

**Congenital Diaphragmatic Hernia in the Right
Central Part of the Semi-Lunar Tendon
of the Cat***Alice Ferguson*

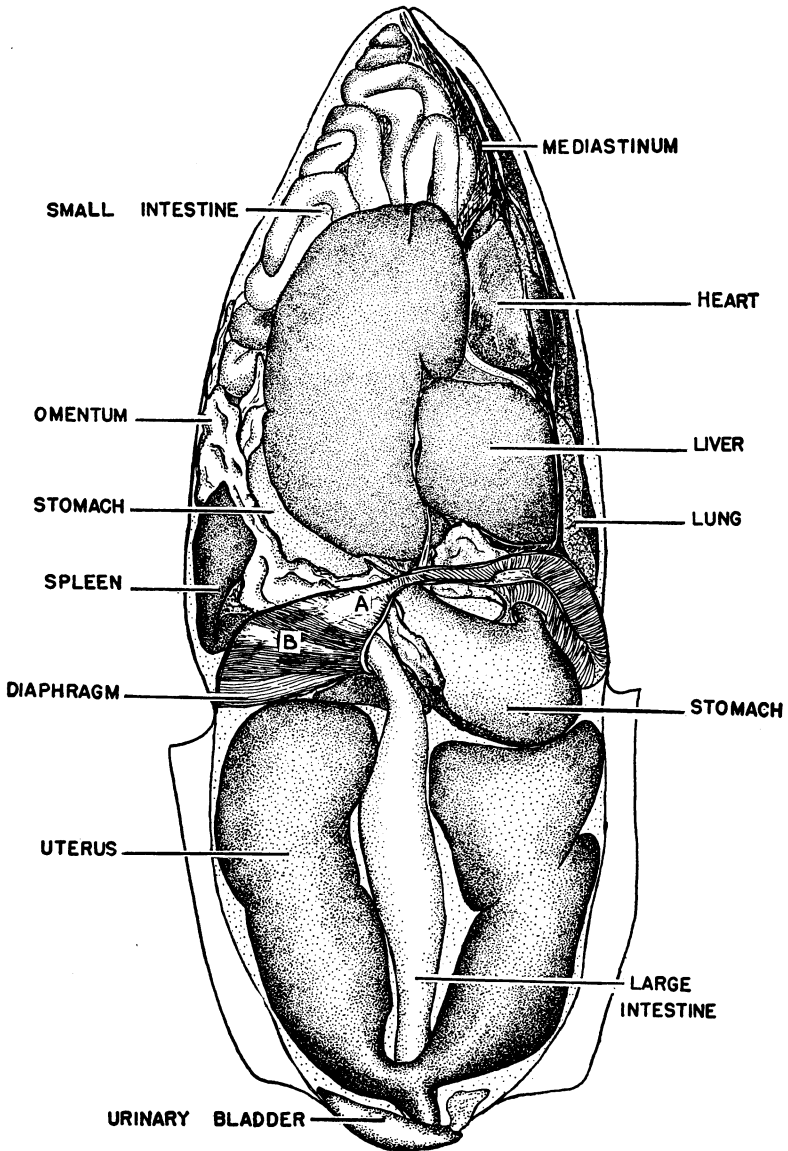
Several reports of congenital diaphragmatic hernia in the domestic cat have appeared in the literature. Briscoe (1928) described a male exhibiting a minimal displacement of the abdominal contents, which included a hernial sac lined by peritoneum, and containing one lobe of the liver, the gall bladder, and three inches of the greater omentum. Rifenburgh, Lawson, and Ogden (1937) described a male with nearly all of the small intestine, the pancreas, the spleen, and part of the greater omentum in the thoracic cavity. In this animal the right kidney was absent. Plagens and Bradbury (1930) described a specimen in which part of the stomach, the entire small intestine, part of the large intestine, the spleen, and a small portion of the liver were in the thoracic cavity. In the case reported by Kent (1945) the cat resembled the one described by Plagens and Bradbury, but the mediastinum was displaced to the left instead of to the right. Griffin (1945) reported a case in which the abdominal viscera, including over half of the liver, were in the thorax. In the latter specimen the left kidney was cystic.

The purpose of this paper is to contribute additional information concerning the site of congenital diaphragmatic hernia in the domestic cat and the extent of displacement of the abdominal contents so that the ontogeny of this anomaly may be better understood.

Description

The position of the esophagus was normal in relation to the heart and mediastinum, but, along with these structures, was displaced to the left in the thoracic cavity. The esophagus entered the abdominal cavity through the esophageal hiatus. The mid region of the stomach, constricted as shown in the diagram, passed anteriorly through the hernial hiatus

of the diaphragm and into the thoracic cavity. The opening, thirty-five millimeters in diameter, was located five millimeters ventro-lateral to the esophageal hiatus in the right half of the central portion of the semi-lunar tendon (including the area where the vena cava typically perforates the tendon). The right prolongation of the semi-lunar tendon extended dorsally from the opening. The left half of the diaphragm was reduced in size commensurate with the small left pleural cavity. The area of the diaphragm to the right of the semi-lunar tendon was expanded, apparently due to the tension produced during development by the displaced abdominal viscera. Except for the encroachment of the hernial hiatus of the right medial sterno-costal muscular portion and the presence of two membranous areas (*A* and *B* on diagram) (one fourteen millimeters wide in the anterior region and the other five millimeters wide in the area slightly lateral to the first) the musculature of the diaphragm was complete. However, the muscular elements appeared to be somewhat reduced in thickness. The small intestine passed posteriorly from the stomach for ten millimeters, then bent upward, became convoluted, and filled most of the space in the right anterior section of the thoracic cavity. The first fifty millimeters of the colon, exhibiting no differentiation into ascending and transverse regions, was in the thorax. The omentum, attached as usual, was almost entirely displaced into the thoracic cavity where its folds were consolidated in the right caudal area concealing only part of the stomach and a limited sector of the small intestine. The liver was almost wholly within the thoracic cavity. A small lobe (twenty-five millimeters in length) extended into the abdomen dorsal to the large intestine, as illustrated in the diagram. The abdominal viscera utilized most of the space in the thoracic cavity, displacing the mediastinal structures as well as the lungs to the extreme left side of the cavity. The left lung was slightly less than typical in size, but was functional and extended from the anterior to the posterior region of the pleural cavity. The right lung, located in the dorsal part of the thorax, was much reduced in size and appeared to be non-functional. The mediastinum joined the diaphragm to the left of the central part of the semi-



lunar tendon. The kidneys, adrenals, and reproductive organs were normal in appearance and in location. The abdominal cavity was occupied chiefly by the horns of the uterus, which contained four fetuses.

Discussion

Consideration of the cases reported reveals that, as stated by Kent, in the cat the central part of the semi-lunar tendon (generally believed to be derived from the septum transversum) apparently is the chief site of the hernial opening. Plagens and Bradbury and Kent reported cases in which the left half of the central part was open. The central tendon of the cat described by Briscoe contained the hiatus. Rifenburgh and co-workers were not specific as to the exact location of the hiatus, other than it was dorsal on the right. Griffin reported two openings, a small one on the left median area of the diaphragm and a larger one of the right side. In the cat described by Day the entire septum transversum of the diaphragm was absent, leaving only a ridge located in the normal dorsal position. In the specimen herein described the right central part of the semi-lunar tendon contained the hernial opening.

Kent stated that maximum displacement of the abdominal contents in congenital diaphragmatic hernia of the domestic cat evidently transposes to the thoracic cavity the entire alimentary canal from the cardiac portion of the stomach to the first inch or more of colon along with the pancreas and spleen, but excludes most of the liver. The cat described in this paper, as well as the one reported by Griffin, shows that the herniation may involve much of the liver. Over half of this organ was displaced in the individual described by Griffin, and all but a twenty-five millimeter lobe was transferred into the thoracic cavity in the animal herein described.

BIBLIOGRAPHY

- BREMER, J. L. (1943). The diaphragm and a diaphragmatic hernia. *Arch. of Path.*, 36: 539-549.
- BRISCOE, G. (1928). Hernia through the central tendon of the diaphragm. *J. of Anat.*, 62: 224.
- DAY, C. D. (1940). Visceral topography in a cat with almost complete congenital absence of a diaphragm, with embryological interpretations. *Jl. Tenn. Acad. Sci.*, 15: 267-279.
- GRIFFIN, L. E. (1945). A case of incomplete diaphragm with displacement of organs in a cat. *Turtox News*, 23: 133.
- KENT, Geo. C. Jr. (1945). Congenital diaphragmatic hernia in a domestic cat. *Arch. of Path.*, 40: 133-134.
- PLAGENS, G. M. and J. T. Bradbury (1930). A case of congenital hernia through the left central linea semi-lunaris of the diaphragm (cat). *Anat. Rec.*, 46: 259-269.
- RIFENBURGH, S. A., W. P. Lawson and R. P. Ogden (1937). A cat with an "upside down stomach." *Proc. Ind. Acad. Sci.*, 47: 285-286.