RESEARCH ARTICLE
Open Access

Journal of Veterinary and Animal Sciences
ISSN (Print): 0971-0701, (Online): 2582-0605
https://doi.org/10.51966/jvas.2022.53.2.158-162

Radiographic evaluation of hoof affections in dairy cattle

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Citation: Anees, R., Dinesh, P.T., Nithin, C. J., Sooryadas, S., George, C. and David, P. V. 2022. Radiographic evaluation of hoof affections in dairy cattle. *J. Vet. Anim. Sci.* **53**(2): 158-162
DOI: https://doi.org/10.51966/jvas.2022.53.2.158-162

Received: 26.04.2021 *Accepted: 20.05.2021* *Published: 30.06.2022*

Abstract

The study was undertaken to identify radiographic changes of hoof affections in dairy cattle. Out of the 78 cases radiographed, 67 cases were found to have lesions. Lateral and dorso-palmar/ plantar views of the affected foot of selected animals under study was evaluated. Soft tissue mass at inter-digital space, alterations in bone density of third phalanx, deviation of third phalanx were the major radiographic lesions diagnosed followed by fracture of third phalanx, osteomyelitis, deviation of second phalanx, periosteal reactions on phalanges and soft tissue swelling at coronary region. No radiographic changes were present in 14.10 per cent of the cases.

Keywords: *Radiography, hoof, dairy cattle*

Lameness is a disease of high producers which can cause a significant loss of milk yield (Mohamdnia and Khaghani, 2013). It is an ever-persistent issue and risk to the productivity and indirectly affect the profit of dairy farmers. Not only it shortens the productive life of cows, but also it adds many hours of labour in terms of its treatment (Mahendran and Bell, 2015). Since lameness is painful condition and causes financial loss to the farmers, it is considered as a serious welfare issue (Kossaibati and Esslemont, 1997).

Lameness is a multifactorial disease, a combination of several disorders in limbs and affections of hoof. Majority of the lameness cases reported are due to lesions in the feet; hind foot had more lesions compared to front foot (Shearer, 1997). Anju *et al.* (2019) atudied about the morphology and morphometry of buffalo hooves and reported about the normal morphometry,

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Early diagnosis and implementing appropriate treatment based on type of hoof affections are essential in sustainable reduction of lameness cases in cattle.

Radiographic diagnosis can be an effective tool for the differential diagnosis of hoof disorders. Most of the hoof disorders are associated with marked rotation or sinking of pedal bone and it cause significant changes in hoof dimensions and radiographic analysis aids in decision making on treatment plans and to predict the prognosis of lameness cases.

Materials and methods

The present study was conducted in selected organised dairy farms and small holder livestock units. Animals were observed at rest and during progression at different paces for evaluation of lameness. Those animals which showed moderate to severe lameness were suspected for osseous lesions and radiographically evaluated. The hooves were radiographed in dorso-palmar (forelimbs) or dorso-plantar (hind limbs), oblique and lateral views. Radiographs were examined and radiographic changes were recorded. Radiographs of hooves that did not manifest alterations were used as controls for comparison with affected radiographs. Radiographs were taken using a portable X-ray machine EP CORSA 2.4 with 8 MAS and 50 KVP settings.

Results and discussion

Lateral and dorso-palmar or dorso-plantar radiographs of the affected foot of animals under study was taken. A total of 78 animals were radiographed of which 67 animals showed radiographic lesions. Lesions that could be detected were periosteal reactions on phalanges (2.56 per cent) (Fig.1), osteomyelitis (2.56 per cent) (Fig. 2), alterations in bone density of third phalanx (21.79 per cent) (Fig. 3), fracture of third phalanx (7.69 per cent) (Fig.5), deviation of third phalanx (21.79 per cent) (Fig. 6), deviation of second phalanx (2.56 per cent) (Fig. 4), soft tissue mass at interdigital space (25.64 per cent) and soft tissue swelling at coronary region (1.28 per cent). Details of radiographic lesions observed during this study is tabulated (Table 1).

Lateral and dorso-palmar or dorso-plantar radiographic views were taken in the present study similar to that used by Farrow (1999). Radiography is the best way to differentially diagnose the foot affections (Nouri *et al.*, 2011). In a radiographic study of hoof affections Parizi and Shakeri (2007), identified osteomyelitis, exostosis, deformity of bones, change in bone density, soft tissue calcification, arthritis, degenerative joint diseases, ankylosis of joint, rotation of phalanges, displacement of navicular bone and fracture were obtained. One case of abscess at coronary region was radiographed and extend of infection into the distal interphalangeal joint was identified. Radiographic study of distal interphalangeal joint is useful in identifying the extent and duration of sepsis of joint and bones (Anderson *et al.,* 2017).

Out of the ten corkscrew claws radiographed, eight claws were found to have deviation of third phalanx. In one case lateral deviation of second phalanx could be noticed. In corkscrew claws, upward and inward rotation of the toe region led to weight bearing on abaxial wall of hoof and sole become completely non-weight bearing (Amstel, 2017). This rotation and imbalance from the normal biomechanics of weight bearing may be the reason for higher incidence of deviation in third phalanx in cork screw claws. Nouri *et al.* (2011) observed structural alterations in phalanx in animals with chronic hoof affections when they were evaluated radiographically. Radiography of nine cases with sole ulcers found to have deviation of third phalanx. Excessive overgrowth of hooves at the toe lead to deviation of pedal bone and pinching of the deviated pedal bone in hoof corium led to incidence of sole ulcer (Blowey, 1993). Radiography helped to assess the position of pedal bone and supporting structure of the hoof. Most of the hoof disorders are associated with marked rotation or sinking of pedal bone (Philip, 2018). Shearer and Amstel (2017) opined radiographs are indicated in deep seated penetration of foreign body into the sole to rule out a fracture. Six cases of pedal bone fracture were diagnosed by radiography. Early radiographic diagnosis of hoof disorders helps to make decisions on treatment plans and to predict the prognosis (Philip, 2018).

Table 1. Radiographic findings of different hoof affections

Type of lesions	Forelimb	Hindlimb	Total	
	No. of cases	No. of cases	No. of cases	%
Periosteal reaction on phalanges	-	2	2	2.56
Osteomyelitis	2	-	2	2.56
Alteration in bone density of third phalanx	3	14	17	21.79
Fracture of third phalanx	2	4	6	7.69
Deviation of third phalanx	2	15	17	21.79
Deviation of second phalanx	-	2	2	2.56
Soft tissue mass at interdigital space	2	18	20	25.64
Soft tissue swelling at coronary region	-	1	1	1.28
No abnormalities detected	3	8	11	14.10
Total	14	64	78	100

Fig. 1. Periosteal reactions

Fig.2. Osteomyelitis

Fig.3. Changes in Bone density

Fig.4. P2 deviation

Fig. 5. Fracture of 3rd Phalanx

Fig.6. P3 deviation

Conclusion

From the present study it could be understood that lameness originating from the hoof should not be ignored and affected animals should undergo detailed investigations to diagnose the actual cause of lameness. Radiography ccould be an effective tool for the differential diagnosis of hoof disorders. Most of the hoof disorders are associated with marked rotation or sinking of pedal bone and it cause significant changes in hoof dimensions and radiographic analysis aids in decision making on treatment plans and to predict the prognosis of lameness cases.

Acknowledgement

The authors wish to thank the Dean, CV&AS, Pookode for the facilities provided for conducting this study.

Conflict of interest

The authors declare that they have no conflict of interest.

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