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CASE REPORT

Companion or pet animals

Renal liposarcoma in a guinea pig (*Cavia porcellus*)

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Abstract

A 4-year-old, male, entire guinea pig (*Cavia porcellus*) was presented in stuporous state with hypoglycaemia, hypothermia and hypotension. After stabilising the animal, a complete blood cell count, biochemistry, survey radiographs and an abdominal ultrasound were performed. The abdominal ultrasound revealed a 3.2 × 5.4 cm soft tissue mass occupying the caudal half from lateral to medial part of the right kidney. To investigate further, a computed tomography scan with intravenous contrast was performed and confirmed the invasion of the mass into the caudal vena cava. A right nephrectomy was performed and submitted for histopathology, and a diagnosis of renal liposarcoma was made. The animal, although stable during surgery, died after recovery from anaesthesia. Spontaneous renal liposarcoma is rarely reported in human and veterinary medicine. This case report describes the clinical signs, diagnostic evaluation, surgical procedure, and gross and histological features of renal liposarcoma in a guinea pig.

KEYWORDS

guinea pigs, renal liposarcoma, small animals

BACKGROUND

Liposarcoma is a rare, malignant, mesenchymal tumour derived from adipocytes.[1] It may appear wherever fat tissue is present.[1] Liposarcomas tend to be locally invasive, and metastasis is rare; however, metastasis to liver, lung and bone has been reported.[1,2] Liposarcomas are described in human medicine and can occur in many animal species, but in the majority of cases primary renal liposarcoma is considered rare.[3] In an 18-month-old, male guinea pig that presented with a mass in the upper right eyelid, a palpebral well-differentiated liposarcoma with histopathology postmortem was described.[4]

CASE PRESENTATION

A 4-year-old, 0.990 kg, male, entire guinea pig (*Cavia porcellus*) presented with acute apathy and weakness ongoing for 2 hours. On evaluation, the patient was depressed, with pale mucous membranes, mild dehydration and hypothermia (34.3°C, reference range: 37.5°C–39.5°C).[5] The animal was painful on abdominal palpation, and a firm mass was found in the right cranial abdomen. A glycaemic test, performed using a point-of-care glucometer set for dogs and cats (Zoetis Alpha-TRAK 2), revealed severe hypoglycaemia (18 mg/dL, reference range: 60–125 mg/dL).[5] In order to stabilise the animal, an intravenous catheter 24G (Introcan Certo, B. BRAUN) was placed in the right cephalic vein and it received a bolus of glucose solution (1 mL/kg; GlucosaVet 40 g/100, B. BRAUN) diluted with warm crystalloids solution (1 mL/kg; Isofundine, B. BRAUN) (concentration 1:1). Once stabilised, the animal was placed in an incubator at 28°C, and a blood sample was taken with manual restraint from the right cranial vena cava. The guinea pig was hospitalised with a crystalloid solution of 2.5% glucose (at a rate of 4 mL/kg/h intravenously [IV]; Isofundine, B. BRAUN), meloxicam (0.5 mg/kg every 12 hours; Loxicom, Norbrook) and famotidine (0.5 mg/kg every 12 hours; Pepcid, JNTL CONSUMER HEALTH).

INVESTIGATIONS

A complete blood cell count showed leukocytes to be on the high end (14 × 10^3/μL, reference range: 7–14 × 10^3/μL),[5] with moderate neutrophilia (85%, reference range: 20%–60%),[5] and marked lymphopenia (5.3%, reference range: 30%–80%),[5] alterations compatible with an inflammatory process. Biochemistry revealed mild hyperkalaemia (9.5 mEq/L, reference range: 68–8.9 mEq/L),[5] mild hyperproteinaemia (6.3 g/dL, reference range: 4.6–6.2 g/dL),[5] moderate hyper-

globulinaemia (3.6 g/dL, reference range: 1.7–2.6 g/dL),[5] and a moderate elevation of alanine aminotransferase (68 U/L, reference range: 10–25 U/L).[5] The following day, the patient was more alert and imaging tests with manual restraint were performed. Due to the high quantity of ingesta filling the gastrointestinal system, the kidneys were not identified in the radiographic study, with ventrodorsal and right lateral views. However, calcification of the right gluteal tendon was seen as an occasional finding in the radiographic ventrodorsal view. The abdominal ultrasonography revealed a large heterogenous mass of about 3.2 × 5.4 cm occupying the caudal half of the right kidney and deforming the normal renal contour. Most of the mass was markedly hyperechoic to the renal cortex, with an echogenicity compatible with fat tissue. Other hypoechoic irregular areas were present in the central region of the mass. The mass appeared to extend through the renal vein into the caudal vena cava, where a hyperechoic tubular structure with a similar echogenicity to part of the mass was visible occupying about 60% of the lumen. The structure could be followed into the intrahepatic caudal vena cava, which was moderately distended. A small amount of free anechoic peritoneal fluid was detected, otherwise the rest of the abdominal structures were unremarkable (Figure 1). A computed tomography (CT) scan with a 16-slice CT scanner (General Electric Brivo CT385) was carried out to further characterise the mass and its invasion into the caudal vena cava. The guinea pig was sedated with ketamine (2 mg/kg IV; Ketamidor, Ritcher Pharma), butorphanol (0.5 mg/kg IV; Torbugesic Vet, Zoetis) and midazolam (0.5 mg/kg IV; Midazolam Normon, Normon). During the examination, the animal was positioned in sternal recumbency. Native and post-contrast (2 mL/kg IV; XENETIX 300 mg/mL iodine, Guerbet) venous phases were obtained. The CT scan confirmed the presence of a heterogeneous mass, with fat and soft tissue attenuation in the caudal pole of the right kidney. The mass invaded cranially into the caudal vena cava, and a thrombus with fat attenuation was also confirmed (Figure 2).

DIFFERENTIAL DIAGNOSIS

Considering the apparent fat echogenicity, liposarcoma and angiomyolipoma were considered as possible differentials. A granuloma was considered less likely.

TREATMENT

Right ureteronephrectomy was performed. During the operation, a crystalloid solution of 2.5% glucose (10 mL/kg/h; Isofundine, B. BRAUN) was administered IV placed in the right cephalic vein. The patient was sedated with methadone (0.2 mg/kg IV; Semfortan, Dechra) and midazolam (0.5 mg/kg IV; Midazolam Normon, Normon), induced with alfaxan (1 mg/kg IV; Alfaxan, Jurox) and maintained with sevoflurane 4% (Sevoflo, Ecuphar) in 100% oxygen. The animal was in dorsal recumbency and the abdomen was prepared aseptically. A standard ventral midline laparotomy was performed from the caudal aspect of the stomach to 1 cm caudal of umbilicus. A self-retaining retractor (Lone Star Retractor, CooperSurgical) was placed to keep the abdominal cavity opened. The right kidney was isolated (Figure 3a), and the right ureter and vessels were isolated using blunt dissection with cotton swabs. The right ureter was cut with iris scissors between two simple interrupted sutures of 4-0 polyglactin 910 (Vicryl, Ethicon). The renal artery and vein were separated and independently ligated with the same technique and material described for the right ureter; then, they were cut between the ligatures, and the kidney was removed. The abdominal cavity was flushed with warm sterile saline. The abdominal wall was sutured with 4/0 polyglactin 910 with circle needle (Vicryl, Ethicon) with interrupted cruciate suture. The skin was closed with simple horizontal mattress suture with 4/0 polyglactin 910 with triangular needle (Vicryl, Ethicon).

LEARNING POINTS/TAKE-HOME MESSAGES

- Description of retroperitoneal tumours in the guinea pig is rare.
- Renal liposarcoma should be considered as a differential diagnosis in guinea pigs presenting with a retroperitoneal mass.
- Computed tomography is a useful diagnostic imaging technique to evaluate the morphology of the lesion in the case of retroperitoneal masses.
- Further research and additional study could help understand the true incidence of this type of lesion.

OUTCOME AND FOLLOW-UP

The patient, although stable during surgery, died in the awakening from anaesthesia.

The diagnosis of renal liposarcoma was confirmed by histopathology of the right kidney. Grossly, the mass was polylobulated, whitish, firm and, when sectioned, compressed the renal tissue (Figure 3b). Histologically, it was consistent with a malignant neoplasm infiltrating the renal cortex, medulla and pelvis (Figure 4a). Cells grew in sheets or thick beams and presented well-defined borders with moderate or wide cytoplasm containing frequent lipid vacuoles that often displaced the nucleus to the periphery (Figure 4b). Interspersed between the richly vacuolated cells were clusters of more densely packed neoplastic cells with scarce, ill-defined cytoplasm, big nuclei and lax chromatin. In some areas, lipid vacuoles were scarce, cells showed increased anaplasia and a higher mitotic index, with 20 mitoses/2.37 mm^2 (two mitoses per high-power field). Multifocally, there were foci of lytic necrosis and haemorrhage. Neoplastic cells were negative to IBA-1 immunohistochemical staining (IHC) and pancytokeratin IHC and strongly positive to vimentin IHC (Figure 4c), confirming a mesenchymal origin of cells. Fibrosarcoma was ruled out because vacuolated cells were positive to S100 IHC, and fibrosarcomas lack immunoreactivity for this protein. The adjacent renal parenchyma showed evident signs of compression, with dilated tubules and interstitial fibrosis (Figure 4d). The morphological features of cells, along the immunohistochemical results, permitted the diagnosis of a well-differentiated liposarcoma. Both positive and negative controls were performed for IHC stains.

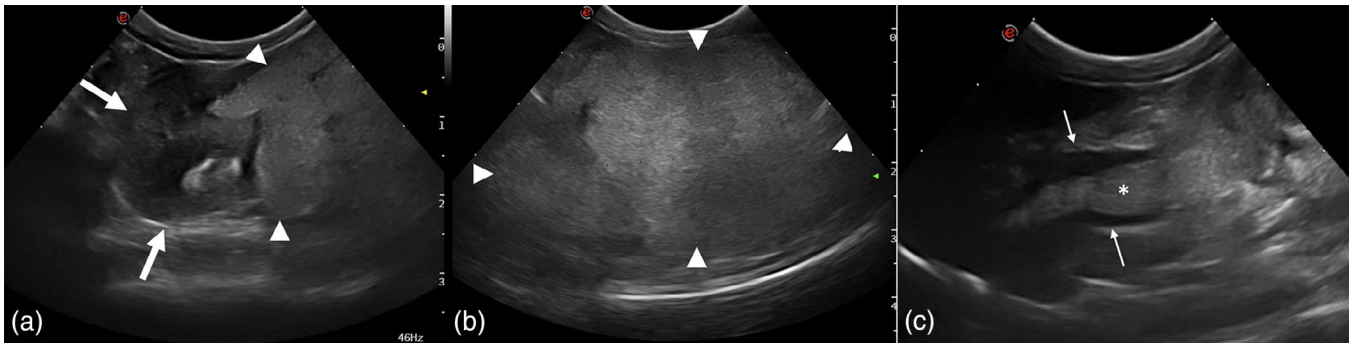

FIGURE 1 Ultrasonographic images of a 4-year-old, male, entire guinea pig at the level of the right kidney. Sagittal images showing the cranial pole of the right kidney (arrows) and a heterogeneous hyperechoic mass occupying the caudal aspect of the kidney (arrowhead) (a and b). Sagittal image at the level of the cranial vena cava. A tubular hyperechoic structure (asterisk), with similar echogenicity to the renal mass, is seen in the lumen of the caudal vena cava (arrows) (c).

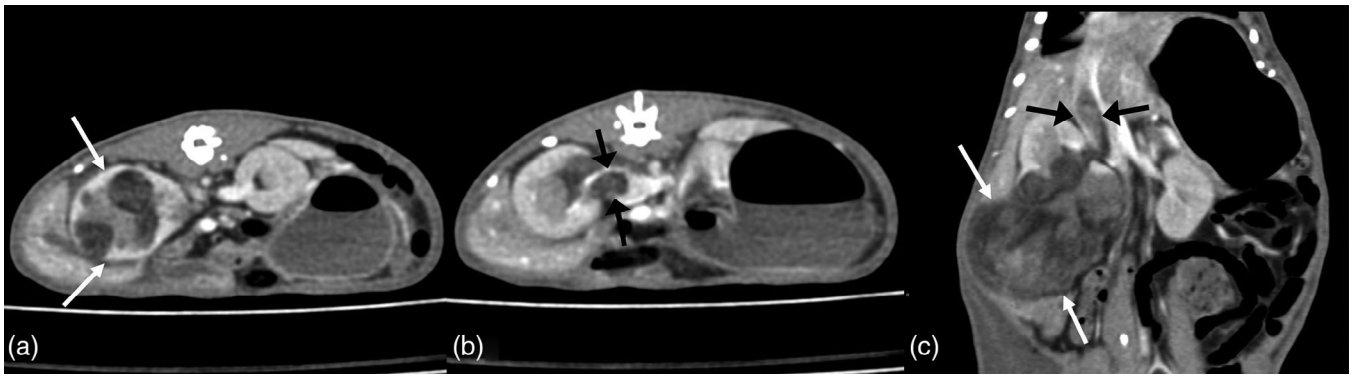

FIGURE 2 Post-contrast transverse computed tomography scan images of a 4-year-old, male, entire guinea pig (a and b) and dorsal reconstruction (c) in soft tissue window at the level of the right kidney. A large renal mass, with heterogeneous attenuation, including fat attenuation (white arrows) is visible occupying and deforming the caudal pole of the kidney. A tubular structure with fat attenuation is extending from the mass into the lumen of the caudal vena cava (black arrows), consistent with a neoplastic thrombus.

DISCUSSION

This report describes an unusual case of a primary renal liposarcoma in a guinea pig.

Soft tissue sarcoma is a general classification referring to tumours that arise from the embryonic mesoderm.[2] The histopathological subtypes are classified by histopathology or immunohistochemistry based on the cell of origin, such as fibrosarcoma, peripheral nerve sheath tumour, myxosarcoma, liposarcoma or leiomyosarcoma.[2] In human medicine, they are classified into five types based on morphological features and cytogenetic aberrations. These are well-differentiated liposarcoma, dedifferentiated liposarcoma, myxoid/round cell liposarcoma, pleomorphic liposarcoma and mixed liposarcoma are also described.[3] Well-differentiated liposarcoma is also classified into three subtypes: lipomatous, sclerotic and inflammatory liposarcoma.[3] In some cases, macroscopically liposarcoma can mimic lipomas, which is why histopathology is required for a definitive diagnosis.[3] These types of tumours commonly develop in the extremities and in the retroperitoneum, and the treatment of choice is complete surgical resection; The prognosis of liposarcomas depends on the degree of differentiation, histological type, size and tumour staging or grading.[3] Liposarcomas in animals are divided into three categories: well-differentiated, pleomorphic and myxoid liposarcomas based on cellular morphology and following the World Health Organization classification.[6,7]

In veterinary medicine, liposarcomas have been described in many domestic and nondomestic species such as dogs, cats, rabbits, ferrets, guinea pig, rats, domestic pigs, meerkats, monk parakeets, geese, common elands, macaques, kudus.[6,8–22,7,4] Dogs seem to be the most affected species, and incidence increases with age.[7]

A palpebral liposarcoma was described in an 18-month-old male guinea pig that presented a mass in the upper right eyelid. After euthanasia, the histological examination confirmed a well-differentiated liposarcoma.[4]

Renal liposarcomas are rarely reported in humans or in veterinary medicine.

In humans, they represent 0.8% of all renal neoplasms and 2%–3% of malignant kidney tumours.[3] The tumour growth rate varies based on type, but they tend to reach very large sizes before producing symptoms; therefore, most are discovered as asymptomatic abdominal masses found incidentally on abdominal examination. The reported symptoms are not specific: abdominal pain, flank pain, early satiety, lower extremity swelling, weight loss and haematuria. Neurological, musculoskeletal and urinary obstructive signs may be due to the compressive effect of the mass. Radical nephrectomy is the treatment of choice, but the margins are not clean, some

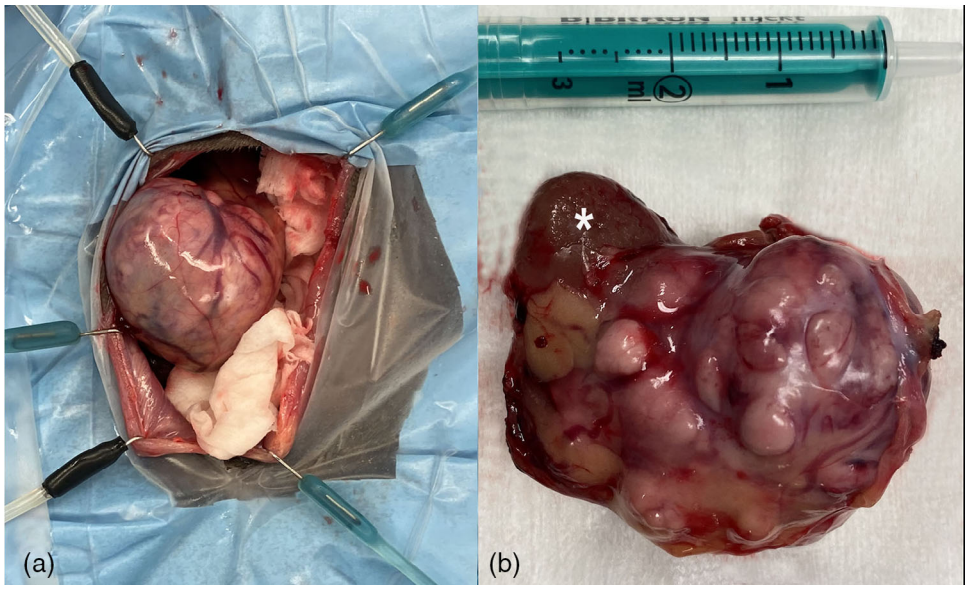

FIGURE 3 Visualisation of the right kidney in a 4-year-old, male, entire guinea pig affected by organomegaly during laparotomy (a). Gross image of the right kidney affected by a liposarcoma during postmortem examination. There is a polylobulated pale mass in the perirenal area, compressing the renal tissue (asterisk) (b).

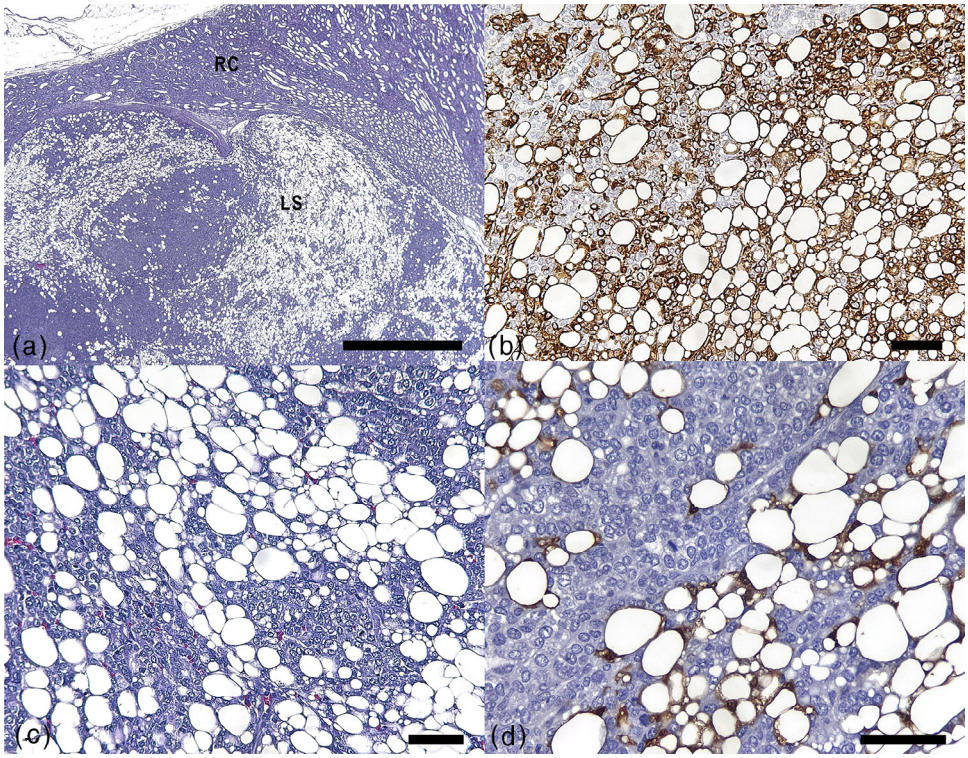

FIGURE 4 Renal mass in a 4-year-old, male, entire guinea pig. Renal cortex and renal liposarcoma (LS), haematoxylin and eosin stain, low magnification. The neoplasm compresses the renal cortex and medulla resulting in tubular dilation and mild interstitial fibrosis. Abundant lipid droplets are visible in the neoplasm intermingled with areas of more solid growth. Scale bar = 1 mm. RC: renal cortex; LS: renal liposarcoma (a). High magnification, haematoxylin and eosin. Note the abundant lipid-containing cells. There are frequent mitotic figures. Scale bar = 100 μm (b). High magnification, vimentin immunohistochemical (IHC) staining. Neoplastic cells are mostly vimentin positive, indicating a mesenchymal lineage. IHC for IBA-1 and pancytokeratin were negative in vacuolated cells. Scale bar = 100 μm (c). Higher magnification, S100 IHC. Vacuolated neoplastic cells are S100 positive. Scale bar = 100 μm (d).

authors report the possibility of chemotherapy; however, to date there are not many studies on the effectiveness.[2,23]

In animals, primary renal liposarcoma has been reported in rats[24–27] and in a domestic pig,[6] but not in other animals. The National Toxicology Program archives examined 165 cases of rat kidney mesenchyme-related tumours and nephroblastomas. There were 20 renal liposarcoma cases and only one metastasised to distant organs, specifically to the lung and seminal vesicles. Furthermore, there was an apparent predisposition in males. The average survival time for rats with this alteration was 682 days, and it did not appear to be the main cause of death.[24] In one different study, the incidence of renal

liposarcoma in Crl:CD(SD)Br rats was 0.1%, and pulmonary metastasis had been reported,[27] while in another study these tumours were observed in 0.4% of Sprague–Dawley rats and in 0.8% of F-344 rats.[26] None of the three studies mentioned clinical alterations.

In a 2.5-year-old commercial sow, a liposarcoma was found postmortem in the right kidney. According to the authors, it had developed from perinephric fat that metastasised to the adjacent kidney. The animal, which had been slaughtered, had shown no obvious alterations during the antemortem examination and no clinical signs compatible with the lesion were reported.[6]

In the patient reported in this study, the clinical signs were very similar to those reported in human medicine, and these are due to the compression of the surrounding tissues and organs by the mass. However, the signs of nonspecific discomfort in this animal may not be attributable to the lesion found. At the time of writing this paper (July 2024), a literature search of databases (PubMed, Science Direct, Google Scholar) with the keywords (renal liposarcoma and guinea pig or *Cavia porcellus*) did not return any reports. This seems to be the first report of renal liposarcoma in a guinea pig; however, further studies should be conducted to find out the incidence of the disease. Although it appears that this pathology is rare, this case report suggests that renal liposarcoma should be considered as a differential diagnosis in guinea pigs that present with a retroperitoneal mass.

AUTHOR CONTRIBUTIONS

Glenda Murciano managed the clinical case and wrote the article. **Laura Martino Gomez** performed the postmortem examination and the histopathology; and reviewed the article. **Rosa Novellas** performed the transabdominal ultrasound; informed the images and reviewed the article. **Anna Palomares** performed the CT scan and reviewed the article. **Jaume Martorell** managed and supervised the case; performed the surgery and reviewed the article.

CONFLICT OF INTEREST STATEMENT

The authors declare they have no conflicts of interest.

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ETHICS STATEMENT

The authors confirm that the ethical policies of the journal have been adhered to.

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OWNER'S PERSPECTIVE

The owner was compliant in following the instructions proposed in order to carry out a diagnosis and know prognosis. Through the CT scan images we were able to explain to him how complicated the surgery was. Although the prognosis was highly guarded, the surgical option was accepted to allow the patient a good quality of life if it survived the operation.

IMAGE QUIZ

A 4-year-old male guinea pig presented with acute apathy and weakness. Abdominal ultrasound and CT scan revealed the presence of an abdominal mass. Figure 3 shows the opening of the abdominal cavity during laparotomy to remove the mass.

MULTIPLE-CHOICE QUESTION

Which organ, in Figure 3A, appears to have increased significantly in size at the opening of our patient's abdominal cavity?

POSSIBLE ANSWERS TO MULTIPLE-CHOICE QUESTION

1. Stomach
2. Right kidney
3. Uterus
4. Urinary bladder
5. Intestinal loop with foreign body

CORRECT ANSWER

2. Right kidney.

In the photo, we can see the right kidney affected by organomegaly. There are multiple underlying causes for this alteration, but neoplasia is frequently recognised as pathogenesis. In our specific case, the kidney had increased in volume due to a fatty neoplastic infiltration that affected the cortex, medulla and pelvis.