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# STUDIES ON CHRONIC HYPERPLASTIC LAMINTIS IN THE HORSE

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## INTRODUCTION

Chronic laminitis is a sequel to acute attack, associated with visible morphological hoof changes. Much of the available literature on laminitis is based on clinical signs (**Hickman 1964; Coffman 1969; Colles and Jeffcott 1977**). The characteristic symptoms were changes in the shape of the hoof, bands of irregular horn growth (laminitic rings), and the short gait which stilled with a shuffling motion. Radiographic view of the foot showed a marked degree of rotation of the third phalanx.

Literature on histopathological changes in laminitis include distrubances in the processes of cornification in various parts of the hoof followed by secondary changes in the corium (**Obel 1948**). Recent studies on laminitis revealed the presence of several degenerative changes of the stratum lamellatum resulting in the formation of a new intermediate degenerated layer (**Mostafa 1986**).

The histopathological evaluation of chronic laminitis has not yet been described. So the purpose of the present investigation is to evalute the clinical signs, radiographic examination in relation to histopathological changes in the foot of the horses affected with chronic laminitis.

## MATERIAL AND METHODS

Eight horses affected with chronic laminitis and five normal horses were collected from Surgery Department, Faculty of Veterinar Medicine, admitted for teaching purposes. These horses were clinically examined with special attention to morphological changes of the fore and hind hoofs of each animal. Radiographic picture (lateral views) for determination of pedal bone changes in chronic laminitis on the basis of standard criteria described by **Adams (1979)**. Only five horses determined to by normal in regard to these criteria were used in this study.

These horses were euthanized, and the laminitic hooves showing hyperplasia in their keratinized laminar structures were collected for histopathological studies.

A total of 32 feet from laminitic hooves (16 fore and 16 hind) and 20 feet normal (10 fore and 10 hind) were sectioned sagitally with a band saw. Specimens 2 cm x 2 cm were taken from the frontal mid-line sections of the whole wall layers, outer (perioplic), middle (coronary) and inner (laminar) until the dorsal surface of the third phalanx,. The sections were removed by using a thin scalpel. Three successive sections from dorsal to ventral were collected. All hoof tissues were fixed in 10% formol-saline. Frozen sections were taken at-30 five microns thin sections were cut. The sections were then stained with Harris haematoxylin and eosin (Careleton (1967).

## RESULTS

The clinical features of chronic laminitis were represented by changes in the shape of the hoof, irregular horn growth (laminitic rings) flat sole, cracking and widening of the white line at the toe, short gait with a shuffling motin. These changes are more severe in the fore limbs. The hind feet are less affected except the hoof was found to be narrow and elongated with contracted heels.

The sagittal sections of the fore limbs showed irregularity or wavy appearance of the hoof layers, widening of the laminar layer at the toe which appeared yellowish in colour. The countour of the third phalanx was not parallel to the contour of the hoof wall (Fig. 1). The hind feet were noticed within normal appearance. Disintegration and atrophy of the frog have been seen (Fig. 2).

Radiographic appearance of the fore hooves showed severe rotation of the third phalanx (Fig. 3). While in the hind hooves there was no rotation of any other changes in the os pedis (Fig. 4).

The normal histology of the hoof shown in figure 5. The hoof is composed of three layers: The outer (perioplic), middle (coronary) and inner (laminar).

The histopathological changes in hooves affected with chronic laminitis were characterized by marked degenerative changes. The stratum lamellatum characterized by absence of normal arrangement of primary and secondary epidermal laminae (Fig. 6). There was a wide area separating the stratum lamellatum from the stratum medium of the hoof containing a keratinized layer arranged in finger like structures. In addition, coarse multiple cysts, haemorrhage and necrosis have been observed. Islands of epithelial tissues forming pseudotubu-

structures have been seen.

The tubules of the middle layer of the hoof (tubular and intertubular layer) appeared elongated, oval in shape, and their center contained multiple cysts (Fig. 8).

The histopathological picture of the hind hooves were found to be within normal limits (Fig. 9).

## DISCUSSION

Chronic laminitis is usually associated with visible morphological changes within the hoof. Clinical signs and morphological changes which had been observed were in agreement with those described by **Frank (1961), Hickman (1964), Coffman, et al. (1969) and Mostafa (1986).**

The present study revealed that the fore limbs showed the characteristic morphological and histopathological changes of chronic hyperplastic laminitis, while the hind limbs were found within normal limits. According to **Roony (1969)**, the fore limbs bear about 60 to 65% of the body weight of the horse. It seems reasonable that these intended animals contracted acute laminitis on both fore limbs and complicated to chronic condition.

In general, the histopathological changes in spontaneous chronic laminitis were characterized by the formation of a new intermediate degenerated layer inter-posed between the stratum lamellatum and stratum medium. This layer contains multiple cysts, haemorrhage, necrosis and pseudotubular like structures. Similar findings have been reported by **(Mostafa 1986)** in experimental laminitis, The authors observed the onset of the formation of this layer on the 5th day of the experimental study, associated with several progressive changes and disturbances in keratinization and disconfiguration of both the primary and secondary epidermal laminae, ended with the formation of this new layer.

**Budras et al. (1989)** noticed cap horn tubules over the crests of the primary dermal laminae in the normal laminar epidermis of the equine hoof, which is much smaller in diameter than the tubules of the stratum medium, and without intertubular horn and integrated into the wall of the hoof. Therfore, the presence of these structures in normal laminar epidermis may be given as a poosible explanation in the future to the processes of the formation of pseudotubular structures and formation of intermediate degenerative layer or hyperplastic keratinization in chronic laminitis.

The degenerative changes observed in the strtum lamellatum could be attributed to the disturbances of nutrition as a result of

the decreased blood flow to the feet which have been reported in both acute (Coffaman et al., 1970; Hood et al., 1978 Mostafa 1986) and chronic laminitis (Akerman et al., 1975).

The results of this study also showed several degenerative changes in the stratum medium of the hoof. Thes ehanges could be attributed to disturbances in circulation and keratinization in various parts of the hoof. Moreover, the formation of this new hyperplastic layer. impaired nutrition by diffusion in the stratum medium.

It could be concluded that chronic laminitis is characte rized by the formation of a new hyperplastic intermediate degenerated layer within the hoof leading to weakness and disruption in the attachment between the hoof wall and the pedal bone, which affects the strength and quality of the hoof. Moreover, it provides information about the nature of thickening and widening or hyperplastic of the stratum lamellatum at the toe. These changes are considered to be irreversible changes.

## SUMMARY

Chronic hyperplastic laminitis is usually a sequal to acute attack, associated with mechanical failure of the foot. The nature of the thickening or hyperplastic chronic laminitis were studies histopathologically. Evaluation displayed formation a new intermediate degenerative layer interposed between stratum lamellatum and stratum medium, leadint to weakening and disruption in the attachment between hoof wall and pedal bone. This layer consisting of areas of incomplete keratinization and multiple areas of necrosis, heamorrhage and pseudotubular like structures in different stages of degeneration and hyalinization. The nature of these changes is irreversable.

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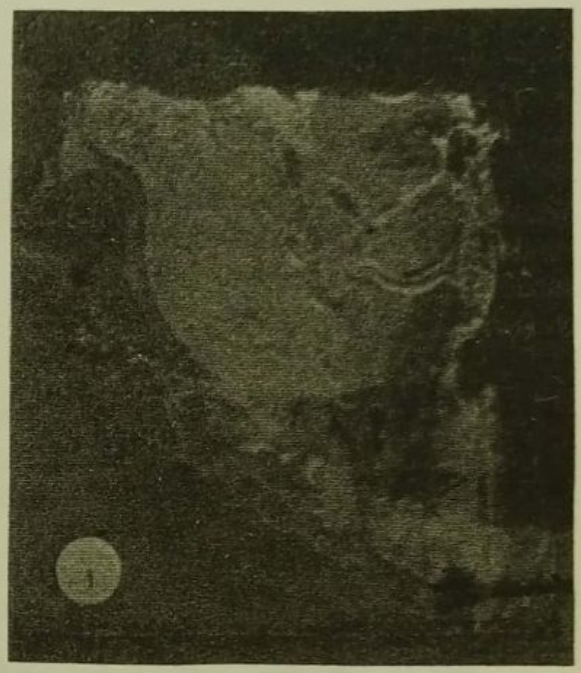
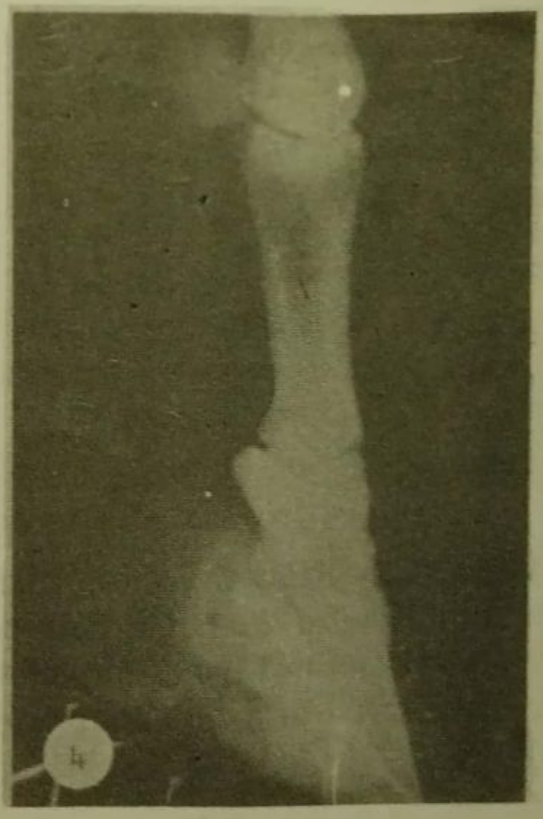
## FIGURE LEGENDS



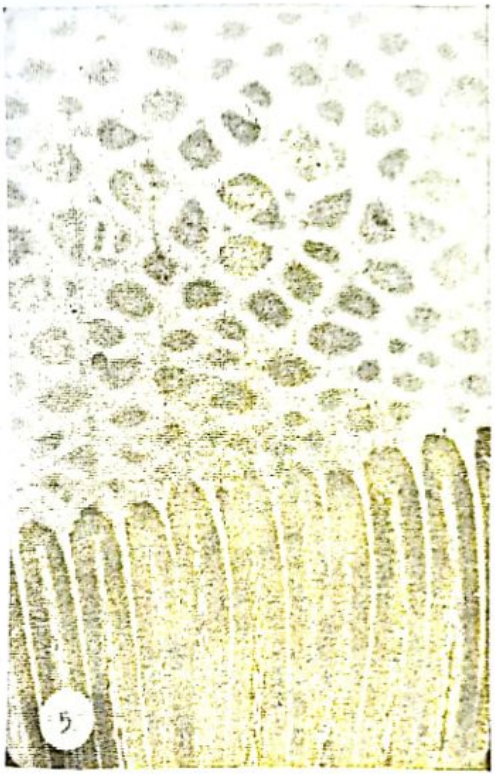
**Figur(1).** Chronic laminitis, sagittal section on the fore foot of the hoof note the marked widening of the laminar layer at the toe.

**Figur( 2).** Sagittal section of the hind foot of the horse: Showing the contour of the third phalanx is parallel to the contour of the hoof.

Figur( 3). Lateral radiographic appearance of the fore feet on charonic laminitis marked rotation of the third phalanx.



Figur( 4). Lateral radiograph of the hind feet showing the contour of the third phalanx is parallel to the contour of the hoof.



**Figur( 5).** Normal histology of the hoof. C.S. in the wall at the toe H & E. X 3 note A) stratum externum, B) stratum medium C) stratum lamellatum.

**Figur(6).** Chronic laminitis. C.S. in the laminar layer at thetoe. Note absence of normal arrangement of the primary and secondary epidermal laminae, and the formation of the new intermediate degenerated layer along the course of stratum lamellatum H & E. stain.

**Figur( 7).** Chronic laminitis. C.S. in the laminar layewr at the toe Note: the processes of formation of the pseudotubular structures; A. Cellular body consists of : 1) central connective tissue Bore 2) stratum basalis 3) prickle cell layer.
B) Pseudotubular body.
H & E stain X 40

**Figur( 8).** C.S. in the wall of the hoof, stratum medium. Note the tubular layer appeared elongated, oval in shape and its centre contains multiple cysts. H & E stain X 40.

**Figur( 9)**. C.S. in the wall of the hind hoof at the toe. Note the hoof within normal structures. H & E stain X 3.