

Pneumoperitoneum in four cats



Pneumoperitoneum is a pathological condition characterised by peculiar clinical and radiographic findings. It is infrequently observed in veterinary medicine, especially in cats. Here we report four cases of pneumoperitoneum in cats, describing the clinical presentation, diagnostic procedures, and medical and surgical therapeutic options. We also compare our data with the recent veterinary literature.

Alessandra Lonigro*,
DMV

Filippo Cinti,
DMV, PhD

Guido Pisani,
DMV, Dipl. ECVS

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Pneumoperitoneum is defined as the pathological clinical condition in which air and gas accumulate in the peritoneal cavity, instead of remaining contained within the hollow organs.¹ This pathology is rarely described in veterinary medicine and its incidence is higher in dogs than in cats.² The clinical presentation of patients varies depending on the underlying cause and the time of onset but, in general, apart from findings related to a known traumatic cause and tympany, the clinical signs referred by the owner and noted during the clinical examination are non-specific, particularly in the cat. In the literature, affected animals are described as conscious, tachycardic, tachypnoeic, with low, normal or high body temperature, pink to moderately pale mucosal membranes, slight or moderate dehydration (mainly related to the persistence of the triggering cause), abdominal distension and pain, dejection, sporadic vomiting and loss of appetite.²

The purpose of this report is to describe four cases of pneumoperitoneum in the cat, comparing the clinical presentation, diagnostic and therapeutic procedures and clinical outcomes with those in the available scientific literature.

CASE REPORTS

Four European shorthair cats, three castrated males and one spayed female, aged between 1 and 18 years and weighing 1 to 9 kg, were referred to four different veterinarians because of dejection, anorexia and abdominal distension. On examination, all had a distended, dilated and tympanic abdomen; tachycardia, weak pulse, pale

to cyanotic mucosa in three cases out of four, hypothermia and dehydration in two cases out of four, and polypnoea with respiratory distress in one case were also noted. In three of the patients the time elapsed between the onset of symptoms and arrival at the clinic was 8, 14 and 72 hours (time not known for the fourth patient). Latero-lateral and ventro-dorsal X-rays revealed the presence of free air in the abdomen of all patients (Fig. 1), while blood-chemistry examinations showed leukocytosis in three of the four cases (values between 26.5 and 64.0 x 10³ white blood cells, with granulocytosis in two cases and lymphocytosis in one). Three of the four patients underwent abdominal paracentesis using an intravenous catheter or 14G butterfly, both to help to restore the compromised haemodynamics and to facilitate the abdominal ultrasound examination subsequently performed in two patients, which, in one animal, showed a breach in the wall of the ileum (Fig. 2). In three cases, despite the indications of the veterinarian, economic reasons led to refusal of surgery and implementation of symptomatic medical therapy, with unfavourable outcomes and survival times ranging from 12 hours (two cases) to 21 days (one case) from

The radiographic picture of pneumoperitoneum, regardless of the underlying cause and the patient's signalment, is pathognomonic. Conversely, the clinical history and findings can be very non-specific, especially in feline species.

Table 1 - Summary of data				
	Signalment	Aetiology	Treatment	Outcome
Case 1	Gatto europeo FS 1 anno PC 1,5 kg	Non individuata	Terapia medica sintomatica	Infausto
Case 2	Gatto europeo MC 15 anni PC 9 kg	Ulcera gastrica perforata con peritonite purulenta	Terapia medica sintomatica	Infausto
Case 3	Gatto europeo MC 18 anni PC 6 kg	Perforazione intestinale (tratto ileale)	Terapia medica sintomatica	Infausto
Case 4	Gatto europeo MC 12 anni PC 6,5 kg	Perforazione gastrica su base neoplastica (mioxosarcoma)	Terapia chirurgica (gastrectomia)	Favorevole

diagnosis [supportive therapy: intravenous (IV) fluid therapy, maropitant 1 mg/kg subcutaneously (SC), ranitidine 2 mg/kg SC, antibiotic therapy with amoxicillin-clavulanic acid 12.5 mg/kg SC associated with metronidazole 10 mg/kg IV, warming devices]. The owner of the fourth patient agreed to surgery: an exploratory celiotomy revealed a gastric perforation, which was treated by performing gastrectomy (Fig. 3). Only in this last case was the outcome favourable, both in the post-operative period and in the follow-up controls over the subsequent 5 months. In two patients, histopathological studies were carried out on biopsy specimens of the gastric wall and peritoneum taken in one case from the site of surgery and in the other during necropsy: both specimens showed gastric perforation, in the first case at the pyloric antrum (Fig. 3) and in the second in the gastro-duodenal region (Figure 4). The

histopathological diagnoses were, respectively, myxosarcoma and perforated gastric ulcer, resulting in purulent peritonitis.

RESULTS - DISCUSSION

In accordance with reports in the literature, this study highlights the similarity of the radiographic presentation of pneumoperitoneum, which, irrespectively of the underlying cause and the patient's signalment, is very characteristic.² In contrast, the history and clinical signs may be much less specific (unless there is clear, pathognomonic abdominal tympany), especially in felines.^{2,4} With regards to signalment/aetiology, previous studies have not identified breed- or gender-related factors affecting prevalence; as far as age is concerned, traumatic causes appear to be more common in young animals (<6 years), while pneumoperitoneum is more frequently of neoplastic or chronic inflammatory origin in older animals.² The cases of pneumoperitoneum reported in the veterinary literature were all the result of localised perforation of the gastrointestinal tract, whether traumatic, iatrogenic (following surgical or diagnostic procedures, intake of non-steroidal anti-inflammatory drugs or corticosteroids), spontaneous (inflammatory, neoplastic), or idiopathic.² Despite our limited series, our data are concordant with those in the literature, with a predominance of elderly subjects (Table 1) in two of which the investigations carried out showed that the pneumoperitoneum had inflammatory and neoplastic causes.² Haemodynamic status may be compromised to varying degrees both as a result of a traumatic aetiology and because of the persistence of the pneumoperitoneum, regardless of the underlying



Figure 1 - Latero-lateral X-ray of the abdomen, Case 3: the free air present in the abdomen is indicated by the white arrows.

cause: in fact, the clinical course varies, especially in cats, and may be acute or sub-acute, such that the period between the onset of clinical signs and presentation at the veterinary clinic may range from 30 minutes to 6 weeks.² In the series reported here there was a prevalence of distributive shock due to the pressure exerted by the large amount of free air on the viscera and abdominal vessels, as well as the thoracic expansion, which tended to be reversible and transiently responsive to symptomatic therapy (decompression, fluid therapy, restoration of temperature and perfusion), thus excluding underlying septic states. Sepsis can be identified not only by the failure to respond to protocols for the emergency management of shock, but also from a core set of laboratory data. In fact, according to some authors, there may or may not be alterations to white blood cell counts and various biochemical parameters (transaminases, azotaemia, bilirubin, electrolytes, glycaemia); more favourable outcomes are seen in patients with albumin values within the normal range, suggesting the possible use of this parameter as a predictive prognostic factor.² The blood tests performed in patients included in this report were mostly complete blood counts and differentials, with 75% of the cases having moderate to severe leukocytosis; the only biochemical profile assessed was normal.

A suspected diagnosis of pneumoperitoneum can easily be confirmed by latero-lateral and ventro-dorsal X-rays with the animal in decubitus. Although more difficult to perform, the use of a horizontal radiographic beam is indicated in the literature for patients which are difficult to manage or for which the image detail is poor: in this way, in the presence of a peritoneal effusion, air-fluid levels can be seen at the interface between air (dorsal) and fluid (ventral).⁴ An abdominal ultrasound examination after the paracentesis is particularly useful for acquiring further data on the triggering cause (perforation, neoplasia, visceral and peritoneal inflammation) as well as for sampling any effusion present for macroscopic inspection, cytological examination and, possibly, culture studies, to look for any contamination, even in aseptic exudates, by microorganisms (frequently found contaminants include: *E. coli*, *Enterococcus*, *Clostridium perfringens*, *Candida albicans*, *Bacteroides*,



Figure 2 - Ultrasound, Case 3: focal thickening of the ileal mucosa with a breach in the intestinal wall; surrounding peritoneal reaction (examination performed after decompression).

Streptococcus spp., *Actinobacter*, *Staphylococcus*, *Proteus spp.*).^{2,3} This study substantiates the essential role of basic diagnostic imaging for a quick and relatively easy confirmation of the suspected diagnosis, as well as the usefulness of such imaging for completing the clinical and prognostic evaluation. Although radiographic studies provide the definitive diagnosis, ultrasonography, when performed, can locate the perforated area, aid identification and sampling of the abdominal effusion, and detect additional abnormalities (peritoneal inflammation, reactive

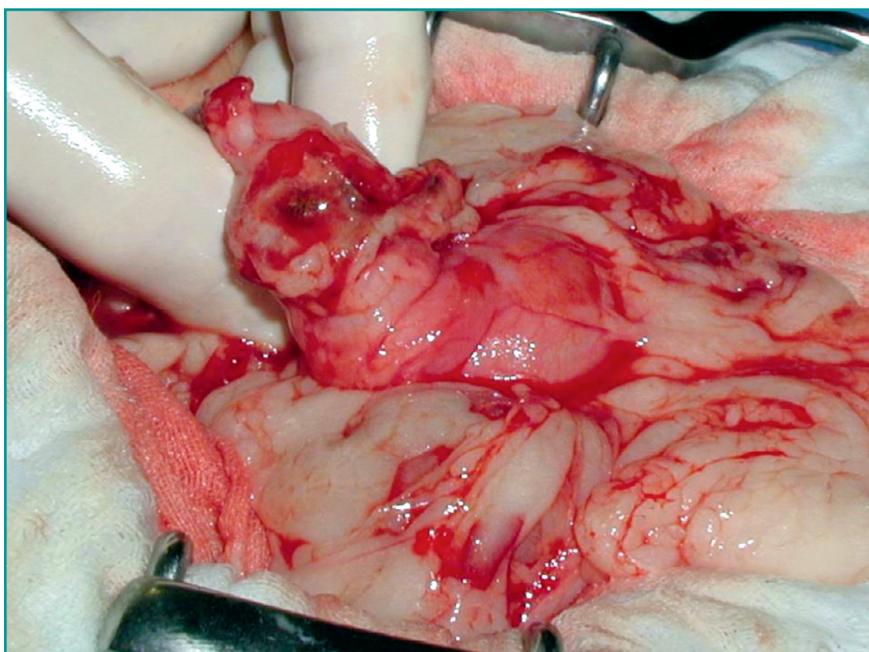


Figure 3 - Case 4: gastric perforation detected at the site of surgery.

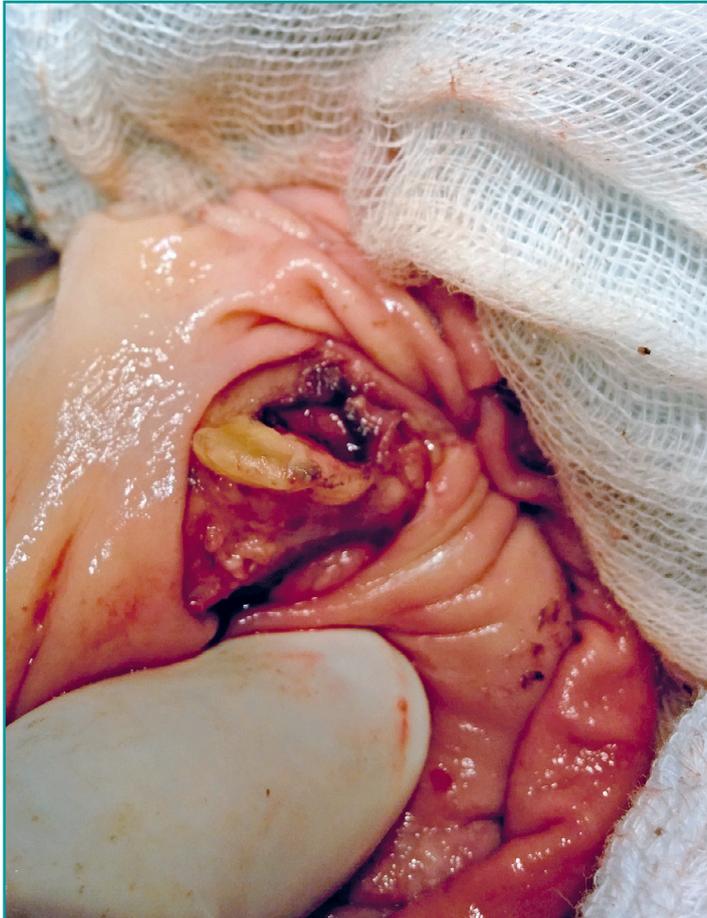


Figure 4 - Case 2: gastric perforation detected during necroscopy.

mesenteric lymph nodes, mucosal thickening) which can be useful, in addition to the clinical findings, for indicating the aetiological trigger.

Prompt exploratory celiotomy, once the patient has been stabilised, is closely associated with a favourable outcome and faster clinical recovery, with less impairment of organ function.

All of the authors cited agree that surgery is the treatment of choice for pneumoperitoneum.^{2,3,4} Indeed, it has been reported that although the prognosis is influenced by the aetiology and initial clinical condition and haemodynamic status, prompt exploratory celiotomy, once the patient has been stabilised, is closely associated with a favourable outcome and faster clinical recovery, with less impairment of organ function.^{2,3,4} This series, albeit limited, is in line with literature data, with the patient that underwent surgical treatment having a better outcome.

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KEY POINTS

- Pneumoperitoneum is a pathological condition rarely described in veterinary medicine; particularly in the cat, the clinical presentation, aetiology, presence of free air in the abdomen and the related state of shock are often subtle and non-specific.
- Diagnostic imaging plays an essential role in confirming the suspected diagnosis and in locating the perforated GI tract; in the literature, serum albumin is also considered of prognostic value.
- Surgery is the treatment of choice for pneumoperitoneum; a prompt intervention is closely associated with a more favourable outcome, compatibly with the patient's clinical and prognostic profile.

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