



Research Journal of  
**Veterinary  
Sciences**

ISSN 1819-1908



Academic  
Journals Inc.

[www.academicjournals.com](http://www.academicjournals.com)

## **Congenital Hypoplasia of the Fore Claw in Dairy Cows: Report of Two Cases**

<sup>1</sup>Mohsen Nouri, <sup>2</sup>Iradj Nowrouzian and <sup>3</sup>Taghi Madadzadeh

<sup>1</sup>Iranian Arad Pajouh Veterinary University Center, Tehran, Iran

<sup>2</sup>Department of clinical Sciences, Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran

<sup>3</sup>Department of clinical Sciences, Faculty of Veterinary Medicine, University of Islamic Azad, Urmia, Iran

*Corresponding Author: Mohsen Nouri, DVM, Iranian Arad Pajouh Veterinary University Center, Tehran, Iran, P.O. Box: 14195-181, Tehran-Iran Tel: + 98-2188066331 Fax: 66933222*

### **ABSTRACT**

Lameness is considered to be a major welfare and economic problem throughout the world. Foot and leg shape are both highly heritable and poor limb conformation is a predisposing factor for lameness. The objective of this study is to report of congenital hypoplasia of the claw in fore limb in two dairy cows. The case included two local and Holstein dairy cows presenting hypoplasia of the medial claw in forelimb. Both medial fore claws were generally narrower than normal. Cows exhibited a mild to severe lameness. The Sarabi cow showed a marked and painful bruising on the lateral heel region and Holstein cow showed sole ulcer with a circumscribed granulation tissue located in the region of the sole-bulb junction (zone 4) in both fore limbs. Poor conformation result to regional overloading on the sole and heel influence the distribution of different lesions. This change in claw shape also combined with pressure-induced pain on the affected claw might force the cow to distribute its weight to the contralateral claw. The feature was considered consistent with the anomaly entity described as hypoplasia of the claw.

**Key word:** Cow, sarabi breed, congenital anomaly, hypoplasia of the claw, overloading

### **INTRODUCTION**

Lameness is considered to be a major welfare and economic problem throughout the world (Whay *et al.*, 2003; Bruijnijns *et al.*, 2010; Nouri *et al.*, 2011). Apart from the negative economic consequences and welfare, the owners are under a strong moral obligation to prevent any suffering from livestock and to increase welfare standards (Boelling and Pollott, 1998a) by selection of better claw and leg conformation (Blowey, 1993; Boettcher *et al.*, 1998). For these reasons, claw and leg traits have been under investigation for over three decades (Distl *et al.*, 1984; Hahn *et al.*, 1984; Ral, 1990; Boelling and Pollott, 1998a, b; Boettcher *et al.*, 1998; Fatehi *et al.*, 2003; Van Dorp *et al.*, 2004). Foot and leg shape are both highly heritable and poor limb conformation is a predisposing factor for lameness (Eddy and Scott, 1980; Smit *et al.*, 1986; Ral, 1990; Wells *et al.*, 1993; Murray *et al.*, 1994; Boettcher *et al.*, 1998; Van Dorp *et al.*, 2004).

The inner and outer claws often differ in size and shape; the medial claw of the front foot is larger than the lateral (Greenough *et al.*, 1981; Murray *et al.*, 1996; Greenough, 2007). Hypoplasia of the claw is a congenital defect of the bovine claw. In hypoplastic claw, the lateral claw of the hind limb is smaller than the medial claw (Greenough *et al.*, 1981). Greenough (1962) observed that in about 18 per cent of cattle the lateral hind claws were smaller than the medial. This claw contact

may impede locomotion and contribute to lameness (Greenough *et al.*, 1981). There are very few reports of this defect and it can be assumed to be quite rare. In the literature, there is no published study of congenital hypoplasia of the claw in forelimb to our best knowledge. The objective of this study is to report of congenital hypoplasia of the medial claw in fore limb in two local and Holstein dairy cows.

### CASE DESCRIPTION

**Cow No. 1:** A 3-year-old, non-pregnant, 350 kg Sarabi cow with minor pathological changes such as claw hypoplasia in the medial fore claw were obtained from a number of slaughterhouse cattle markets in Ardebil in July 2009. The medial fore claws were generally narrower than normal. The lateral claws of the forelimb were curved medially and overlay the medial claw (Fig. 1a). The owner had purchased the cow approximately 3 months previously. The cow was housed with 40 other adult Sarabi cows, none of which had any similar clinical signs. The cow showed a grade 3 (of 5 = non-weight bearing) lameness on the left forelimb. Examination of the foot revealed a marked and painful bruising on the lateral heel region (Fig. 1b). The animal has no clinical evidence of systemic disease.

**Cow No. 2:** A 4-year-old, 600 kg Holstein cow presented with signs of severe lameness (grade 4 of 5 = non-weight bearing) in the left forelimb in August 2011. The cow was in second lactation and at 6 months of pregnancy and was otherwise healthy. The cow produced a high milk yield level. The dairy herd of origin (Varamin) had no other incidents of hypoplasia of the claw and the cows had been bred by artificial insemination. Cows in this herd exhibit a mild incidence of foot lameness associated with subclinical laminitis.

Both medial fore claws were generally narrower than normal (Fig. 2a). The lateral claws of the forelimb were strongly curved medially and overlay the medial claw. The cow was reacted to



Fig. 1(a-b): (a) Hypoplasia of the claw in left fore limb of sarabi dairy cow and (b) The same case in photo A showing marked bruising and cyanosis is obvious in the hind half of zone 6 (white arrows)



Fig. 2(a-b): (a) Hypoplasia of the claw in left fore limb of Holstein dairy cow, (b) The same case in photo A showing sole ulcer in medial claw (black arrow). This case showed sole ulcer in both medial claws of forelimb

pressure on the sole area. Examination of the medial fore claw revealed a typical clinical sign of detachment of the heel-horn from around the bulb; the horn covering the medial heel bulb separated from the corium at the sole and heel. Further paring exposes an ulcer with a circumscribed granulation tissue about 1.5 cm in diameter located in the region of the sole-bulb junction (zone 4). The lesion was prone to bleed and painful when touched. There was not any sign of granular or velvet like surfaces of the lesion on the zone 4 (Fig. 2b). Both medial claws of forelimb has affected by sole ulcer. Interdigital hyperplasia (IDH) was seen in both fore and hindlimb.

## DISCUSSION

The physical characteristics of the cow's legs and feet can contribute to the incidence of lameness and so any information on the occurrence of and influences on, these traits could prove to be of value in dairy cow production (Boelling and Pollott, 1998b; Van der Waaij *et al.*, 2005). The genetic correlations suggest that cows genetically susceptible to some type of health problems are likely to be susceptible to other health problems as well (Enevoldsen *et al.*, 1991; Boettcher *et al.*, 1998; Koenig *et al.*, 2005; Van der Waaij *et al.*, 2005). A shallow foot angle, high heels, a long diagonal and sickled rear legs were associated with a worsening walking ability (Wells *et al.*, 1993; Boelling and Pollott, 1998a; Van Dorp *et al.*, 2004).

Although the aetiology of sole lesions is not well known, it is clear from experience that both overburdening of the lateral hind claw, as compared with the medial hind claw and some nutritional aspects can be considered important predisposing factors (Toussaint-Raven, 1973; Vermunt and Greenough, 1994). Numerous factors such as laminitis, claw overgrowth, sole thickness and claw size have been implicated in the development of sole ulcers (Eddy and Scott, 1980; Enevoldsen *et al.*, 1991; Vermunt and Greenough, 1994; Van Amstel and

Shearer, 2006). Sole lesions seem to be genetically correlated to claw angle and length; Longer claws were genetically associated with higher total lesion scores and more sole ulcers (Smit *et al.*, 1986). Other studies also have reported that daughters of certain bulls had a higher incidence of sole ulcers and white line lesions (Singh *et al.*, 1993).

The majority of foot lesions involve the lateral digits of hind limb while the least number of digital lesions were recorded in the digits of the forelimb (Toussaint-Raven, 1973; Eddy and Scott, 1980; Russell *et al.*, 1982; Jubb and Malmo, 1991; Murray *et al.*, 1996; Nouri and Helan, 2012). These differences between front and hind feet in environment, use and shape clearly influence the distribution of different lesions to different degrees (Russell *et al.*, 1982). The difference may be explained partly by the fact that the hind feet are more often abnormally shaped than front feet and are more subjected to the transitory loads (Russell *et al.*, 1982).

The high incidence of abnormal claws associated with lameness may indicate that hereditary factors are involved in the aetiology of the disease (Eddy and Scott, 1980; Russell *et al.*, 1982). Koenig *et al.* (2005) found a uniform size of both claws were associated with fewer disorders. It seems likely that the size and shape change in hypoplastic claws is a cause or effect of differences in loading between claws. Thus, the distribution of different lesions to different degrees will change. The differences between front and hind feet in environment, use and shape clearly influence the distribution of different lesions to different degrees (Russell *et al.*, 1982). Ossent *et al.* (1997) suggested mechanical forces applied to the sole of the claw result from a permutation of claw size and shape, body weight, conformation of the limbs, claw hardness and the quality of the surface over which the animal walks.

Poor conformation result to regional overloading on the sole and heel. It has been proposed that this great variability of weight bearing on the sole and heel leads to contusions (bruising) (Toussaint-Raven, 1973; Van Amstel and Shearer, 2001). On the other hand, a change in claw shape due to lameness combined with pressure-induced pain on the lateral claw might force the cow to distribute its weight to the medial claw (Van der Waaij *et al.*, 2005). Neveux *et al.* (2006) also found strong reciprocal relationships between the degree of load applied to contralateral hooves: When a single claw was on an uncomfortable surface, the weight removed from this claw was transferred primarily to the contralateral claw. A shifting of weight between contralateral limbs may increase the risk of secondary claw injuries (Hood *et al.*, 2001).

Foot and leg shape are both highly heritable and poor limb conformation is a predisposing factor for lameness (Eddy and Scott, 1980; Ral, 1990; Murray *et al.*, 1994; Boettcher *et al.*, 1998). Therefore, selection could be used to decrease the incidence of disease (Blowey, 1993; Boettcher *et al.*, 1998; Boelling and Pollott, 1998a).

Hypoplastic hooves may be seen in mature as well as young animals and should be regarded as a separate entity, not a stage in development of 'corkscrew claw' with which it may be confused in appearance (Greenough *et al.*, 1981). In this study, the feature was considered consistent with the anomaly entity described as hypoplasia of the claw by Greenough (1962), Greenough *et al.* (1981).

## CONCLUSION

It seems likely that the poor conformation result to regional overloading on the sole and heel influence the distribution of different lesions between claws. Foot and leg shape are both heritable and poor limb conformation is a predisposing factor for lameness. Therefore, selection could be used to decrease the incidence of disease.

## **ACKNOWLEDGMENT**

The cooperation of dairy farmer and hoof trimmers in this study was greatly appreciated.

## **REFERENCES**

- Blowey, R., 1993. Common Diseases of the Foot. In: Cattle Lameness and Hoof Care, Blowey, R. (Ed.). Farming Press, Ipswich, UK., pp: 39-55.
- Boelling, D. and G.E. Pollott, 1998a. Locomotion, lameness, hoof and leg traits in cattle II.: Genetic relationships and breeding values. *Livestock Prod. Sci.*, 54: 205-215.
- Boelling, D. and G.E. Pollott, 1998b. Locomotion, lameness, hoof and leg traits in cattle. I. Phenotypic influences and relationships. *Livest. Product. Sci.*, 54: 193-203.
- Boettcher, P.J., J.C.M. Dekkers, L.D. Warnick and S.J. Wells, 1998. Genetic analysis of clinical lameness in dairy cattle. *J. Dairy Sci.*, 81: 1148-1156.
- Bruijnjs, M.R.N., H. Hogeveen and E.N. Stassen, 2010. Assessing economic consequences of foot disorders in dairy cattle using a dynamic stochastic simulation model. *J. Dairy Sci.*, 93: 2419-2432.
- Distl, O., M. Huber, F. Graf and H. Krausslich, 1984. Claw measurements of young bulls at performance testing stations in Bavaria. *Livestock Prod. Sci.*, 11: 587-598.
- Eddy, R.G. and C.P. Scott, 1980. Some observations on the incidence of lameness in dairy cattle in Somerset. *Vet. Rec.*, 106: 140-144.
- Enevoldsen, C., Y.T. Grohn and I. Thysen, 1991. Sole ulcers in dairy cattle: Associations with season, cow characteristics, disease and production. *J. Dairy Sci.*, 74: 1284-1298.
- Fatehi, J., A. Stella, J.J. Shannon and P.J. Boettcher, 2003. Genetic parameters for feet and leg traits evaluated in different environments. *J. Dairy Sci.*, 86: 661-666.
- Greenough, P.R., 1962. Observations on some of the diseases of the bovine foot. Part II. *Vet. Rec.*, 74: 53-63.
- Greenough, P.R., 2007. *Bovine Laminitis and Lameness: A Hands-on Approach*. 1st Edn., Elsevier Health Sciences, London.
- Greenough, P.R., F.J. MacCallum and A.D. Weaver, 1981. *Lameness in Cattle*. 2nd Edn., Lippincott, New York, pp: 75-81.
- Hahn, M.V., B.T. McDaniel and J.C. Wilk, 1984. Genetic and environmental variation of hoof characteristics of Holstein cattle. *J. Dairy Sci.*, 67: 2986-2998.
- Hood, D.M., P. Wagner, D.D. Taylor, G.W. Brumbaugh and M.K. Chaffin, 2001. Voluntary limb-load distribution in horses with acute and chronic laminitis. *Am. J. Vet. Res.*, 62: 1393-1398.
- Jubb, T.F. and J. Malmo, 1991. Lesions causing lameness requiring veterinary treatment in pasture-fed dairy cows in east Gippsland. *Aust. Vet. J.*, 68: 21-24.
- Koenig, S., A.R. Sharifi, H. Wentrot, D. Landmann, M. Eise and H. Simianer, 2005. Genetic parameters of claw and foot disorders estimated with logistic models. *J. Dairy Sci.*, 88: 3316-3325.
- Murray, R.D., D.Y. Downham, J.R. Merritt, W.B. Russell and F.J. Manson, 1994. Observer variation in field data describing foot shape in dairy cattle. *Res. Vet. Sci.*, 56: 265-269.
- Murray, R.D., D.Y. Downham, M.J. Clarkson, W.B. Faull and J.W. Hughes *et al.*, 1996. Epidemiology of lameness in dairy cattle: Description and analysis of foot lesions. *Vet. Rec.*, 138: 586-591.

- Neveux, S., D.M. Weary, J. Rushen, M.A.G. von Keyserlingk and A.M. de Passille, 2006. Hoof discomfort changes how dairy cattle distribute their body weight. *J. Dairy Sci.*, 89: 2503-2509.
- Nouri, M. and J.A. Helan, 2012. Clinical and gross pathologic findings of complicated vertical fissures with digital dermatitis in a dairy herd. *Vet. Res. Forum*, 3: 291-295.
- Nouri, M., I. Nowrouzian, A. Vajhi, S.H. Marjanmehr and D. Faskhodi, 2011. Morphometric radiographic findings of the digital region in culling lame cows. *Asian J. Anim. Sci.*, 5: 256-267.
- Ossent, P., P.R. Greenough and J.J. Vermunt, 1997. Laminitis. In: *Lameness in Cattle*, Greenough, P.R. and A.D. Weaver (Eds.). 3rd Edn. WB Saunders Co., Philadelphia, PA., USA., pp: 280.
- Ral, G., 1990. Hoof and leg traits in dairy cows. *Proceedings of the 6th International Symposium on Diseases of the Ruminant Digit*, July 16-20, 1990, Liverpool, UK., pp: 219-231.
- Russell, A.M., G.J. Rowlands, S.R. Shaw and A.D. Weaver, 1982. Survey of lameness in British dairy cattle. *Vet. Rec.*, 111: 155-160.
- Singh, S.S., W.R. Ward and R.D. Murray, 1993. Aetiology and pathogenesis of sole lesions causing lameness in cattle: A review. *Vet. Bull.*, 63: 303-315.
- Smit, H., B. Verbeek, D.J. Peterse, J. Jansen, B.T. McDaniel and R.D. Politiek, 1986. Genetic aspects of claw disorders, claw measurements and type scores for feet in Friesian cattle. *Livestock Prod. Sci.*, 15: 205-217.
- Toussaint-Raven, E., 1973. Determination of weight-bearing by the bovine foot. *Neth. J. Vet. Sci.*, 5: 99-103.
- Van Amstel, S.R. and J.K. Shearer, 2001. Abnormalities of hoof growth and development. *Vet. Clin. North Am. Food Anim. Pract.*, 17: 87-90.
- Van Amstel, S.R. and J.K. Shearer, 2006. Review of pododermatitis circumscripta (ulceration of the sole) in dairy cows. *J. Vet. Internal Med.*, 20: 805-811.
- Van Dorp, T.E., P. Boettcher and L.R. Schaeffer, 2004. Genetics of locomotion. *Livest. Prod. Sci.*, 90: 247-253.
- Van der Waaij, E.H., M. Holzhauser, E. Ellen, C. Kamphuis and G. de Jong, 2005. Genetic parameters for claw disorders in dutch dairy cattle and correlations with conformation traits. *J. Dairy Sci.*, 88: 3672-3678.
- Vermunt, J.J. and P.R. Greenough, 1994. Predisposing factors of laminitis in cattle. *Br. Vet. J.*, 150: 151-164.
- Wells, S.J., A.M. Trent, W.E. Marsh, P.G. McGovern and R.A. Robinson, 1993. Individual cow risk factors for clinical lameness in lactating dairy cows. *Prev. Vet. Med.*, 17: 95-109.
- Whay, H.R., D.C. Main, L.E. Green and A.J. Webster, 2003. Assessment of the welfare of dairy cattle using animal-based measurements: Direct observations and investigation of farm records. *Vet. Rec.*, 153: 197-202.