a limb.<sup>1</sup> The term has been used to describe a rare congenital anomaly associated with a paraxial deficiency in one or more elements of the distal limb in a developing embryo.<sup>2</sup> In later periods, the state has been manifested as splitting of hard and soft tissues.<sup>3</sup> In veterinary medicine the term ectrodactyly is used to describe anomalies in animals which have five digits, even when all of them are developed. Sometimes, ectrodactyly is accompanied by aplasia or hypoplasia of various bones of the carpus, subluxations of the carpal and elbow joints.<sup>4</sup> It is also known as hypodactyly, oligodactyly, lobster-claw syndrome and split-hand deformity.<sup>5</sup> Both recessive and dominant forms of the malformation have been known. The malformation occurs predominantly unilaterally and very often, it affects the first and the second digits of the thoracic limbs.<sup>6</sup> This condition has been reported in various mammalian species including dogs,<sup>5</sup> cats,<sup>7</sup> sheep,<sup>8</sup> primates,<sup>9</sup> and human beings.<sup>10</sup> It has also been described in amphibians.<sup>11</sup> In this report, the radiographic appearance of ectrodactyly in a puppy is described.



◀ **Figure 1.** Dorsal view of affected limb. The affected limb entirely separated from elbow joint to the distal extremity of digits.



◀ **Figure 2.** Radiograph showing the mediolateral aspect of the affected forepaw. As it can be clearly seen there is a wide space between the radius and the ulna. The third carpal bone is absent. U E: Distal Ulnar Epiphysis, R: Radius, U: Ulna, R E: Distal Radial Epiphysis, A C B: Accessory Carpal Bone, R C: Radial Carpal Bone, U C: Ulnar Carpal Bone, C 1: 1st Carpal Bone, C 2: 2nd Carpal Bone, C 4: 4th Carpal Bone

### Case Description

A three-month-old, female mixed breed puppy was referred to small animal surgery section at the Faculty of Veterinary Medicine, Ferdowsi University, Iran. The puppy had an obvious deformity in its right forelimb. It could not use the affected limb. The owner said that this was the only dog affected out of all newborns.

Clinically, there was a separation from elbow joint to the end of digits. There was a long skin cleft between this separated regions (Fig. 1). The radiological evaluation was done (Fig. 2). The affected limb had five digits which three of them were at the ulnar side and the others were at radial side. The radiographs showed a wide space between the radius and the ulna,

particularly visible at their distal epiphyses, forming a separated carpal joint. The characteristic proximal and distal carpal bone rows and distal radioulnar joint were absent.

### **Treatment and outcome**

Based on clinical signs and radiographic findings, a diagnosis of ectrodactyly was made. According to previous study by Pratschke in 1996 in extremely severe cases such as the case described, amputation of the affected limb should be done. But because of the owner's disagreement the operation was not undertaken.

### **Discussion**

Ectrodactyly refers to a congenital reduction in the number of digits on an affected hand, foot or paw. However, in the veterinary literature the term has been used synonymously describe a cleft manus lesion, even when five digits are present. This may be due to a reluctance to use the terms split-hand or cleft-hand when referring to animals. In human embryos, three parallel development areas (rays) form in the limb bud and coalesce to form the hand and carpus. The radial ray forms the radius, associated carpal and metacarpal bones and phalanges of the first digit. The medial ray forms the carpal and metacarpal bones and phalanges of the second digit. The ulnar ray forms the ulna, the carpal and metacarpal bones and phalanges of third, fourth and fifth digits.<sup>12,4</sup> In the dog of this report it would appear that abnormal development was mainly because of the incomplete fusion between the medial ray and ulnar ray. Radiographical features of canine ectrodactyly include axial separation between metacarpal bones; abnormal carpal bones, metacarpal bones and phalangeal bones; syndactyly; and soft tissue contractures.<sup>4</sup> All these features were present in the case described here.

According to the fact that none of the cases described in the veterinary literature are identical, canine ectrodactyly is a very heterogenous disorder, even the one bilaterally affected case was not symmetrically affected.<sup>4</sup> In humans, split-hand anomaly is a very variable disorder and human classification systems leave much to be desired<sup>1</sup>. The heterogeneity seen in canine ectrodactyly makes classification of the anomalies difficult.

Ectrodactyly in cats is inherited in an autosomal dominant manner<sup>7</sup> but the cause(s) of ectrodactyly in dogs are unknown. There is an evidence to support a developmental mechanism for cleft-hand and ectrodactyly based on a specific deficiency of the apical ectodermal ridge in the primordial limb bud.<sup>5</sup> The role of some teratogens in humans and some laboratory animal species in induction of ectrodactyly has been reported.<sup>13,14</sup> Although this may be misleading due to the low number of cases reported, a possible non-hereditary basis for canine ectrodactyly deformity is suggested because there is a low incidence of bilaterally affected cases and also a lack of clear breed predisposition<sup>4</sup>. Inspire of the fact that there is not a clear hereditary basis for canine ectrodactyly, some authors advocate either not breeding from affected individuals or neutering them.<sup>3,15</sup>

Similar to the described clinical case, canine ectrodactyly could be related to congenital elbow luxation.<sup>4,6</sup> In breeds with predisposition to congenital elbow dysplasia, ectrodactyly could never be observed.<sup>15</sup> In other words, ectrodactyly could provoke elbow luxation, but the contrary is not true.

The treatment of ectrodactyly in dogs is determined by the severity of clinical signs.<sup>3</sup> The application of methods used in human medicine is limited because of the functional differences in human hand and animal paw. Simple cleft reconstruction may be of value in mild cases which show no concurrent elbow and minimal carpal joint incongruity or

instability.<sup>5</sup> The extremely severe cases such as the one described here require amputation of the affected limb.<sup>3</sup>

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## گزارش یک مورد اکتروداکتیلی در یک توله سگ ماده در ایران

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**توصیف بیمار و یافته های بالینی** - یک توله سگ ماده سه ماهه با حالت غیر طبیعی آشکار در اندام حرکتی قدامی سمت راست به بخش جراحی دانشکده دامپزشکی دانشگاه فردوسی مشهد ارجاع داده شد. در بررسی بالینی اندام مبتلا وجود یک جدادگی از ناحیه ی آرنج تا نوک انگشتان مشخص گردید که این جدادگی منجر به قرار گرفتن سه انگشت همراه با استخوان اولنا در یک سمت و دو انگشت دیگر همراه با استخوان رادیوس در سمت دیگر گردیده بود. شدت ضایعه منجر به عدم توانایی حیوان جهت وزن گیری بر روی عضو مبتلا گشته بود. بررسی تاریخچه نشان داد که این سگ تنها توله ی مبتلا به این عارضه از بین تمام نوزادان متولد شده در یک زایش می باشد. جهت بررسی بیشتر از اندام مبتلا رادیوگرافی تهیه شد. در بررسی رادیوگرافی وجود فضای بسیار عریض بین استخوان های رادیوس و اولنا به خصوص در ناحیه ی دیستال دو استخوان که همراه با ایجاد فاصله بین استخوان های مفصل کرب می باشد مشخص گردید

**درمان و نتیجه آن** - بر اساس یافته های به دست آمده از معاینات بالینی و بررسی های رادیوگرافی ضایعه ی بیمار اکتروداکتیلی تشخیص داده شد که به علت عدم رضایت صاحب دام عمل مورد نظر انجام نگرفت.

**کاربرد بالینی** - بر طبق مطالعات گذشته در موارد بسیار شدید این بیماری از جمله بیمار توصیف شده قطع عضو مبتلا بهترین روش درمانی می باشد.

**کلید واژگان** - اکتروداکتیلی، سگ، نقائص مادرزادی.

