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Case Report

Renal Hypoplasia in a Calf

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Renal hypoplasia refers to a congenitally small kidney where there is essentially normal residual parenchyma but smaller calyces, lobules, and papillae. This anomaly can be divided into two broad groups: complete (global) renal hypoplasia and segmental renal hypoplasia. In this study, a 3 days-old simmental calf was diagnosed with renal hypoplasia and unreconstructed exstrophic bladder. It presented very low body temperature, pulmonary distress and tachycardia in preoperative clinical examinations along with inability to urinate for 3 days according to its owner's claim. Urine bladder cannulation showed no urine in the bladder. pH, pCO_2, PO_2, $cHCO_3$, cSO_2, were measured as 7.352, 41,3 mmHg, 29.5 mmHg, 22.9 mEq/L, and 53.1%, respectively. The concentrations of Na^+ (mmol/L), K^+ (mmol/L), Ca^{++} (mmol/L), Cl^- (mmol/L), $cTCO_2$ (mmol/L), Hct% and cHgb (g/dL) were seen as 128, 7.1, 0.47, 103, 24.2, 19 and 6.5, respectively in blood hematological and biochemical examinations. Polycystic areas were also detected in the area of kidneys in ultrasonographic examination. Diuretics along with fluid theraphy were not effective on the urine flow from bladder, and the calf died on the 3rd day of its life.

Keywords: Renal hypoplasia, calf, blood chemistry, ultrasonography, necropsy

Renal hypoplasia is a common, yet poorly understood and misused term describing congenital renal anomaly. Renal hypoplasia is defined as abnormally small kidneys with normal morphology and reduced nephron number (1-2). This anomaly may occur as unilateral or bilateral (3). Bilateral congenital renal hypoplasia is 7 times less more frequent (approximately 1 in 5000 fetuses) than unilateral hypoplasia, thus being one of the rarest anomalies of the kidney and urinary tract (4-5). It is not always possible to know why renal hypoplasia happens. According to Dziarmaga et al. (4), in the majority of cases, it is not caused by anything that the mother does during her pregnancy, and it is unlikely that a future pregnancy will result in renal hypoplasia or other problems with the kidneys. Different studies (6-9) reported that renal hypoplasia may be caused by *PAX2* gene and may be observed in the renal-coloboma syndrome, which is caused by mutations of the *PAX2* gene. We aimed in this study to consider carefully the clinical, biochemical, radiological, and ultrasonographical features of renal hypoplsia for a better understanding of the disease and correlation of those features with

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the pathological findings.

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A 3 days-old simental calf was diagnosed with renal hypoplasia in this study. Certain of the clinical manifestations were distinctive. Its owner claimed that no diuresis was apparent during 3 days after birth. Lower body temperature (35.5 °C) and bouts of dehydration were detected along with moderate proteinuria. Diuretics along with fluid theraphy were not effective on the urine flow from bladder and the calves died at the 3rd day of its life. Moreover, some hematologic, serum biochemical and blood gases were measured as below: Hct level was 19 (%), hemoglobin level was 6.5 g/dL. Glucose, lactate and creatinine levels were detected as 66 mg/dL, 0,89 mmol/L and > 15 mg/dL, respectively. Concentrations (as mmol/L) of Na+, K+, Ca++, Cl- and cTCO2 were measured as 2128, 7.1, 0.47, 103, and 24.2, respectively. Blood pH was 37.352. Blood gases were also meausred with regard to pCO_2, pO_2 and $cHCO_3$ as 41.3 mmHg, 29.5 mmHg, and 22.9 mEq/L, respectively.

Polycytic areas and hypoplastic formations were determined in the anatomical place of kidneys in left and right side in ultrasonographic examinations. The bladder was smaller than normal seize and small amount of urine was present in the bladder. When the abdominal cavity was opened for necropsy, both kidneys appeared to be rather small and abnormaly shapped, differing from normal kidneys (Figure 1).



Figure 1. Macroscopic evaluation of renal hypoplasia.

Two gray white color and elastic viscous texture tissues sized 3x2x2 and 4x2x1 cm in edematous adipose and connective tissues were determined in this area. An extra formation of about 3 cm diameter, like a bladder was observed at the point these two tissues commissured. Samples taken from these tissues were fixed in formaldehyde solution for further histopathological examination paraffin embedding.. Sections taken by microtome were stained with hematoxylin and eosin (H & E). Histopathologic examinations (Figures 2, 3) revealed that both kidneys were apparent in the tissues of chronic glomerular nephritis, and kidney tissue formations were present in structures containing tubuli. A large number of crystals surrou-nded by proliferative connective tissue or present in dilated

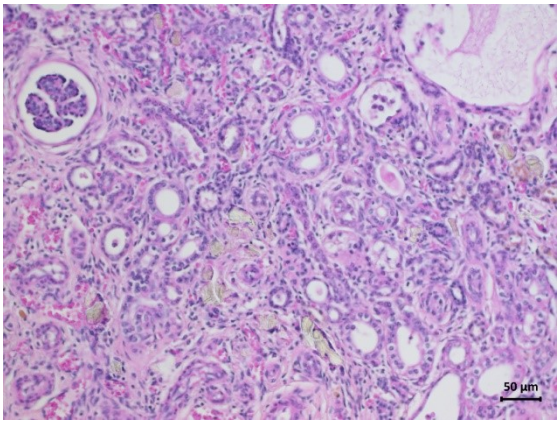


Figure 2. Crystals is in the interstitium, the renal tubules and the parenchyma.

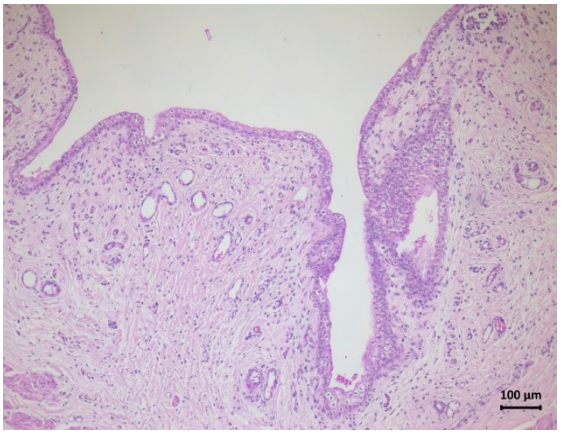


Figure 3. The bladder, 3-5 layered urothelial epithelium.

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cystic tubuli were present in both kidneys. Glomeruli were enlarged and wrapped around with a thick connective tissue. Tubuli were seen as dilated cystic structures in many areas. Their epitels showed degenerative changes. Connective tissue proliferations consisting of collagen, fibrocytes and fibroblasts were widely noticed in the interstitium. The muscle layer of the bladder and urine tissue containing urothelium was detected in the examination of bladder like formation. Therefore, according to the histopathological findings, it was concluded that there was a hypoplasia of the kidneys and bladder.

Discussion

Although unilateral renal hypoplasia is a common anomaly, but bilateral renal hypoplasia is rare. In ultrasonography images, an involved kidney was smaller than normal, with fairly smooth outline and borders (10-12). In the present case,similar findings were detected. The abnormalities in concentrating ability, in acid base balance, and in calcium metabolism displayed by these patients are those common to the chronic renal diseases of neonate. These disturbances, as well as deficiencies in body growth, are often particularly evident in oligomeganephronia. Proteinuria is always moderate (3, 13). Laboratory findings taken from the present study,also supported earlier studies.

We also determined polycystic areas in ultrasonographic examiations and did not see normal kidney formation in anatomical land of kidneys under vertebra. Moreover, the bladder was smaller than normal and included a small amount of urine. Similar ultrasonographic findings was reported by other researchers (14-15).

Gopalh et al. reported that gross changes suggestive of hypoplasia or polycystic kidneys or both were usually encountered in calves that had congenital defects (16). Other significant histological features included immature glomeruli and tubular epithelium. Periglomerular and interstitial connective-tissue proliferation were seen occasionally. Similarly, tubuli were seen as dilated cystic structures in many areas in our study. Additionally, the connective tissue proliferations consisting of collagen, fibrocytes and fibroblasts were widely detected in the interstitium, as claimed previously (13).

Consequently, this is the first case of renal hypoplasia along with its hematological, biochemical and hystopathological evidences reported in Turkey, and to our knowledge there is no other study in calf worldwide. We beleive that this case report may help physicians to decide on how to act and what to do when faced to similar renal hypoplasia cases.

Conflict of interest

The authors declared no conflict of interest.

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