

GROSS AND RADIOGRAPHIC ASSESSMENT OF THE FOOT WITH CLAW DISORDERS IN CULLED CATTLE AT NSUKKA ABATTOIR

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ABSTRACT

The main objective of this descriptive and cross-sectional study was to determine the common radiographic features of claws with gross disorders using abattoir samples. A total of 40 claws were collected from Nsukka abattoir. The claws were examined for identification of different types of gross lesions. Two radiographic exposures, dorso-plantar and lateral views of each of the claws were taken and evaluated for radiographic changes. The prevalence of infectious and non-infectious claw disorders was 55% and 45% respectively. White line disease (WLD), sole ulcer and horn heel erosion were the most prevalent gross lesions with 35%, 30% and 20% prevalent rates respectively while bulb ulcer and wall fissure were the least occurred claw disorders with 5% and 5% occurrence. Infectious claw disorders (55%) had a relatively higher occurrence than the non-infectious disorders (45%). The most prominent radiographic abnormalities were noted in the second (PII) and third phalanxes (PIII) region. The radiographic changes were: increase in joint width (10%) subluxation of pedal bone joint (5%), exostoses (5%) of the pastern (PII) bone, sinking pedal bone (15%) in which the bone was displaced slightly ventrally away from the dorsal wall of the claw. Concurrent appearance of more than one radiographic feature in a single claw was noted in the claw samples.

Key words: cattle, foot, claw disorder, radiograph

INTRODUCTION

Claw disorders are either infectious or non-infectious (Greenough, 2007). Claw disorders in dairy animals cause a great deal of economic loss in terms of milk production and reproduction losses (Booth *et al.*, 2004; Garbarino *et al.*, 2004; Singh *et al.*, 2011). Claw disorders have been found to be the cause of more than 90% of all lameness cases observed in dairy cattle (Murray, *et al.*, 1996). Lameness in animals has emerged as the most severe problem in recent years, at organized farms. It is considered to be the third most expensive health problem of dairy animals after mastitis and infertility (Esslemont, 1990), having adverse effect on their welfare. Lameness is considered to be a major welfare and economic problem both in beef and dairy farming. Economically, lameness due to loss in milk yield, weight and fertility and increases the risk of culling (Reyher *et al.*, 2011; Hogeveen *et al.*, 2011). Because of the low level of farmer's knowledge, training and awareness, the risk of claw disease not being discovered until the clinical condition becomes very obvious. The chances of restoring the productivity of the animal, its milk yield or weight gain, depend largely on rapid medical or surgical treatment, the course of which relates directly to accurate diagnosis and appropriate treatment (Hogeveen *et al.*, 2011). Radiography as a diagnostic tool is often necessary and in most cases, useful to reach to a diagnosis (Ahmed and Shekidef, 2012). The objectives of the study were to macroscopically and radiographically examine claw disorders of the culled cattle at Nsukka Abattoir.

MATERIALS AND METHODS

The Ikpa Nsukka market abattoir and the slaughter slab was purposively selected because the abattoir maintains a regular slaughter of cow. Post-mortem hindlimb digits with gross claw disorders were amputated and collected for assessment. The choice of hindlimbs was based on the fact that hindlimbs have been reported to be responsible for a higher percentage of foot lameness in cattle (Hernandez *et al.*

2002). A total of 20 cow-feet of the hindlimbs (40 claws) with claw-related lesions were macroscopically and radiographically examined.

Macroscopic examination of the claw

The claws were thoroughly washed, assessed for macroscopic lesions identification. The weight-bearing surface of the claws were examined for any gross claw lesions. Excessively overgrown claws were trimmed using hoof knife to effectively reduce their sizes. The horn of the sole was trimmed with a hoof knife to expose any underlying claw lesions and any observable claw lesions recorded accordingly.

The claw lesions were photographed using a digital camera (Sony DSC-S80, 4.1 Mega Pixels).

Radiographic assessment of the claws disorder was using standard radiographic techniques (Beige and Bakir, 2005).

Radiographic examination of the claw

The collected feet were transported to the Radiology Unit of the Department of the Veterinary Surgery and Radiology, UNN for radiographic examination. Lateromedial and dorsoplantar views were obtained using exposure factors of 20 mAs, 80-88kV and FFD of 70 cm. The obtained radiographs were interpreted properly.

Data management and analysis

Presence or absence of a particular lesion were recorded as “1” (meaning “Yes” for presence of a claw lesion), and “0” (meaning “No” for absence of a claw lesion). Percentage distribution of the lesions were computed as: Proportion of the number of positive observations of each lesion type divided by the total number of feet sampled, multiplied by 100 to express it as a percentage.

Results

A total of 20 cows had been enrolled at the end of the study period and had complete data observations. White line disease (WLD) sole ulcer (SU) were the most prevalent claw disorders with 35% (7/20) and 30% (6/20), respectively, while bulb ulcer and wall fissure were the least occurred claw disorders with 5% (1/20) and 5% (1/20) occurrence (table 1). Infectious claw disorders (55%) had a relatively higher occurrence than the non-infectious disorders (45%) (table 2).

Radiographic changes

The most prominent radiographic abnormalities were noted in the third phalanx (PIII) region of the culled cows. The radiographic changes were: increase in joint width (10%), subluxation of pedal bone joint (5%), exostoses (5%) of the pastern (PII) bone, sinking pedal bone (15%) in which the bone was displaced slightly ventrally away from the dorsal wall of the claw. Pedal bone changes were observed to be more severe in the lateral claws than medial claws. Concurrent appearance of more than one radiographic feature in a single claw was noted in the law samples. Prevalent rate of various radiographic features and cows with laminitis were summarized in tables 3 and 4.

Table 1: Prevalent rate of different claw disorders in 20 abattoir feet (40 claws) samples.

Claw Disorders	No of Occurrence	Percentage of Occurrence
White line disease (WLD)	7	35%
Sole Ulcer (SU)	6	30%
Horn Heel Erosion (HHE)	4	20%
Wall fissure (WF)	1	5%
Digital dermatitis (DD)	2	10%
Bulb Ulcer (BU)	1	5%
Total	20	100

Table 2: Prevalent rate of infectious and non-infectious claw lesions.

Type of claw infection	Number of occurrence	Percentage of Occurrence
Infectious	11	55 %
Non-infectious	9	45 %
Total	20	100

Table 3: Prevalent rate of radiographic features of 20 abattoir feet (40 claws) with claw disorders

Radiographic lesion	Occurrence	Prevalence X/20 x 100/1
Increase joint width	2	10 %
Subluxation of the pedal bone	1	5 %
Sinking pedal bone	3	15 %
Exostosis of the pastern bone	1	5 %
Total	7	35 %

Table 4: Prevalent rate of laminitic and non-laminitic cows

Animal	No of occurrence	Prevalent (6/20 x 100/1)
Laminitic cow	6	30
Non-laminitic cow	14	70
Total	20	100

DISCUSSION

Claw lesions such as heel erosion, white line separation and sole ulcer have been incriminated as major underlying predisposing cause for development of laminitis in cattle (Nocek, 1997; Beige and Bakir, 2005). The high prevalence rate of white line disease (35%), sole ulcer (30%) and heel horn erosion (20%) observed in this current study almost proportionally compares with the 30% prevalence rate of laminitis seen among the examined cows. This observation supports works of other researchers who have previously employed presence of, heel erosion, white line separation and sole ulcer for the diagnosis of laminitis in cattle (Greenough and Vermunt, 1991; Bergsten, 1994; Beige and Bakir, 2005).

In this study, all the cows with sole ulcer and horn heel erosion were radiographically confirmed to be laminitic. This linkage is likely to be attributed to the fact that the initial phase of the pathogenesis of

laminitis involves changes in pododermal microvasculature, which results in vascular tissue damage and subsequently manifest as ulcer in the sole (Nocek, 1997; Hirschberg and Plendl, 2005). Sole ulcer is probably the main sign that can be used to diagnose subclinical phase of claw lesions particularly laminitis. The results of this study indicated that cows with laminitis have more than one associated claw lesion and deformity. This report is consistent with the previous findings which stated that laminitis is a predisposing cause of lesions such as sole ulcers, white line separation, heel erosion and double soles (Nocek, 1997, Beige and Bakir, 2005).

White line separation was mostly found on the lateral claw of the hind limbs. White line separation has been reported previously to be attributed to the fact that white line is the weakest point of impact which is likely to succumb and fissure under pressure insults (Baggott and Russell, 1981).

High prevalence rate of infections of the claw observed in this study might be attributed to poor environmental hygiene in the cattle environment. Presence of infectious digital dermatitis (10%) which is also known as digital papillomatosis or “hairy warts” in cows suggested a managerial factor in its aetiological predisposition. Unhygienic environment would promote development and spreading of this contagious lesion (Weaver, 1993). Results of this study indicate that laminitis in cows can tentatively be predicted by presence of some claw deformities. This predictive association between claw deformities and laminitis is supported by findings of others (Greenough, 1987; Ebeid, 1993; Weaver, 1993).

Claws affected with infectious digital dermatitis had narrowed medial pedal bone. This finding is related to the findings of Nguhiu-Mwangi *et al.* (2007) who reported narrowing of pedal bones in extremely deformed chronic laminitic claws of dairy cows. However, narrowing of the pedal bones could be due to an osseous dissolution resulting from osseous necrosis (osteosis). One of the causes of osteosis is associated with nutrition and oxygen especially when there is compromise of local blood supply (Jubb *et al.*, 1993). Exostosis of the pastern bone was also observed in the claws affected with digital dermatitis. Similarly, Maclean (1970), reported in the exostosis of the pedal bone in claws with chronic laminitis. The cause of exostosis could be attributed to periostitis (inflammation) of the pedal bone following prolonged inflammatory stimuli in chronic laminitis. The outgrowths or projections seen on the pastern bone could be a result of exostosis (Jubb *et al.*, 1993).

The cause of rotation of phalanges (mainly third phalanx) in this study could be attributed to damage of the laminar tissue attaching the pedal bone to the dorsal aspect of the claw. Rotation of phalanges usually leads to joint angulation.

In conclusion, radiographic examination revealed that typical changes of chronic laminitis were among the most common pathological features recorded.

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