Lesions of cloisonne kidney in sheep: report on four cases

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SUMMARY

This study describes four cases of cloisonne kidney in sheep. These cases were seen during examinations of the kidneys of 10,080 sheep from different breeds at slaughterhouse. During this study, 316 (3.13%) sheep out of 10,080 had various kidney abnormalities. Three of cloisonne kidney cases were macroscopically, the other one was microscopically diagnosed. Grossly, in three out of four cases, kidney external surface had diffusely from dark brown to blackish color. Histopathological examination of hematoxylin-eosin stained sections revealed thickening and dark brown pigmentation of the basement membrane of proximal convoluted tubules. Hemosiderin pigmentation was determined in epithelial cells of proximal convoluted tubules in all cases. Since the etiology of the condition is unknown, further studies are needed to be carried out to etiology of cloisonne kidney in sheep and goats.

KEY-WORDS: cloisonne kidney - sheep - pathology.

RÉSUMÉ

Quatre cas de rein cloisonné chez le mouton : aspects lésionnels. Par F. HATIPOGLU et H. ERER.

Cet article décrit 4 cas de rein cloisonné de mouton. Ces cas proviennent d’une étude réalisée à l’abattoir sur les reins de 10 080 moutons de différentes races. Dans cette étude, 316 (3,13%) des 10 080 moutons ont montré avoir des anomalies rénales. Parmi eux, 3 cas de reins cloisonnés ont été diagnostiqués macroscopiquement et 1 cas diagnostiqué à l’examen microscopique. Dans les 3 premiers cas, la surface externe du rein possédait une couleur diffuse brune foncée à noiretée. L’examen histopathologique à l’hématoxyline-éosine met en évidence, dans tous les cas, un épaississement et une pigmentation brune de la membrane basale des tubes contournés proximaux. Comme à l’étiologie de ces lésions est inconnue, des études supplémentaires seraient nécessaires pour en déterminer la cause.

MOTS-CLÉS: rein cloisonné - mouton - anatomie pathologique.

1. Introduction

The pigmented thickening of the proximal convoluted tubular (PCT) basement membrane have been described in goats [1, 2, 3, 4, 7, 9, 10], horses [6] and sheep [7, 8]. LIGHT [4] called the condition «cloisonne kidney» because of its resemblance to French enamel work in which the color areas are separated by bands of wire. The anatomic changes in the kidneys are associated with no apparent clinical disease or physiologic abnormality, and the etiology of the condition is unknown [4].

Grossly, the lesion spread diffusely throughout the cortex, ending at the cortico-medullary junction. The renal cortices are uniformly brown or black due to thickening and brown pigmentation of basement membranes of PCT. Microscopically, the tubules involved were always the PCT. The distal convoluted tubules (DCT) and the segments of both proximal and distal convoluted tubules which reside in the medulla were never involved in the alterations of the basement membranes [4, 7, 9].
2. Materials and Methods

A) ANIMALS

The material was obtained from an abattoir study in which the kidneys of 10,080 sheep from different breeds were examined for renal lesions. During this study 4 cases of cloisonne kidney were found.

B) EXAMINATION PROCEDURES

The kidneys of sheep were examined after slaughter procedures and gross abnormalities were recorded. Tissue samples from affected kidneys were fixed in 10 per cent buffered formalin, routinely processed and embedded in paraffin wax. Sections cut at 5 µm thickness were stained with haematoxylin and eosin (H & E), Masson’s trichrome, von Kossa, periodic acid Shiff (PAS), Turnbull blue, Schomorl’s and Armed Forces Institute of Pathology (AFIP) method [5].

3. Results

A) INCIDENCE AND MACROSCOPIC LESIONS

During this study, 10,080 sheep were examined for kidney lesions and 316 sheep (3.13 %) had various kidney abnormalities, and cloisonne kidney was found in 4 sheep (0.04 %) out of 10,080. Three of cloisonne kidney cases were macroscopically, the other one was microscopically diagnosed.

Three cases out of 4 sheep, kidney smooth external surface was diffusely dark brown to blackish color. Examination of kidney external surface with hand lens revealed scattered and slightly blugged, pin-head size, black spots (Figure 1A). Dark brown and blackish pigmentation and narrow radiating stripes, was determined on the cut surface of renal cortex, but no pigmentation could be found in renal medulla (Figure 1B). In one case, color of kidney was reddish-dark brown.

B) MICROSCOPIC FINDINGS

Histopathological examination of H & E-stained section revealed thickening of the basement membrane of PCT due to dark brown pigmentation (Figure 2). These changes, both partly and completely, were limited to PCT throughout the renal cortex. No change were observed in basement membranes of straightened proximal tubules, medullar tubules and Bowman capsules. In these cases hemosiderin pigmentation was determined in epithelial cells of PCT by Turnbull blue staining (Figure 3 A). In addition, a mild increase of connective tissue was seen in peritubular interstitium close to thickenened basement membranes (3B).

4. Discussion

Pigmented thickening of the PCT was described the first time in goats, named as «symmetrical cortical siderosis» in 1952, by ZAHAWI in Iraq [10]. LIGHT [4] termed this lesion as «cloisonne kidney» in goats in 1960, because of the resemblance of the thickened membranes to enamel work separated by wires. This condition have been reported in goats in U.S.A. [1, 2, 9] and India [3]. The first case of cloisonne kidney in sheep was reported by ORYAN et al. [8] in 1993, in Iran. In fact, the first report of cloisonne kidney in sheep was described by METIN [7] (unpublished thesis) in 1980, in Turkey.

In this study, cloisonne kidney was diagnosed in 4 cases (0.04%) out of 10,080 sheep. This incidence is lower than other reports in goats : 3.6 % [10], 14 % [4], 3.02 % [7] and sheep 0.75 % [7]. In the present study, grossly 3 out of 4 cases, the kidneys had dark brown and blackish color, pin-head size black spots in kidney surface, and narrow radiating stripes on cut surface of renal cortex, as previously reported [4, 7, 10]. Some authors [4, 7] reported that cloisonne kidney may not be diagnosed on macroscopic examination in some cases. Similarly in the present study, one case grossly was evaluated as renal hemosiderosis, but slight degree of cloisonne kidney was diagnosed on microscopic examination.

Microscopically, the tubules involved were always the PCT. The DCT and the segments of both proximal and distal convoluted tubules which reside in the medulla were never involved in the alterations of the basement membranes [4, 7]. Similarly, in our study, no alterations were found in these portions of the kidney. On the other hand, ORYAN et al. observed pigmented thickening of both PCT and DCT in one sheep.

In our study, the thickened membranes of PCT failed to stain positively for hemosiderin, lipofuscin, melanin and calcium salts. This results resemble to reports of some researcher, who are stated that the pigment has no relation with hemosiderin [4, 7], melanin [4, 7, 9, 10] and calcium salts [4, 7, 9]. But, these results were contradictory to MARCATO and SIMONI’s finding [6], because of pigmentation of basement membrane due to lipofuscin in horses. In the present study pigmented basement membrane gave PAS positive reaction in all cases. Similar findings was reported by LIGHT [4] and THOMPSON et al. [9]. In contrast KHAROLE [3] stated that the pigmented basement membrane had PAS negative reaction.

It is reported that small, brown color, granular, iron positive pigments were seen in epithelial cells of PCT along with pigmented thickened basement membrane in cloisonne kidney [2, 3, 4, 7, 8, 10]. Some of these researchers [2, 3, 4] stated that the pigment in epithelial cells of PCT is hemosiderin. In this study, renal hemosiderosis were determined by turnbull stain method in all cases.

LIGHT [4] and METIN [7] reported that in some cases isolated large cells lying in the interstices between the thickened membranes of adjacent segments of renal tubules may be found. Such cells, which have the plump stellate or triangular shape necessary to fit into the interstices, have an abundance of rather opaque, very finely granular, slightly basophilic cytoplasm, and possess one or more large nuclei. In addition, increase of intertubular collagen fibers were also reported [7]. LIGHT [4] and METIN [7] stated that these changes represent a response to the presence of large amounts of pigmented basement membrane material. In our study, increase of collagen fibers were shown on peritubular interstitium by


FIGURE 3. — Microscopic appearance of renal tissue sample: Hemosiderin in epithelial cells of PCT. Turnbull blue, X 225 (A). Increase of collagen fibers on peritubular areas, Masson’s trichrome, X 225 (B).
Masson’s tricrome stain in 3 cases (severe), but no cellular reactions were found.

Although the etiology of this condition is unknown, some researchers stated about the reason of this pigmentation [1, 10]. ZAHAWI [10] claimed that the presence of ferric compounds in the cells of the PCT was irreversible and may be the cause of the hypertrophy of the basement membrane. Author has mentioned that diet which has low protein and cobalt content, and rich in iron may be responsible for this condition. One another opinion [1] about etiology is that elevated serum iron-binding saturation, goat erythrocyte with its small size, low membrane enzyme activities (glucose-6-phosphate dehydrogenase, glutathione, and acetylcholinesterase activity), and increased osmotic fragility, may be more susceptible to intravascular hemolysis by any number of inciting causes: e.g. poisonous plants, or copper in the soil. Unfortunately, we couldn’t performed any investigation on blood samples and dietary factors, because the material of this study was taken from abattoir.

In the lights of these findings, further studies are needed to be carried out in order to etiology of cloisonné kidney in sheep and goats.

5. References