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Histopathological Lesions of Buffalo Omasum (Dome) in Nineveh Province in 2013

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Abstract
This study is unique as this part of gastrointestinal tract in ruminant is highly neglected and the reason might be to the principal mechanical digestive role of this part (Omasum). This does not prevent spotting- light on this part and recognizing the lesions that might be found from randomly collected samples from butchers. Gross lesions varied among lack of omasal villi, necrosis of omasal epithelium, and congestion. Histopathological results confirm the previously mentioned gross findings by revealing some necrosis (hyalinization of smooth muscle fibers), edema noticed by lack of muscle fiber bundles under the microscopic field, vacuolar degeneration of some other smooth muscles, proliferation of polymorphonuclear inflammatory cells with loose connective tissue among muscle bundles..
Keywords: key words, Omasum, buffalo, lesions

1. Introduction

The buffaloes have been an important part of livestock agriculture in Asia since 5000 years, producing milk, meat (Nanda and Nakao, 2003; Abu-Seida and Al-Abbadi, 2015). In addition, buffaloes are the major dairy animals and play vital role in the growth of country life (Abu-Seida and Al-Abbadi, 2014).

In general, there is a shortage in literature regarding buffalo issues and especially omasum. Omasum, also known as the bible and the psalterium is the third part of the stomach in ruminants. Although its functions have not been well-studied, it appears to mainly aid in the absorption of water, magnesium, and the volatile fatty acids produced by rumen fermentation, that have not been absorbed into the bloodstream yet. The numerous folds of its mucosa are thought to trap digesta particles. Thus, the maximum amount of nutrients may possibly be absorbed.

There is some evidence that the contractions of the omasum can push large particles backwards through the reticulorumen orifice, the junction connecting the omasum with the reticulorumen, into the reticulorumen, the first compartment of the ruminant stomach. In this way, omasum allows large particles, which still likely contain appreciable amounts of fermentable substrate, to be further digested in the reticulorumen. Though fermentation initiated in the reticulorumen can continue in the omasum, it does so in only limited quantities, so this mechanism of ejecting largely unfermented particles into the reticulorumen is necessary for completed fermentation.

The omasum is spherical in shape and connected to the reticulum by a short tunnel. It is called the “many piles” or the “butcher’s bible” in reference to the many folds or leaves which resemble pages of a book. These folds increase the surface area that absorbs nutrients from food and water.

Food enters omasum at second biphasic reticular contraction. The omasum itself has biphasic contractions. The first contraction expels fluid by squeezing the ingesta from the omasal canal between the lamellae. The second contraction expels solids by mass contraction of the omasum. Contractions are slower than the rumenoreticular contractions. Omasum has a role in the control of digesta outflow from the rumen (Afzalzadeh and Hovell, 2002).

2. Histology of Omasum

The omasum has a keratinised stratified squamous epithelium. It is firm in texture and vary in size. Lamellae thrown into leaves divide the lumen into narrow and uniform recesses. It contains no glands.

The papillae of the omasum are mostly small and lenticular, although some can be large and conical. The circular tunica muscularis extends into papillae of long laminae and the lamina muscualris extends into papillae encircling the tunica muscularis. The omasum has 3 smooth muscle layers in the papillae. Therefore they are very motile.

The mucosa and portions of muscularis mucosae form parallel folds that resemble pages of an open book. The folds are called laminae and they have little projections (papillae) on their surfaces.

The mucosal surface is covered by stratified squamous epithelium. This absorbs water and other nutrients. The core of the laminae are quite characteristic with three layers of smooth muscle. Extending upward from the muscularis mucosae are fibers that form the two outer layers.

The orientation of the muscle cells is parallel to the free edge of the laminae. Sandwiched between these two layers is a single inner layer of smooth muscle. This is derived from the muscularis externa and the fibers are perpendicular to those of the outer layers.

Movements of the laminae folds help to crush the ingesta. After becoming more compact due to the absorption of water, the ingesta is passed on into the abomasum (Bacha and Bacha, 2000).

3. Results

Gross lesions varied among lack of omasal villi, necrosis of omasal epithelium, and congestion.

Histopathological results confirm the previously mentioned gross findings by revealing some necrosis (hyalinization of smooth muscle fibers), edema noticed by lack of muscle fiber bundles under the microscopic field, vacuolar degeneration of some other smooth muscles, proliferation of polymorphonuclear inflammatory cells with loose connective tissue among muscle bundles, and some blue patches that might be pus particles with light pink edematous liquid.

Gross photo reveals redness of the epithelium between two folds of an omasum.

Gross photo reveals necrotic areas on the surface of an omasum with discoloration of the necrotic area and disappearance of its villi.

Gross photos reveal areas of paleness with lack of villi

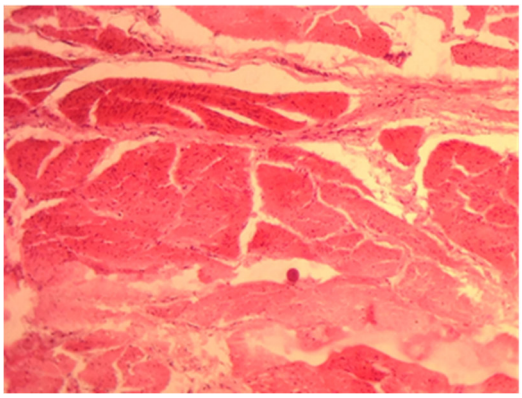

Photo 350 X H&E reveals hyalinization of muscle fibers in muscularis externa, edema with dispersed inflammatory cells.

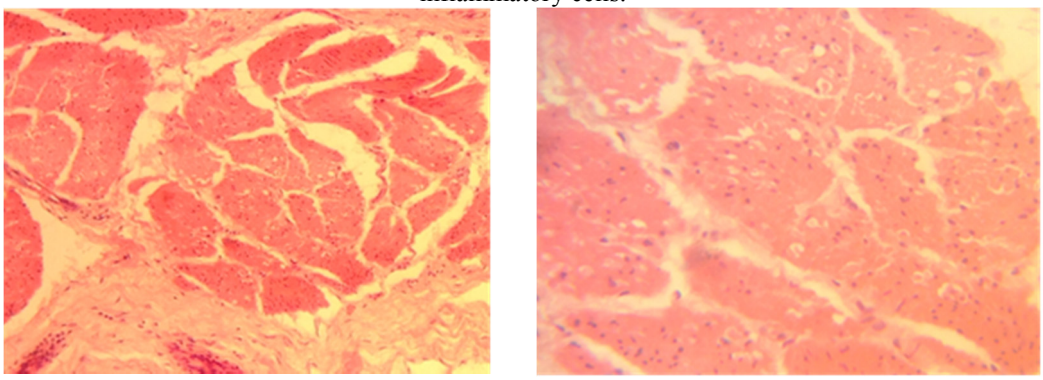

Photo (Left 420 X) (Right 1440X) H&E reveals vacuolar degeneration in elastic muscle fibers of *muscularis externa*, infiltration of polymorphonuclear inflammatory cells with congestion of blood capillaries.

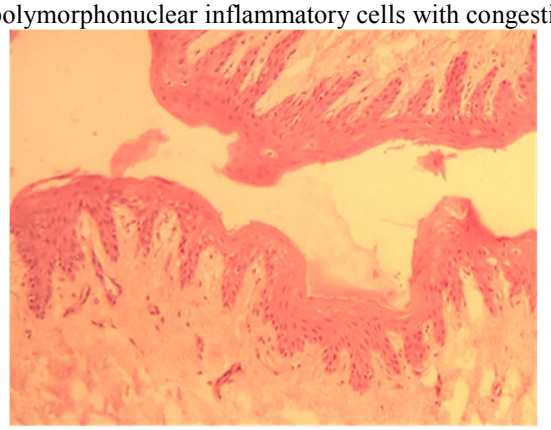

Photo 420 X H&E reveals hyalinization of the *muscularis mucosae*, vacuolization of stratified squamous epithelium, and infiltration of polymorphonuclear cells with congestion.

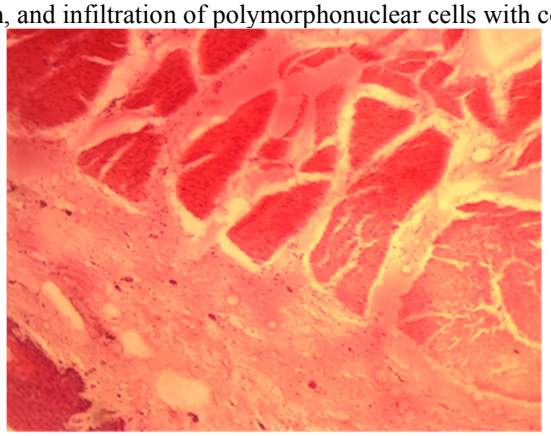

Photo 420 X H&E reveals hyalinization of *muscularis externa*, infiltration of polymorphonuclear cells, blue patches that might represent microbial colonies with cellular debris. Presence of fibrinous exudate.

4, Discussion

Omasal canal experiences contraction with each primary and secondary contraction of the rumen. It is suggested that omasal canal contractions force more fluid components of the ingesta from the canal between the leaves of the omasal body. Canal contractions were often followed by contraction of the omasal body which forced accumulated fluid ingesta into the abomasum.The greatest flow of ingesta from the reticulum seemed to occur directly following the canal contractions. Backflow of large volumes of ingesta from omasum to reticulum was occasionally noted and appeared to occur when the omasal body contracted during closure of the omaso- abomasal orifice (Stevens et al., 1960).

The few references confirm the major mechanical digestive function that characterizes omasum specifically, but this does not prevent that the almost recognized lesions might impede its major function.

Lack of villi will minimize the fluid absorbed from omasal epithelium as decreasing both the surface area and mechanical friction that participate in the mechanical digestive part.

Besides, lesions recognized in the epithelium will participate to previously mentioned disorders in digestion.

In addition to formerly stated linking, recognition of hyaline degeneration in *muscularis externa* and *muscularis mucosae* might contribute to possible mechanical omasal dysfunction.

Some references review recorded some congenital defects; (Bhardwaj et al., 2000) reported an omasal hernia with fistulation. Recently, (Abu- Seida, 2016) diagnosed an omasal impaction using ultrasonography as well as it was conducted by (Buczinski, 2008; Mohindroo et al., 2008).

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