About ectopic gas

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Authors: M. A. C. Udaondo, B. Toribio Calvo, E. Núñez Miguel, R. Petruzzella Lacave, I. Sánchez Lite, M. R. López Pedreira; Valladolid/ES
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Learning objectives

The objective is to show different cases which present abnormal air location as semiological data in common, and also have a special interest because of the unfrequent etiology or pathology.
Background

Ectopic gas may be produced by multiple processes: infectious, inflammatory, neoplastic, iatrogenic, traumatic.

We report 11 cases seen in our department and studied with MDCT
Imaging findings OR Procedure details

**Infectious-inflammatory:**

1- Perforated duodenal ulcer Fig. 1 on page 8 Fig. 2 on page 8 Fig. 3 on page 9 Fig. 4 on page 10
Patient presenting acute severe pain at epigastrium. The findings in emergency CT performed were thickening of the duodenal wall in proximal bulb and second portion, with locoregional inflammatory changes. The finding of two bubbles extraluminal gas alerted us perforation at that level. Puncture was found surgically at the anterior face of the first portion of the duodenum, performing suture and epiploplasty.

2 - Severe pneumocephalus by tegmen timpani fistula in patients with repetition otitis. Patient with severe headache, without previous trauma. Brain CT shows a hypodense lesion in the right temporal lobe Fig. 5 on page 11 compatible with chronic haematoma, hyperdense areas of bleeding and pneumocephalus in ventricles Fig. 6 on page 12, cisterns and sulci. Presented as the only history repeating otitis, this is an unusual example of complicated otitis. Completed with bone CT study, which verifies bone cortical dehiscence in right tegmen timpani and small brain herniation(encephalocele) Fig. 7 on page 13. He needed surgical treatment, right temporal craniotomy, repair bone defect of the roof of the tympanic cavity and dural tear and evacuate the right encapsulated temporal chronic haematoma.

3-Emphysematous cholecystitis Fig. 8 on page 14 Fig. 9 on page 15 Fig. 10 on page 16 Fig. 11 on page 17
Patient with acute right upper quadrant pain and positive Murphy and peritonitis sign. TC emergency requested, confirms the existence of an irregular gallbladder (GB) morphology, gallstones and thickening wall with air in GB wall and lumen, with infiltration of the adjacent fat and minimal amount of fluid around the liver dome, findings regarding emphysematous cholecystitis. In addition the patient had pancreas athrophy with calcifications compatible with chronic pancreatitis.

The pathology was acute gangrenous cholecystitis necrotic-inflammatory.

4-Emphysematous cystitis with severe retropneumoperitoneum and pneumomediastinum. Fig. 12 on page 18 Fig. 13 on page 19 Fig. 14 on page 20
Emphysematous cystitis is a rare infectious cystitis characterized by the presence of gas in bladder mucosa, detrusor muscle or in the bladder lumen.

Usually is caused by E. coli but also can be produced by other germs.

It is more common in females and above 45 years. Associated with diabetes in almost half of patients. Also chronic bacteriuria and urinary retention. These conditions lead to the reduction of oxygen concentration in urine and therefore increase the susceptibility
to infection by anaerobic bacteria. As a result of the fermentation bacterial glucose gas appears in the bladder wall.
In the presence of gas in the bladder wall diagnosis emphysematous cystitis should be considered a priority.
Radiographic changes of this entity are transient and disappear with treatment.

Our case is a woman of 60 years who presented with hypogastrium pain. She had a history of stage IV lung cancer. Diabetic unknown, but glycemia was 312mg/dl. Abdominal CT was performed and was found a severe retropneumoperitoneum (without pneumoperitoneum) extending into the mediastinum. Dissected planes of the abdominal musculature and lower extremities. Wall thickening of the bladder with gas presence, led us to the diagnosis and then its evolution, with improvement after antibiotic treatment.

**Fig. 15** on page 21

5- Emphysematous pancreatitis **Fig. 16** on page 22 **Fig. 17** on page 23

60 years old man with alcoholic pancreatitis was attended in the emergency room with abdominal pain, and palpable left upper quadrant mass. CT was performed showing a striking alteration of normal pancreatic gland morphology, with poorly defined edges and bubbles hidroaéreas intraparenchymal and in the main pancreatic duct. Inflammatory changes in adjacent soft tissues. Adjacent to tail and near the head of the pancreas are collections with air inside being the largest in the tail (6 cm). Was operated with necrohaemorragic abscess drainage of pancreatic tail.

6- Infection of prosthetic aortic graft, gas in the spinal canal. **Fig. 18** on page 24 **Fig. 19** on page 25

64 year old male, abdominal aortic aneurysm operated with prosthetic aortic graft, presented malaise, weight loss, fever spikes cyclic evening, night sweats, asthenia and mechanical lumbar pain.

Abdominal CT with the following findings:
Perigraft fluid and perigraft soft tissues density and ectopic gas.
Increase muscle size of both psoas and paravertebral muscle with collections and gas inside.
Cortical destruction of the anterior aspect of the L3 vertebral body with decreased disc height, probably spondylodiscitis.
Air in the spinal canal.
This is concern with regard to infection of prosthetic aortic graft.

**Neoplastic:**
7- Ascending colon perforation in patient with untreated transverse colon neoplasia. **Fig. 21** on page 26

78 year old patient with intestinal occlusion and suspected perforation. Presented as background carcinoma in the hepatic flexure of the colon with liver metastases,
diagnosed two years ago, the patient decided against treatment. CT was performed: ascending colon perforation with localized pneumoperitoneum and adjacent extraluminal fecaloid content.

"Apple core" lesion constricting tumor of trasverse colon with circunferencial narrowing of the lumen, relative to his known neoplasia.

**Iatrogenic:**
8-Uterine perforation after uterine tumor biopsy. Fig. 22 on page 27
63 year old woman with acute abdomen, as background 24 hours before had undergone hysteroscopy uterine tumor biopsy.
In CT there is abundant free fluid, pneumoperitoneum, and portal vein gas. Enlarged uterus with blood and intramural gas, concerning with uterine perforation.

9-Hypopharynx perforation after nasogastric intubation. Fig. 23 on page 28
Patient after several attempts nasogastric probing presents with severe neck subcutaneous emphysema and respiratory compromise. CT was performed: Emphysema is observed in soft tissues on both sides of the neck, spread into left upper extremity. Marked pneumomediastinum. In the left lateral wall of the hypopharynx shows a possible gap.

10-Duodenal stump dehiscence after gastrectomy. Fig. 24 on page 29
60 year old male with history of gastric neoplasia intervened two months ago, Billroth II surgery was performed. Presents abdominalgia with signs of peritonitis. Abdominal CT: pneumoperitoneum with extraluminal gas and stranding of fat adjacent to the area of duodenal stump, probably due to suture dehiscence deferred.

**Spontaneous:**
11-Spontaneous Pneumoperitoneum. Fig. 25 on page 30
28 year old woman with pain that started suddenly and intense level in right shoulder four days ago, lasted about 15 minutes and was later found at the level of both hypochondria making it difficult to walk. No nausea or vomiting, normal intestinal transit. Last menstruation 10 days ago, were normal. Not refer any urological or gynecological clinic. No sex concerns in recent days. She denied the possibility of pregnancy. Afebrile. Abdominal examination normal. Analysis: unchanged.
Abdominal CT: Important pneumoperitoneum mainly distribution and left hypochondria and perihepatic, although bubbles are scattered throughout the abdominal cavity. Bowel morphology and size was normal. There is no free intraperitoneal fluid identified. Gallstones. Fluoroscopic findings: study without evidence of visceral perforation.
The patient was admitted for observation, performing serial clinical and laboratory examinations, which were all normal. Preserved intestinal transit. The patient had good digestive tolerance, so that was discharged with the diagnosis of spontaneous pneumoperitoneum. The plain radiographs control one month after was normal.
Fig. 1: Axial MDCT with contrast, perforated duodenal ulcer, thickening wall of the first and second portions of the duodenum, with infiltration of surrounding fat and adjacent small amount of liquid.

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Fig. 2: Axial MDCT with contrast, perforated duodenal ulcer, little bubble of air next to duodenum.

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Fig. 3: Axial MDCT with contrast, perforated duodenal ulcer, little bubble of air within Morison space.

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Fig. 4: Coronal MDCT with contrast, perforated duodenal ulcer.

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Fig. 5: Axial Brain CT, pneumocephalus, hipodense lesion in right temporal lobe with rebleeding compatible with chronic hematoma.

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Fig. 6: Axial Brain CT, pneumocephalus, air in the lateral ventricles.

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Fig. 7: Coronal reformats bone CT, bone cortical dehiscence in right tegmen timpani and small brain herniation (encephalocele).

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Fig. 8: Axial MDCT, Emphysematous cholecystitis, an irregular gallbladder (GB) and thickening wall with air in GB wall and lumen.

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**Fig. 9:** Axial MDCT, emphysematous cholecystitis. Irregular gallbladder (GB) and thickening wall with air in GB wall and lumen. Atrophy of the pancreas.

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Fig. 10: Coronal MDCT, emphysematous cholecystitis, gallstones, infiltration of surrounding fat and small amount perihepatic fluid. Pancreas head calcifications compatible with chronic pancreatitis.

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Fig. 11: Coronal MDCT emphysematous cholecystitis, gas in gallbladder wall, with small amount of fluid in liver dome.

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Fig. 12: Axial MDCT. Emphysematous cystitis. There was a severe retropneumoperitoneum and planes dissecting abdominal wall muscle.

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Fig. 13: Axial MDCT with intravesical contrast. Emphysematous cystitis. There was thickening bladder wall with gas and extraluminal gas.

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Fig. 14: Coronal MDCT with intravesical contrast. Emphysematous cystitis. There was thickening bladder wall with gas and severe retropneumoperitoneum extending into the mediastinum, planes dissecting abdominal wall muscle to lower extremities.

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Fig. 15: Axial MDCT with contrast. Emphysematous cystitis, improvement after antibiotic treatment.

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Fig. 16: Axial MDCT with contrast. Emphysematous pancreatitis. Yellow arrow: Gas in main pancreatic duct. White arrows: Collection in the pancreatic tail with gas. Also observed disintegration of the pancreas with another collection in head and inflammatory changes in adjacent soft tissues.

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**Fig. 17:** Coronal MDCT with contrast. Emphysematous Pancreatitis. Yellow arrow: gas in main pancreatic duct. White arrows: Collection in the pancreatic tail with gas. Also observed disintegration of the pancreas with another collection in head and inflammatory changes in adjacent soft tissues.

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**Fig. 18:** Axial MDCT with contrast. Infection of prosthetic aortic graft. Perigraft fluid and perigraft soft tissues density and ectopic gas. Collections and gas in both psoas and paraspinal musculature. Air in the spinal canal.

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**Fig. 19:** Coronal MDCT with contrast. Infection of prosthetic aortic graft.

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**Fig. 20:** Coronal 1,2 and sagittal 3 MDCT with contrast. Infection of prosthetic aortic graft. Cortical destruction of the anterior aspect of the L3 vertebral body with decreased disc height, probably spondylodiscitis. Ectopic air in the spinal canal and both psoas.

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**Fig. 21:** Ascending colon perforation in patient with untreated transverse colon neoplasia. 1 Axial MDCT with contrast. Arrow: localized pneumoperitoneum and adjacent extraluminal fecaloid content. 2 Axial MDCT with contrast. Lung window. Gas extraluminal. 3 Axial MDCT with contrast. Yellow arrow: "Apple core" lesion constricting tumor of transverse colon with circumferential narrowing of the lumen, relative to his known neoplasia. Inflammatory changes in adjacent fat.

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Fig. 22: Uterine perforation. 1 Coronal MDCT with contrast. Abundant free fluid, pneumoperitoneum, and portal vein gas. Enlarged uterus with intramural blood and gas. 2 Axial MDCT with contrast. Arrow: portal vein gas. 3 Axial MDCT with contrast. Arrow: enlarged uterus with intramural blood and gas.

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**Fig. 23:** Hypopharynx perforation after nasogastric intubation. Axial MDCT, lung window. Arrow: Gap In the left lateral wall of the hypopharynx. Axial MDCT. Severe neck subcutaneous emphysema spread into left upper extremity. Marked pneumomediastinum.

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Fig. 24: Axial MDCT. Duodenal stump dehiscence after gastrectomy. Arrow: Postsurgical changes. Pneumoperitoneum with extraluminal gas and stranding of fat adjacent to the area of duodenal stump.

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**Fig. 25:** Spontaneous Pneumoperitoneum. 1 Coronal MDCT with contrast. Small diffuse extraluminal air bubbles. 2 Axial MDCT with contrast. Lung window. Important pneumoperitoneum mainly distribution and left hypochondria and perihepatic. 3 Axial MDCT with contrast. Soft tissue window.

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Conclusion

The ectopic gas is really a semiological warning data, being helpful to assess the location and underlying etiology. MDCT is the modality of choice because it has a high sensitivity, being able to discriminate small amounts of gas, as well as due to its speed and availability.
References
