Bilateral lumbar hernias in a domestic shorthair cat

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Case Description—A 2.8-kg (6.1-lb) 4-month-old sexually intact female domestic shorthair cat was referred for evaluation of bilateral, subcutaneous lumbar masses that were presumed to be the kidneys.

Clinical Findings—Physical examination findings included 2 mobile, nonpainful, 3 × 3-cm, bilaterally symmetric masses in the dorsolateral lumbar region. Abdominal radiography, ultrasonography, and CT confirmed bilateral body wall defects with renal herniation. Serum biochemistry profile, urinalysis, and excretory urography confirmed normal renal function.

Treatment and Outcome—Exploratory laparotomy, reduction of the kidneys, repair of the body wall defects, bilateral nephropexy, and ovariohysterectomy were performed. There were no perioperative complications.

Clinical Relevance—Lumbar hernia has not been reported previously in a cat. It is important for veterinarians to be aware that although rare, lumbar hernia should be included in the list of differential diagnoses for a lumbar mass or signs of chronic lumbar pain in cats. (*J Am Vet Med Assoc* 2012;241:1495–1498)

A 2.8-kg (6.1-lb) 4-month-old female domestic shorthair cat was examined at the University of Georgia Veterinary Teaching Hospital for evaluation of bilateral subcutaneous masses over the lumbar dorsum. The masses were present when the cat was adopted 1 month prior to examination and had not changed in appearance. On initial examination, the patient was bright, alert, responsive, and in good body condition (body condition score, 3 [scale, 1 to 5]) and appeared clinically normal. Two mobile, apparently nonpainful masses were palpated subcutaneously in the dorsolateral lumbar region. Each mass was approximately 3 × 3 cm, and the right mass was slightly cranial to the left. The results of the physical examination were otherwise unremarkable. A CBC revealed mild anemia (26.1%; reference range, 30.7% to 46.1%). Serum biochemical analysis abnormalities included mild elevation of BUN concentration (34 mg/dL; reference range, 19.3 to 33.3 mg/dL), mild elevation of alanine aminotransferase activity (159 U/L; reference range, 27 to 100 U/L), and mild hyperphosphatemia (6.5 mg/dL; reference range, 2.9 to 5.9 mg/dL). These mild serum biochemical abnormalities were attributed to the young age of the patient combined with possible infestation with gastrointestinal parasites. Urine specific gravity was 1.038, and results of urinalysis[a] were unremarkable. Results of tests for FeLV and FIV[b] were negative.

Digital abdominal radiographs[c] were obtained, and 2 well-defined, ovoid soft tissue opacities were identified in the dorsal extra-abdominal soft tissues. Normally positioned renal silhouettes were not identified within the retroperitoneal space. Abdominal ultrasonography[d] confirmed the masses as the kidneys, with normal renal echogenicity and echotexture and of normal size (3.66 ± 0.46 cm^1). Mild pyelectasia was identified in the right kidney (measured 1.4 mm). The cat underwent general anesthesia for CT.[e] The patient was premedicated with glycopyrrolate (0.01 mg/kg [0.005 mg/lb], IM) and buprenorphine hydrochloride (0.02 mg/kg [0.009 mg/lb], IM). Anesthesia was induced with ketamine hydrochloride (10 mg/kg [4.5 mg/lb], IV) and diazepam (0.5 mg/kg [0.22 mg/lb], IV) and maintained with isoflurane in oxygen. Abdominal CT was performed (120 kV and 70 mA) from just cranial to the diaphragm to the coxofemoral joint caudally. Helical CT images (thickness, 2 mm; pitch, 1; 70 mA; 120 kVP) were obtained before and during the venous phase following IV administration of iodinated positive contrast[f] (880 mg of I/kg [1,936 mg of I/lb], IV). Images, acquired with a soft tissue detail algorithm, were reviewed as 2-mm reconstructed axial, dorsal, and sagittal reformations. Both kidneys were located outside of the retroperitoneal space within the dorsolateral subcutaneous tissues (**Figure 1**). The right kidney was located at the level of L2 to L4, and the left kidney was at the level of L3 to L4–5 intervertebral disk. Fusiform, fat-filled body wall defects were identified immediately cranial to both kidneys. The abdominal wall defect on the right measured approximately 1.1 cm in width and 2.0 cm in length, and the defect on the left measured 1.3 cm in width and 2.5 cm in length. Bilaterally, the ureters and renal vessels traveled cranially from the kidneys before entering through the body wall defect into the abdominal cavity. The right and left renal veins were subjectively increased in length, mea-

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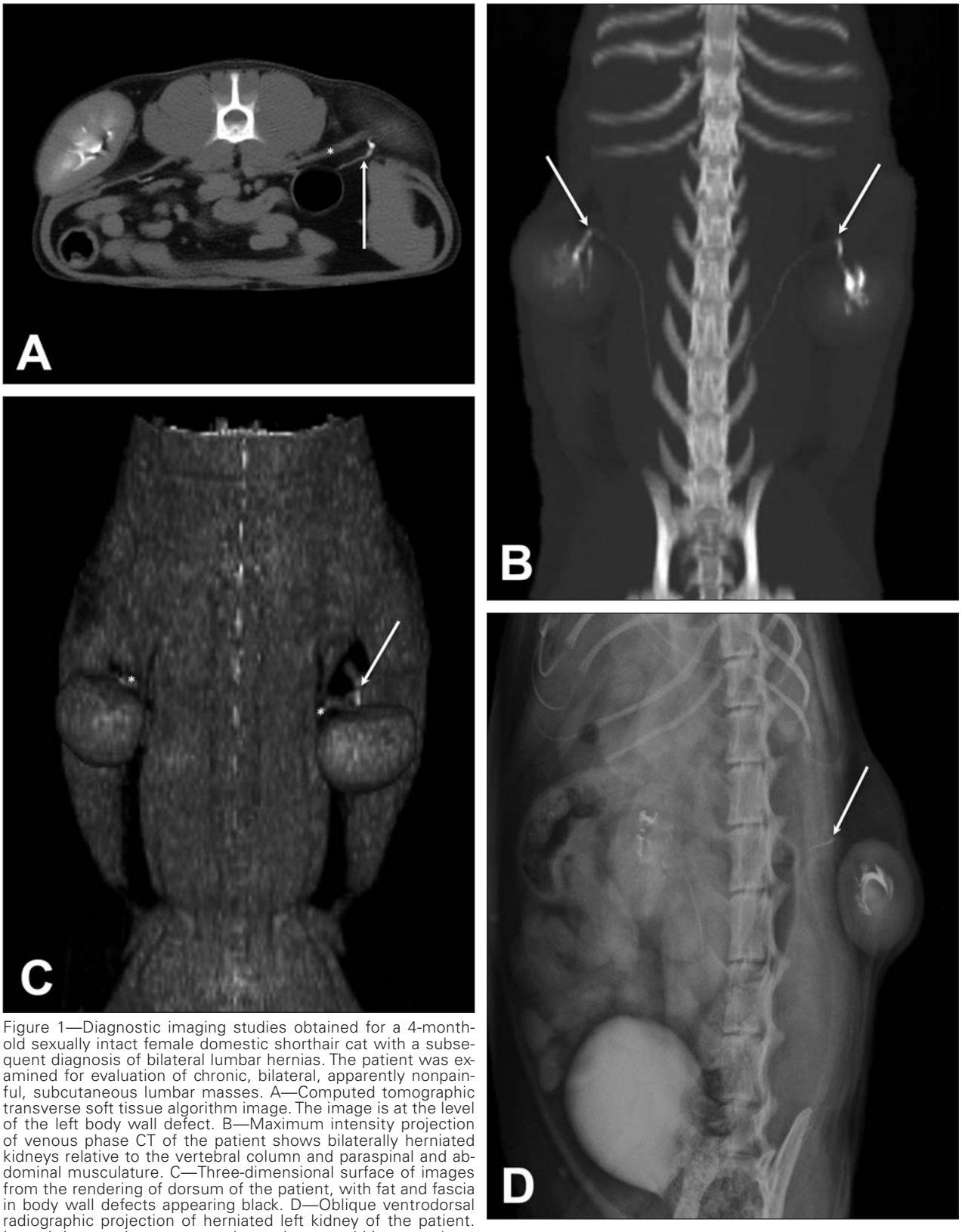

Figure 1—Diagnostic imaging studies obtained for a 4-month-old sexually intact female domestic shorthair cat with a subsequent diagnosis of bilateral lumbar hernias. The patient was examined for evaluation of chronic, bilateral, apparently nonpainful, subcutaneous lumbar masses. A—Computed tomographic transverse soft tissue algorithm image. The image is at the level of the left body wall defect. B—Maximum intensity projection of venous phase CT of the patient shows bilaterally herniated kidneys relative to the vertebral column and paraspinal and abdominal musculature. C—Three-dimensional surface of images from the rendering of dorsum of the patient, with fat and fascia in body wall defects appearing black. D—Oblique ventrodorsal radiographic projection of herniated left kidney of the patient. In each image, the contrast-enhanced ureters (thin arrows) are depicted as white structures passing through the body wall defects, which are located cranial to the herniated kidneys. Adjacent vasculature is also identified (* denotes renal veins). These structures are cranially directed toward the body wall defects and have a normal elongated path in the retroperitoneum to the level of the bladder trigone.

suring 3.5 and 4.3 cm, respectively. On postcontrast images, subjectively normal nephrogram and pyelogram were observed bilaterally. The contrast-filled left ureter was traced from its origin and inserted at the normal location on the urinary bladder trigone. The right ureter

was only traceable in the proximal two-thirds and poorly visualized distally because of lack of contrast opacification. This lack of opacification was presumably the result of peristalsis of the ureter. Both ureters were of normal size. On abdominal radiographs obtained after the CT excretory urography, radiopaque contrast was present within the renal collecting system, ureters, and urinary bladder. The ureters entered the urinary bladder trigone normally.

Surgical correction was pursued because of concern for potential trauma, even though the kidneys were functional and the patient had no clinical signs associated with the hernias. Although the cat was housed indoors, it lived in a multicat household and had direct interaction with the other cats. The goals of surgery were to identify the body wall defects, move the kidneys into the abdominal cavity, repair the abdominal wall defects, perform bilateral nephropexy to prevent torsion or crimping of the elongated renal vessels and ureters, and perform an elective ovariohysterectomy per the owner's request. Surgery was performed the day following CT. Premedication included glycopyrrolate (0.01 mg/kg, IM), acepromazine (0.05 mg/kg [0.02 mg/lb], IM) and buprenorphine hydrochloride (0.02 mg/kg, IM). Anesthesia was induced with ketamine (5 mg/kg [2.3 mg/lb], IV) and diazepam (0.25 mg/kg [0.11 mg/lb], IV) and maintained with isoflurane in oxygen. The patient was placed in dorsal recumbency and draped in such a way that the dorsally located ectopic kidneys could be accessed in sterile fashion from the external body wall if necessary. A ventral midline approach to the abdomen was made with an incision extending from xiphoid process to pubis. The body wall defects were easily identified caudal to the 13th rib. The medial extent of the hernia was defined by the lateral border of the quadratus lumborum muscle, the lateral border of the hernia was defined by the dorsal origin of the transversus abdominis muscle, and the cranial border of the hernia was at the caudal extent of the retractor costae muscles. The hernia was determined to extend through the layers of the body wall into the adjacent subcutaneous tissues. The right body wall defect was slightly enlarged to facilitate access to the kidney.

A combination of blunt and sharp dissection was used to free the kidneys from the subcutaneous space, and both kidneys were subsequently reduced into the abdominal cavity. The margins of the muscular defects in the abdominal wall were sharply excised and then closed primarily by use of nonabsorbable suture[g]; a simple continuous pattern was used to achieve a tension-free closure. The ureters and renal vessels had normal attachment at the renal hilus. Nephropexy was performed to prevent torsion or crimping of the ureters and renal vessels. Because of the length of the renal vessels, final location was immediately caudal to the diaphragm but cranial to the normal kidney position. The only other abnormality identified during abdominal exploration was a small, rounded spleen with a central band of fibrous tissue. The importance of the splenic abnormality was unclear but was hypothesized to be the result of entrapment during development. The liver, gastrointestinal tract, pancreas, and reproductive organs were unremarkable. Standard ovariohysterectomy was performed, and abdominal closure was performed via a routine 3-layer closure. Cefazolin (22 mg/kg [10 mg/lb], IV) was administered intraoperatively. Buprenorphine (0.005 mg/kg [0.002 mg/lb], IV, q 8 h) and a maintenance rate of IV fluids using a balanced electrolyte solution[h] with 20 mEq of potassium chloride[i]/L (2.5 mL/kg/h [1.1 mL/lb/h], IV) was administered after surgery. Intravenous fluids were discontinued several hours following recovery from anesthesia, and buprenorphine was discontinued the following day. There were no postoperative complications, and the patient was discharged from the hospital 2 days following surgery. The patient was doing well 18 months following surgery, as noted via phone conversation with the owner. Laboratory indices of renal function remained within reference limits, and the only reported abnormality was hypersensitivity to handling over the area of the previous hernias.

Discussion

The only reports[1,2] of lumbar hernia in the veterinary literature include spontaneous hernia in a New Zealand white rabbit and experimental teratogen models in rats. Lumbar hernias in humans are rare, with fewer than 300 cases reported in the literature.[3–5] These hernias may be congenital (20%) or acquired (80%).[6] Acquired hernias may occur spontaneously or as a result of trauma.[3–6] Spontaneous hernias (55%) occur primarily in elderly patients; increased risk factors include excessive weight loss, increased intra-abdominal pressure, or increased physical labor.[4,5] Twenty-five percent of acquired lumbar hernias are associated with traumatic etiologies, including blunt force and penetrating traumas, retroperitoneal abscess, and hematoma. Surgical procedures in humans with the reported complication of lumbar hernia include flank surgeries (nephrectomy and aortic aneurism repair) and iliac bone graft harvest.[3–7]

Lumbar hernias are often difficult to diagnose in humans; patients may be asymptomatic, may complain of mild lumbar pain, and may or may not have a palpable mass, depending on the size and content of the hernia.[3,5] Hernia contents may include fat, mesentery, liver, spleen, stomach, intestine, colon, ovary, and rarely, kidney tissues.[5,6] In human patients, hernia size progressively increases over time and long-term morbidity includes pain, bowel obstruction, strangulation, and incarceration. Therefore, early surgical repair is recommended for all lumbar hernias.[3,4,6] In the patient described in the present report, surgical correction was recommended in an effort to decrease the risk of trauma to the poorly protected kidneys. Whereas this cat was an indoor cat, it was housed with several other cats and was reported to interact with them in a manner that may have resulted in puncture of the kidney via a claw or through a bite wound. Surgical techniques used in human medicine include direct closure of the defect, local tissue flaps, and mesh for large defects.[3,6,7] A laparoscopic approach for repair was described in 1997.[3]

In humans, there are very specific anatomic regions where lumbar hernias develop; these regions are defined by triangles of overlapping muscle groups. The

first triangle was described by Petit in 1783 and thereafter named the Petit, or inferior, triangle. The Petit triangle is bordered by the iliac crest and the external abdominal oblique and latissimus dorsi muscles.[3,5,6] The superior, or Grynfelt, triangle was described by Grynfelt in 1886 and Lesshaft in 1870. The Grynfelt (sometimes called Grynfelt-Lesshaft) triangle is larger and the most common site for herniation.[5,7] Borders of the Grynfelt triangle include the 12th rib and the internal abdominal oblique, erector spinae, sacrospinalis, and muscles.[3,6,7] One study[7] evaluated 50 human cadavers to characterize the Grynfelt triangle. Most (50%) cadavers had small triangles (surface area < 5 cm^2). Only 10% had large triangles (surface area > 15 cm^2), 20% had medium-sized triangles (surface area, 5 to 15 cm^2) and, interestingly, 20% did not have a Grynfelt triangle. A similar classification on the basis of size has been established for the Petit triangle.[8] It has been hypothesized that larger triangles are more prone to herniation.[4] Although (on the basis of the findings during surgery) it is difficult to directly equate the hernia in the cat of this report to either the Grynfelt or the Petit hernia, it is most consistent with the Grynfelt hernia on the basis of the muscular boundaries identified. A more detailed and elaborate dissection of the hernia to better define its boundaries was beyond the dissection required for repair of the defect in this patient.

Approximately 20% of lumbar hernias in people are congenital with the remaining hernias classified as either primary or secondarily acquired.[6] Primary hernias are associated with conditions that result in increased intra-abdominal pressure such as strenuous physical activity or chronic bronchitis. Secondarily acquired hernias make up 25% of lumbar hernias and are frequently associated with a previous surgical incision, trauma, or lumbar abscess.[6] The Petit and Grynfelt triangles represent areas of anatomic weakness in the lateral abdominal wall. Embryologically, the body wall is derived from somatopleure, a layer of ectoderm and mesoderm. Somites, transient mesoderm structures adjacent to the vertebral column, differentiate into primordial muscle groups, the epimere and hypomere.[6,9] The epimere is located dorsal to the transverse process of the vertebrae and eventually develops into epaxial muscle. The hypomere, located ventral to the transverse processes, develops into the internal and external abdominal oblique muscles and the transversus abdominis muscle.[6,9] In early development, an intermuscular septum is present between the epimere and hypomere. However, later in development, the intermuscular septum is replaced with fasciae and aponeuroses of the oblique muscles.[6] Weakening at this site of the former embryonic intermuscular septum may result in lumbar hernia and is most consistent with the hernia observed in this cat.[6]

Lumbar hernia has not been previously reported in a cat. Because of the young age of the patient, congenital etiology seems most likely. However, given the unknown initial history, trauma cannot be entirely excluded but seems unlikely given the bilateral nature of the defects. Differential diagnoses for lumbar masses include abscess, hematoma, and neoplasia.[3] It is important for veterinarians to be aware that lumbar hernias exist, and, although rare, lumbar hernia should remain on the list of differential diagnoses for a lumbar mass or signs of chronic lumbar pain.

a. Multistix, Siemens Healthcare Diagnostics Inc, Tarrytown, NJ
b. Snap, Idexx Laboratories, Westbrook, Me.
c. Siemens Sireskop 5, Siemens, Washington, DC.
d. Phillips HDI 5000, Phillips Healthcare, Andover, Mass.
e. GE Goldseal HiSpeed NXiPro with Smartprep, GE Healthcare Inc, Princeton, NJ.
f. Omnipaque (iohexol), 350 mg of iodine/mL, GE Healthcare Inc, Princeton, NJ.
g. 2-0 polypropylene, Prolene, Novartis Animal Health Inc, Greensboro, NC.
h. Hospira Inc, Lake Forest, Ill.
i. Abraxis Pharmaceutical Products, Schaumburg, Ill.

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