

Herniation of Duodenum into the Right Ventral Hepatic Peritoneal Cavity with Groove Formation at the Ventral Hepatic Surface in a 2-Week-Old Chicken

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(Received 27 September 2012/Accepted 29 May 2013/Published online in J-STAGE 12 June 2013)

ABSTRACT. Internal hernia in avian species is very rare. A necropsy of a 2-week-old SPF White Leghorn chicken revealed that a loop of the duodenum and part of the pancreas ($4 \times 2 \times 1$ cm) was protruding through the abnormal foramen (2.5 cm in diameter) in the right posthepatic septum into the right ventral hepatic peritoneal cavity. The herniated loop was located underneath the ventral hepatic surface, leaving a groove on the right hepatic lobe ($2 \times 1.5 \times 0.4$ cm). The part of the pancreas involved in the hernia was grossly enlarged. Microscopically, a zone of pressure atrophy of hepatic tissue was characterized by crowdedness of hepatocytes with pyknotic nuclei and faint eosinophilic cytoplasm and indistinct narrow sinusoids. The pancreas revealed hypertrophy of the acinar cells with an increase in the secretory granules and basophilic cytoplasm. This is the first report of duodenum herniation into the right ventral hepatic peritoneal cavity resulting in groove formation on the ventral hepatic surface in a 2-week-old chicken

KEY WORDS: chicken, groove, hernia, posthepatic, septum.

doi: 10.1292/jvms.12-0434; *J. Vet. Med. Sci.* 75(10): 1405–1407, 2013

The peritoneal cavity in birds is subdivided into five chambers by five double-layered sheets of peritoneum. The five peritoneal cavities are the right and left ventral hepatic cavities (liver sacs), right dorsal hepatic cavity (right pulmonary recess), left dorsal hepatic cavity (left pulmonary recess) and intestinal peritoneal cavity. The first three cavities are isolated; however, the last two compartments are interconnected by narrow openings [4, 9]. The right and left sheets of the posthepatic septum divide the peritoneal cavity into the hepatic peritoneal cavity (containing liver) and intestinal peritoneal cavity (containing intestines and urogenital organs). The hepatic peritoneal cavity is subdivided by the right and left hepatic ligaments into small right and left dorsal hepatic cavities and large elongated right and left ventral hepatic cavities, which extend to the caudal body wall [9]. The posthepatic septum is important in restricting the spread of ovarian and/or oviductal tumors by transcoelomic implantation into the intestinal peritoneum and left dorsal hepatic cavity [5, 7]. Moreover, ascitic fluid of broiler ascites syndrome was found in large quantities in ventral hepatic cavities, in moderate quantities in the right dorsal hepatic cavity and in small quantities in the intestinal cavity, but no fluid was observed in the left dorsal hepatic cavity [1]. Other important factors with regard to compartmentalization of the peritoneal cavity include the intraperitoneal injections and

surgical approach in birds [5, 8].

An internal hernia is a displacement of the intestine through normal or pathological foramina within the abdominal cavity without formation of a hernia sac [2]. External abdominal hernia is frequently observed in birds, although it is not a true hernia because there is no opening in the aponeurosis of the abdominal muscles and no typical hernia ring [10]. Internal hernia in birds is rarely observed, and to the author's knowledge, there is only one report concerning herniation of intestine and oviduct through the posthepatic septum in adult White Leghorns chickens [5]. In the present work, we report a case of duodenal herniation into the right ventral hepatic cavity with groove formation on the ventral hepatic surface in a 2-week-old White Leghorn SPF chicken.

In experimental work related to pathogenesis of colibacillosis in the Department of Veterinary Pathology, Faculty of Agriculture, Iwate University, necropsy of an euthanized control 2-week-old specific-pathogen-free (SPF) White Leghorn line female P2 chicken revealed that a loop of the duodenum ($4 \times 2 \times 1$ cm) was protruding through an abnormal foramen (2.5 cm in diameter) in the right posthepatic septum into the right ventral hepatic cavity. A groove ($2 \times 1.5 \times 0.4$ cm) on the ventral surface of the right hepatic lobe beneath the herniated duodenal loop was found. The part of the pancreas involved in the hernia was grossly enlarged (Fig. 1). Samples of the liver and pancreas were collected and immersed into 10% neutral buffered formalin for fixation, dehydrated and embedded in paraffin wax in the usual manner, sectioned ($4 \mu\text{m}$ thick) and stained with hematoxylin and eosin (HE). Microscopically, hepatic tissue at the site of the groove was characterized by crowdedness of hepatocytes with pyknotic nuclei and faint eosinophilic cytoplasm and indistinct narrow sinusoids (Fig. 2). The pancreas revealed hypertrophy of the acinar cells with an increase in the secre-

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Fig. 1. Herniation of a loop of the duodenum and the pancreas into the right ventral hepatic cavity, producing a groove (arrow) in the right lobe of the liver.

tory granules and basophilic cytoplasm.

Hernia of the intestine and oviduct into the right and left ventral hepatic cavity respectively has been recorded in adult fowls at postmortem examination [5]. Herniated organs rarely carried genital tract carcinomas related to the oviducts in these adult chickens. In the present case, the oviduct had not yet developed on the left side, and the herniation involved the duodenum on the right side. Hernias are much more common through the right than left posthepatic septum [5]. Parts of the duodenum and pancreas are usually involved in the hernia in the right septum. Other parts of the small or large intestines could be involved in the right septum hernia [5]. The oviducts, particularly in laying hens, are commonly involved in left septum hernia. However, the groove formation on the ventral hepatic surface observed in the present study has not been previously described.

The histopathological findings of the hepatic tissue at the site of the groove indicated that the underlying hepatic tissue was atrophied. Atrophy of a part of the liver may be a response to pressure or to impairment of blood or bile flow [11]. Local pressure atrophy occurs adjacent to space-occupying lesions in the liver. Hepatic pressure atrophy was observed in chronic (long-standing) pressure from neighboring organs, such as a distended rumen in the ox [11] and a distended right dorsal colon and base of the cecum in the horse resulted in right hepatic lobe atrophy [6]. In humans, Zahn's grooves are deep grooves on the upper liver surface and oc-

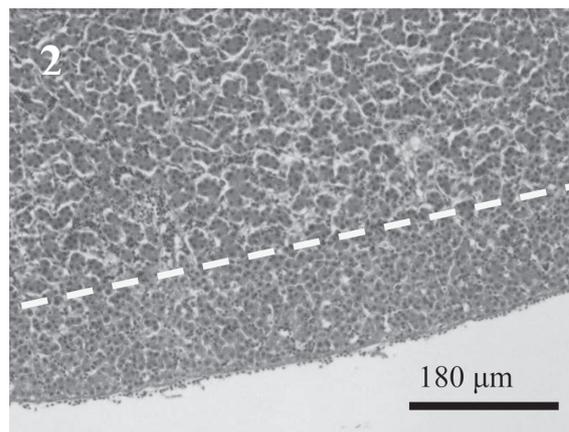


Fig. 2. Photomicrograph of hepatic tissue revealed a zone of superficial atrophy characterized by crowdedness of the hepatocytes with scant cytoplasm and pyknotic nuclei. HE.

cur predominantly on the right liver lobe. They are caused by pressure of the hypertrophied diaphragmatic muscle bundles predominantly in chronic obstructive pulmonary disease on the liver parenchyma, resulting in superficial hepatic atrophy [3]. To the author's knowledge, there is no report of pressure atrophy of hepatic tissue due to mass entrapment between the abdominal wall and ventral hepatic surface. The herniated part of the pancreas was hypertrophied. But, in the present case, the relationship between pancreatic hypertrophy and duodenal herniation could not be established.

Given the age of this case (2 weeks old) and the degree of atrophy, this herniation was likely congenital, and as the chick grew, the herniated loop of the duodenum might have pressed on the lateral ventral surface of the liver, leaving a groove. This is the first report of posthepatic septum herniation resulting in groove formation on the hepatic surface in a young (2-week-old) chicken. To hypothesize about whether or not the pathogenesis of herniation in the present case is the same as in adult chickens, further studies need to be implemented.

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