

Surgical correction of bilateral polydactyly in a dromedary camel: a case report

A.F. AHMED

Faculty Veterinary Medicine, Assiut University, Assiut, Egypt

ABSTRACT: The following case report describes the diagnosis and surgery of bilateral polydactyly of unknown origin in a dromedary camel. A two-year-old, 290 kg, intact female camel was admitted for surgical removal of bilateral supernumerary digits associated with the medial aspects of the metacarpi and proximal to the fetlock joints. Radiographic examination revealed bilateral polydactyly with complete fusion of metacarpal bones. Surgery consisted of an osteotomy of surplus metacarpal bones combined with amputation of the supernumerary digits. The follow-up at 12 months after surgery revealed a sound camel with an excellent cosmetic outcome.

Keywords: supernumerary; digit; congenital; anomaly; single-humped; *Camelus dromedarius*

A number of different congenital anomalies are known to occur in domestic animals (Newman et al. 1999; Noh et al. 2003; Sakamoto et al. 2004). Congenital malformations of the limbs are among the most frequent congenital anomalies found in humans and animals, and they preferentially affect the distal part (Leipold and Dennis 1987; Talamillo et al. 2005). Polydactyly is a redundancy of digits distal to the basopodium specific for a species (Barber 1990; Alam et al. 2007). Unilateral or bilateral polydactyly has been reported as a single anomaly or in combination with other congenital defects (Camon et al. 1990; Talamillo et al. 2005). Polydactyly has been reported in humans, horses, cattle, sheep, dogs, cats, llamas and guanaco (Al-Ani et al. 1998; Clark et al. 2000; Bahr et al. 2003; Giofre et al. 2004; Fayeye et al. 2006; Sakai 2006; Altenbrunner-Martinek et al. 2007; Zapata et al. 2008). In about 80% of equine cases, supernumerary digits are found in the forelimb, usually on the medial side (Giofre et al. 2004; Carstanjen et al. 2007).

Polydactyly can be classified as teratogenic, developmental (atavistic), or bilateral symmetrical inherited (Stanek and Hantak 1986). According to the literature this malformation occurs solitarily or on rare occasion together with other developmental or inheritable anomalies (Crowe and Swerczek

1985; Rousseaux and Ribble 1988; Villagomez and Alonso 1998). The aetiology is unknown but it may be inherited or due to exposure to teratogenic factors or to toxins (Clark et al. 2000; Grzeschik 2002; Giofre et al. 2004). Polydactyly is easily diagnosed by clinical examination, but radiographic examination is necessary to evaluate the extent of the osseous abnormalities associated with the extra digit, especially if surgical removal is being considered (Bani-Ismael et al. 1999; Alam et al. 2007; Zapata et al. 2008). Surgical removal of the supernumerary digit is recommended to restore normal limb conformation, thus preventing lameness and self-mutilation to the digit (Barber 1990; Carstanjen et al. 2007). Polydactyly is rare in the dromedary camel with only a single report of a unilateral case thus far (Bani-Ismael et al. 1999). The purpose of this case report is to present the clinical signs, surgical management and prognosis of bilateral polydactyly in the forelimbs of a dromedary camel.

Case description

A two-year-old, 290-kg, intact female camel was admitted for surgical removal of bilateral supernumerary digits associated with the medial aspects

of the metacarpi and proximal to the fetlock joints (Figure 1A). The supernumerary digits had been present since birth, and according to the owner, the extra digits had increased in size as the camel grew. The camel was not lame and had no history of polydactyly in its pedigree. Physical examination was within normal limits with the exception of the presence of two supernumerary digits. The supernumerary digits originated from the medial aspects of the distal half of the third metacarpal bones and extended distally for 15 cm with cornified hooves present at their distal ends (Figure 1B).

There were two movable joints within the extra digits; coffin and pastern joints that could be manipulated without difficulty. Dorsopalmar radiographs of both metacarpal regions and phalanges were obtained. Each supernumerary digit attached medially at the middle of the metacarpal bone. Three distinct bones made up the supernumerary digit. At its proximal aspect, the first bone that fused with the third metacarpal bone had an open physis at the distal end and resembled the second metacarpal bone, and the second bone had an open physis at the proximal end and constituted the first

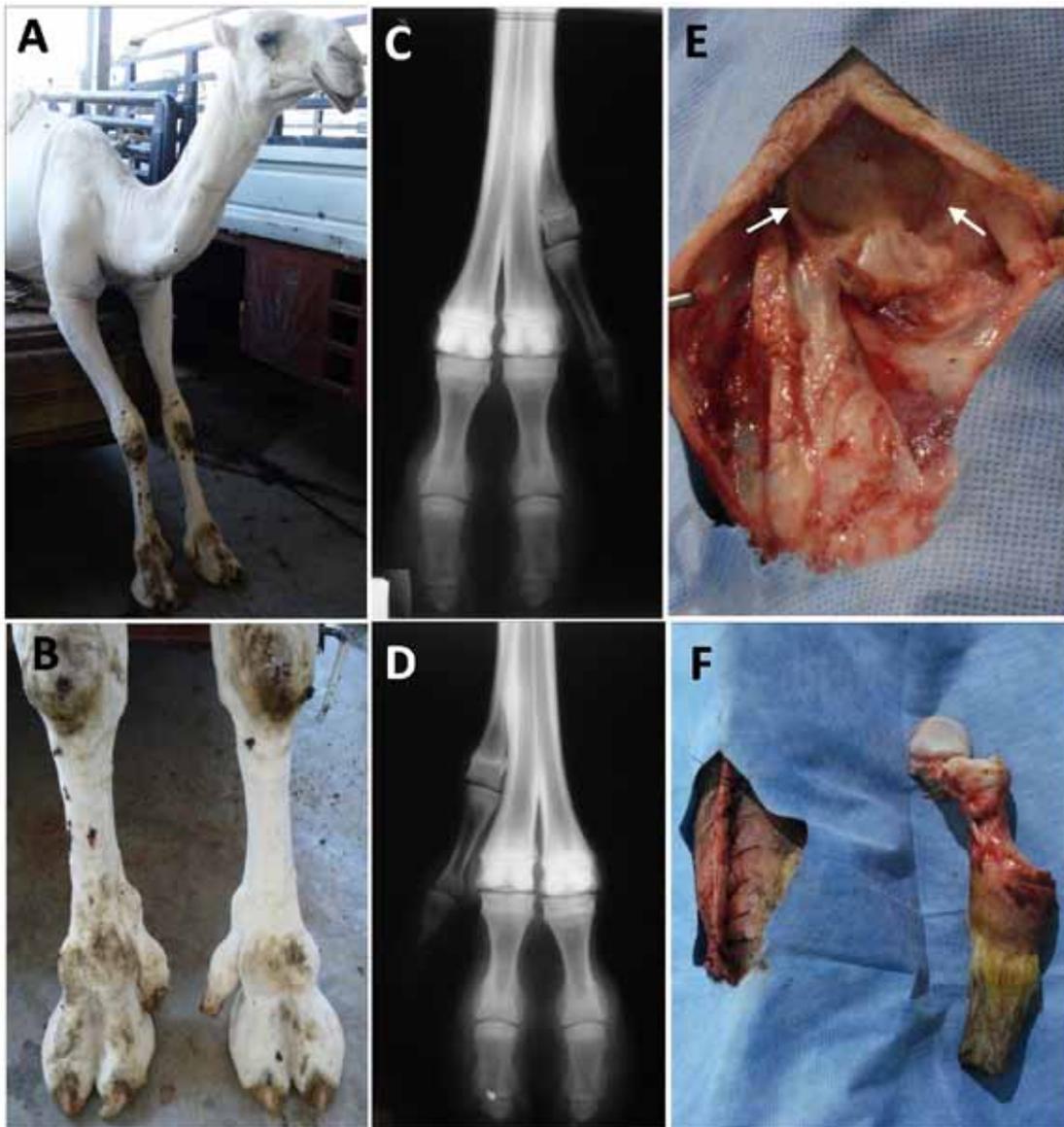


Figure 1. The heifer at the time of its presentation to the clinic with the two supernumerary digits (A), a close up picture of the forelimbs with the two supernumerary digit (B), dorsopalmar radiograph of the metacarpal region of the left (C) and right (D) forelimbs, intra-operative picture after osteotomy (E) note the cut end of the bone (arrows), the skin was closed with interrupted vertical mattress sutures and the amputated extra digit is seen beside the closed skin (F)

phalanx. Distally, there was a third bone that resembled fused second and third phalanges; this was enclosed partially within the hoof (Figure 1C, D).

Surgical procedure. The cow was sedated with xylazine hydrochloride (0.2 mg/kg, *i.v.*, Bomazine 10%, BOMAC Lab, Ltd., New Zealand) and was positioned in left lateral recumbency to operate the left forelimb. The left forelimb distal to the carpus was prepared for surgery and a tourniquet was applied distal to the carpal joint. Fusiform local infiltration analgesia was applied around the extra digit using Lidocaine 2% (Norbrook Laboratories, UK). A fusiform skin incision, performed directly over the supernumerary digit, was started with a linear incision proximal to the extra digit, then around its base, and ended with a linear incision distal to the extra digit. Subcutaneous tissue and fascia were dissected sharply from the supernumerary digit. Blood vessels were ligated as they were encountered during the dissection with 0 polyglactin 910 (Vicryl, Ethicon, Somerville, New Jersey, USA). A towel forceps was placed into the skin surrounding the hoof, and the digit was elevated. No tendon or muscle was associated with the digit. The supernumerary digit was isolated completely from the third metacarpus before its amputation. A sterile obstetrical wire was placed under the supernumerary digit starting distally and proceeding proximally for osteotomy of the metacarpal bone of the extra digit (Figure E). The surgical site was lavaged with 1 l of 0.9% saline solution before closing the fascia and subcutaneous tissue layers in two separate layers with 0 polyglactin 910 with a simple continuous suture pattern. The skin was closed with one polyamide (Ethibond, Ethicon, Somerville, New Jersey, USA) using an interrupted vertical mattress suture pattern (Figure 1F). The tourniquet was removed, and a full-limb pressure bandage was placed over the wound. The same procedures were carried out on the right forelimb after positioning the camel in right lateral recumbency.

Postoperative care. Penicillin and streptomycin (30 000 IU/kg penicillin, 10 mg/kg streptomycin, Penstrep, Norbrook Laboratories, Corby, Northamptonshire, NN189EX, UK) was administered intramuscularly for five days. Phenylbutazone (Phenylarthritis, Vetoquinol, LURECEDEX, France) was administered at 4.4 mg/kg intravenously for three days. The owners were instructed to confine the cow to a box stall for two weeks before allowing exercise and to keep the limb bandaged during the period of stall confinement.

Examination of the supernumerary digit after surgical removal (Figure 1F) revealed two complete bones and part of the proximal bone and two joints, and no rudimentary tendons. The joints articulated with the distal end of the proximal bone and proximal end of the middle bone and between the distal end of the middle bone and the two fused phalanges within the hoof.

Follow-up. Follow-up information was obtained through a telephone conversation with the owner 12 months after surgery. The surgical incision had healed cosmetically without signs of lameness and the owner was satisfied with the result.

DISCUSSION AND CONCLUSIONS

To the author's knowledge, this paper represents the first report of bilateral polydactyly in a camel. However, a case of unilateral polydactyly has previously been reported (Bani-Ismail et al. 1999). Although polydactyly is a rare congenial anomaly (Barber 1990; Sakamoto et al. 2004), it has been reported in humans and animals. The female camel reported here had no other congenial anomalies and no history of exposure to teratogens. Moreover, to the owner's knowledge, there was no hereditary predisposition to polydactyly in this camel. The supernumerary digits of this camel were medial to the third metacarpal bones, which was similar to the reported unilateral case. The vast majority of polydactyly in horses has been reported to be medial in the forelimbs (Giofre et al. 2004; Carstanjen et al. 2007). However, the extra metacarpal bones were completely fused with the main metacarpal bones. Clinically, there were no changes in the width of the metacarpal bones proximal to the extra digits in both forelimbs of the camel reported here. An increase in the width of the metacarpus has been reported in the camel due to the presence of unfused extra carpal bone in addition to changes in size, shape, and articulation of the medial aspect of the carpus (Bani-Ismail et al. 1999). Angular limb deformity was not present in the present case.

The goals of surgical removal of supernumerary digits are to restore normal limb conformation, thus preventing lameness, and to improve the cosmetic appearance of the limb (Bani-Ismail et al. 1999; Carstanjen et al. 2007). Surgical removal in this case was straightforward because of the fusion between the extra metacarpal bone and the third metacarpal bone, which mandated osteotomy at

the most distal part of the extra metacarpal bone. In the camel reported previously (Bani-Ismail et al. 1999), complete removal of the supernumerary digit that was fused to the anomalous first carpal bone at its proximal extent complicated removal of the digit via the carpal joint.

It has been reported that animals with supernumerary digits can survive successfully with normal locomotion and better aesthesis if the surgical excision is performed under proper aseptic conditions and appropriate postoperative care is provided (Hossain et al. 1980; Singh et al. 1989; Fourie 1990; Rahman et al. 2006). In the described case the surgical procedure was indicated for cosmetic reasons. On the other hand, an incomplete removal of supernumerary digits might cause an insufficient cosmetic outcome or lameness. The surgical correction of polydactylism in this case resulted in normal locomotion, better cosmetic appearance of the limb, and better quality of life. In conclusion, a rare case of bilateral polydactyly was here described in a dromedary camel along with successful surgical correction.

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Corresponding Author:

Ahmed F. Ahmed, Assiut University, Faculty Veterinary Medicine, Department of Animal Surgery, Assiut 71526, Egypt
Tel. +20882333938, Fax +20882366503, E-mail: afahmed1970@gmail.com
