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Clinical Report

Unilateral Forelimb Polydactyly (Type II) with Contracted Tendon in a Female Calf and its Correction by Surgical Intervention

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ARTICLE INFO	ABSTRACT
<p><i>Article History:</i></p> <p>Received 22 February 2023 Revised 11 March 2023 Accepted 5 April 2023 Online 5 April 2023</p> <hr/> <p><i>Keywords:</i></p> <p>Polydactyly; Contracted tendon Calf</p>	<p>Polydactyly is a malformation characterized by the presence of one or more additional digits that usually occurs solitarily or rarely together with other developmental or inheritable anomalies such as contracted tendon. A 5-day-old mixed native breed calf presented to the clinic of faculty of veterinary medicine of Razi University (Kermanshah, Iran) with extra digits (polydactyly) and contracted tendon in the right forelimb. The calf was born during normal delivery without intervention and had normal clinical symptoms in the examination. In physical examinations, an extra part was seen in the right forelimb with distinct metacarpus and digits, and also contracted tendon was evident in the main digits. Regarding the inability of the calf to locate the affected limb on the ground normally, surgical intervention was performed to remove extra digits and resolve the contracted tendon. Case follow up showed a good improvement and the calf had a normal life.</p>

Introduction

Congenital malformations of the limbs are among the most frequent congenital anomalies found in humans and animals.¹ Polydactylism is a malformation characterized by the presence of one or more additional digits. This anomaly has been described in humans and animals; e.g. birds,^{2,3} cats,⁴ dogs,^{5,6} horses,⁷⁻⁹ camel,¹ and cattle,¹⁰⁻¹² and they preferentially affect the distal part.¹³ Although, the frequency is much less in cattle and affected calves show abnormalities in forelimb compared to hind limb.^{10,11} According to the literature,

this malformation occurs solitarily or rarely together with other developmental or inheritable malformation such as contracted tendon.¹³ Surgical removal of the supernumerary digits is recommended to restore normal limb conformation and preventing lameness.^{1,14} There are few reports of unilateral polydactyly in calves in the available literature, and only bilateral polydactyly in hind limbs was reported in Iran.¹⁵ This report describes concurrent unilateral forelimb polydactyly (type II) with accompany contracted tendon in a 5-day-old mixed native breed calf. Also, the successful treatment of the conditions with surgical intervention is reported.

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Case Description

A 5-day-old female mixed native breed calf, 14.5 kg weight, presented to the Clinic of Faculty of Veterinary Medicine of Razi University (Kermanshah, Iran) with unilateral forelimb polydactyly and contracted tendon of unknown origin. The calf was born during normal delivery, and the history of this disease was not recorded in the herd. The clinical signs included; heart rate (132/min), Respiratory rate (24/min), and temperature (38 °C) were in the normal range. The laboratory parameters (Complete Blood Count and hematocrit) also were in the normal range. Unfortunately, there were no necessary facilities for radiography. Physical examinations of the extra digits on the caudo-medial region of the right fore limb, showed distinct metacarpi and digits, and contracted tendon was evident in the main metacarpal of the affected limb. Since, the calf she was not able to bear weight on the affected limb, she was candidate for surgery.

Treatment and Outcome

The calf received procaine penicillin 10 mg/kg and dihydrostreptomycin sulfate 12.5 mg/kg (Pen & Strep, Norbrook Laboratories, Northern Ireland) and Flunixin meglumine (1.5 mg/kg, Rooyan Darou, Iran) both intramuscularly 30 minutes before the commencement of the surgery. The calf was sedated with xylazine hydrochloride (0.05 mg/kg, IV, Xyla 2%, Holland) and anesthetized locally (ring block) with 1% lidocaine solution. The right forelimb was prepared for aseptic surgery from the elbow down to the claws, then the skin between the extra metacarpus/digit and the main metacarpus/digit incised, following draping. The subcutaneous tissue was gently dissected with sharp and blunt dissection. The extra digits and corresponding metacarpus removed using an embryotomy wire, following hemostasis using ligation of vessels. Then, the extra superficial and deep digital flexure tendons (SDFT, DDFT) was incised and removed. Finally, the fascia and subcutaneous tissue sutured by using No. 2-0 catgut with simple continuous pattern. The skin was closed by using No. 2-0 nylon with the same pattern (Figures 1 and 2) and a sterile bandage was applied for 10 days. Postoperatively, the same aforementioned of the antibiotics and anti-inflammatory agents were continued for three consecutive days. Sutures were removed 10 days after

the operation. Case follow up for three months showed a good improvement and the calf had a normal life.



Figure 1. Intra-operative view of the dissection of the extra digits of the right forelimb.



Figure 2. The affected limb after amputation of extra digits and resolving contracted tendon.

Clinical Relevance

Polydactyly is a congenital disorder that often progresses bilaterally and rarely unilaterally.¹⁶ The occurrence of polydactylism may be due to the genetic defect or external factors (infections, toxins, management, abnormal fertility techniques) or a combination of different factors.^{1,17-19} Usually both forelimbs are affected by polydactylism, but less frequently a malformation of one or up to all four limbs is described.¹⁰ Right forelimb is usually affected in unilateral affection and most polydactylism cases show extra digit at the medial aspect of the forelimbs.^{20,21} The affected limb often shows an axial rotation,^{22,23} which was found in the calf described in this clinical case report. Polydactylism in cattle can be subdivided into seven types (Types I to VII):¹⁰ Bilateral polydactyly of both forelimbs (Type I), Unilateral polydactyly of one forelimb or one pelvic limb (Type II), Extra digits of all four limbs (Type III), Bilateral duplication of digits with dimely of the fore- or hindlimb (Type IV), a rare occurrence. Polysyndactyly (Type V), bilateral incomplete formation of metacarpus II (Type VI) and Polydactylism in combination with a malformation-complex (Type VII).^{10,23} A genetic cause is thought to be responsible for polydactylism Types I to VI and Type VII polydactylism is described to be due to environmental factors.¹⁰ Furthermore, characteristics of more than one type of polydactylism can be present in one individual.^{6,8,12}

The calf described in this present report suffered from a polydactylism Type II. Polydactylism may rarely be due to exposure to external factors during fetal development. These factors include exposure to toxins e.g., Lupines, physical forces e.g., radiation; or chemical agents. Also, cholesterol deficiency during pregnancy was reported to have adverse effects on development of limbs due to interference with the signaling pathways in rats.²⁴ In 2008, Gugjoo *et al.*, reported the successful management of bilateral hind limbs polydactyly (IV) in a nondescript calf by surgical procedure. The calf was born from a mother served with the bull having the history of polydactylism in its younger age that had been treated surgically. This suggests that the polydactylism may be of congenital origin due to sex linked recessive autosomal trait.²² Giofre *et al.*, reported the unilateral right forelimb polydactyly in a Murgese horse and according to the genetic analysis and the study of the pedigree (four generations) of the horse and the absence of a genetic problem and polydactyly in

them. They concluded that it is probably a characteristic caused by incomplete penetrance of a dominant autosomal gene or simply a spontaneous, not inherited anomaly in fetal development due to (nongenetic) exogenous causes.⁹ Ahmed (2014) reported a rare case of bilateral hind limbs polydactyly in a dromedary camel, explaining that the surgical correction of polydactylism in this camel resulted in normal locomotion, better cosmetic appearance of the limb, and better quality of life. In our report, cow and bull of the described case and their further offspring did not show any signs of polydactylism. Therefore, in this calf, polydactyly cannot exactly be attributed to a genetic source or to an abnormal development due to external causes. In order to cosmetic appearance and prevent injury to the main digits and lameness, surgical removal of the extra digits is recommended in such cases. Care should be taken to avoid damage to the corresponding joints during surgical intervention. Although, an incomplete removal of supernumerary digits may cause an insufficient cosmetic outcome and not improving a persistent lameness.^{7,17} In our case, regarding the inability of the calf to locate the affected limb on the ground normally, surgical intervention was performed to remove extra digits and resolving the contracted tendon. Case follow up showed a good improvement and the calf had a normal gait and a good quality of life.

Conflict of Interest

The authors declare no conflict of interest.

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