An acute pancreatitis complications review focusing in the grave and rare emphysematous pancreatitis.

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Learning objectives

1. To correctly understand the importance of imaging in the diagnosis of a potentially life threatening condition such as complicated acute pancreatitis.
2. To review the radiological description and characterization of acute pancreatitis complications: extent and severity.
3. To go over the radiological findings in grave emphysematous acute pancreatitis.

Background

ACUTE PANCREATITIS AND COMPLICATIONS INTRODUCTION

The pancreas is an endo and exocrine gland, located at the retroperitoneum, in the anterior pararenal space.

Acute pancreatitis is defined as the inflammation of the pancreatic gland with a variable inflammatory involvement of adjacent and long distance organs.

<table>
<thead>
<tr>
<th>Types</th>
<th>Frequent causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanic</td>
<td>Cholelithias, ERCP, posterior to surgery, trauma.</td>
</tr>
<tr>
<td>Infectious</td>
<td>AIDS/HIV, fungus (Aspergillus), CMV, parasites, etc.</td>
</tr>
<tr>
<td>Vascular</td>
<td>Atheroembolism, polyarteritis nodosa, etc.</td>
</tr>
<tr>
<td>Metabolic</td>
<td>Alcohol abuse, hypercalcemia, hyperlipidemia, hereditary cause, etc.</td>
</tr>
<tr>
<td>Drugs</td>
<td>Furosemide, aminosalicylic acid, corticosteroids, opiates, etc.</td>
</tr>
<tr>
<td>Idiopathic-Other</td>
<td>Scorpion venom, congenital, etc.</td>
</tr>
</tbody>
</table>

The 80% of cases are filiated either to cholelithiasis or to alcohol abuse.

An approximate of 85% of patients with acute pancreatitis resolve spontaneously and only a 15% present complications implying a torpid evolution. Mortality rates elevate from a 5% in mild acute pancreatitis to a 50% in complicated acute pancreatitis.
Severity in acute pancreatitis can be analyzed by laboratorial and clinical criteria (Ransom or APACHE II scales) but their help in predicting complications is not assured; that is why imagenology intervenes playing an important role, as an adequate indicator of complication appearance and in this order a valuable factor in the treatment and prognosis.

**What should we have in mind before initiating the radiology lecture of a possible acute pancreatitis case?**

- The examination moment: Remember that the US study is limited the first 48 hours because of the reflex ileum. Also pancreatic necrosis has variable imaging findings before the first 12 hours of occurrence, coulding even seem normal.

- Chronic pancreatitis underlying: US may be limited by the sonic shadowing left by the calcifications, a characteristic of chronic pancreatitis. Notes too that some radiological data may be associated also with a chronic disease underlying, for example pseudocyst.

- Extraglandular affectation: The infrequent possibility to find long distance complications such as acute collections that could dissect planes arriving even to mediastinum.

**IMAGENOLOGY**

1. **Ultrasonography**

   - The importance of this exam is to detect the cholelitiassic etiology of the case and in the outcome to evaluate the response to conservative treatment.

   - Radiological finding: Diffusely enlarged hipoecogenic gland, due to the pancreatic edema.

2. **CT:**

   - It is important to determine that CT findings will correlate well with the severity of the pancreatitis, meaning a marked affected gland will be easier to detect by the CT study.
It helps in establishing the presence of complications, adequately describing their location and extent. Guides the aspirations and percutaneous drainage and also serves as a prognosis factor addressing the gravity of the pancreatitis by the severity scales.

**Imaging findings OR Procedure details**

**CT FINDINGS:**

We can find a diffusely enlarged pancreatic gland with an irregular and shaggy contour showing an heterogeneous density.

Blurred peripancreatic fat and enlarged, high attenuation and dirty aspect of the adjacent fascias.

In grave cases it's observed a severe enlargement of the pancreatic gland as well as presence of liquid intrapancreatic collections.

- **Necrosis of the gland**, better visualized in a dynamic CT with IV contrast realized between the 24 to 48 hours from the beginning of the symptoms. The study demonstrates well defined focal or diffuse areas with lack of enhancement, involving whether > 3cm or >30% of the gland. Necrosis can be segmentary (30%), focal (50%) or complete (100%).

- **Disconnection from the main pancreatic duct**: If the necrosis affects a segment of epithelial duct we can find a viable segment of pancreatic tissue disconnected from duodenum generating a continuous pancreatic secretion leak with the secondary inflammation and infection. It translates in a necrotic area major or equal to 2 cm with proximal viable pancreatic tissue and contrast material leaking in the pancreatography.

**ACUTE PANCREATITIS COMPLICATIONS**

**Acute liquid collections:**

Defined as ill defined, low attenuation collections without a surrounding wall.

They are frequently located at the anterior pararenal space, minor sac or transverse mesocolon.
More than half of the collections resolves spontaneously within 6 weeks from its appearance, especially those with a maximum diameter minor to 6 cm.

Have in mind infrequent locations by dissecting planes collections such as: mediastinum, liver, spleen, and the wall of the adjacent segment of the gastrointestinal tract (mostly duodenum).

**Pseudocyst:**

Pancreatic round shaped fluid collections, surrounded by a fibrous wall that enhances after the contrast IV administration.

Its appearance implies a minimum of 4 weeks development time.

Their most frequent complications are, of course, infection or hemorrhage, we can find in the US exam presence of internal echoes, tabication or content; and in the CT study its observed high attenuation content at the interior of the pseudocyst.

Up to a 50% of the cases resolve also spontaneously.

Radiologist should remember that it cannot only be related to acute pancreatitis, but also to a traumatic event or to chronic pancreatitis.

**Abscess:**

Collections with poor or non pancreatic necrosis.

At the imagenologic evaluation we can find encapsulated liquid density collections that can show enhancement after the contrast administration and in an approximate of 25% of abscesses we can observe the presence of gas bubbles inside.

The demonstration of gas bubbles in the collection doesn’t necessarily means its an abscess; other processes can also be associated to this finding (for example enteric fistulas).

The development time is also of a few weeks.
ATLANTA CLASSIFICATION

- Interstitial pancreatitis.
- Sterile necrosis.
- Infected necrosis.

1. Fluid acute collection.
2. Pancreatic pseudocyst.
3. Pancreatic abscess.

ACUTE PANCREATITIS COMPLICATIONS

<table>
<thead>
<tr>
<th>ACUTE LIQUID</th>
<th>PSEUDOCYST</th>
<th>ABSCESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low attenuation.</td>
<td>Round shaped.</td>
<td>Poor or non associated to necrosis.</td>
</tr>
<tr>
<td>Ill defined.</td>
<td>Fibrous wall.</td>
<td>Encapsulated</td>
</tr>
<tr>
<td></td>
<td>Complications: Infection vs hemorrhage.</td>
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</tbody>
</table>

VASCULAR COMPLICATIONS

Pseudoaneurysm

Pseudoaneurysm means vascular lesion caused by enzymatic pancreatic leakage, visualized at CT as a mass that shows rapid contrast enhancement, acquiring a similar density to the near by vessels.

The US Doppler can help the diagnosis by confirming the flux into the lesion in systole and flux out of it in diastole.

Frequent locations are: spleen artery, gastroduodenal artery, pancreaticoduodenal artery.
In case of rupture we can observe high attenuation free liquid en the retroperitoneum or at the peritoneal cavity.

**Splenic vein trombosis**

It can be present also in chronic pancreatitis.

Portal vein system can also be affected as the process progresses.

### ACUTE PANCREATITIS VASCULAR COMPLICATIONS

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<th>PSEUDOANEURYSM</th>
<th>SPLENIC VEIN THROMBOSIS</th>
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<td>Mass that shows rapid contrast enhancement.</td>
<td>Also in chronic pancreatitis.</td>
</tr>
<tr>
<td>Similar density to the near by vessels.</td>
<td>Possible portal vein system thrombosis.</td>
</tr>
<tr>
<td>Doppler: Flux into the lesion in systole and flux out of it in diastole.</td>
<td></td>
</tr>
<tr>
<td>Rupture: high attenuation free liquid en the retroperitoneum or at the peritoneal cavity.</td>
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### ENPHYSEMATOUS PANCREATEITIS

It's defined as a necrotizing infection associated to parenquimal air infiltration and in the peripancreatic pararenal space.

It's a rare and grave acute pancreatitis complication that occurs in patients with a comorbic factor, mostly immunocompromised patients.

The coliform bacteria that originates it reaches the pancreatic bed by vascular flow, lymphatic channels, enteric fistula, colonic transmural passage or enteric reflux.

Gas in the pancreatic bed is not a normal finding, it may be related to: abscess, infected pseudocyst, cancer, or enteric fistulae.
Findings

Frequently the abdominal x-ray and US are the first techniques used, and are often complementary to each other.

The abdominal x-ray study may show mottled air pattern in epigastrium. At US we can see multiple ecogenic images with reverberating acoustic posterior shadow.

Retropneumoperitoneum is the a key factor in the diagnosis of this entity.

A proper CT evaluation may demonstrate gas bubbles in the pancreatic bed in a patient with necrotic pancreatic areas. Also we can find air in the portal venous system and the presence of liquid collections.

Importance

As we have signaled before the presence of gas in the pancreatic bed doesn't necessarily means abscess, it could suggest also grave emphysematous pancreatitis; the differentiation between this two entities is crucial due to their different treatment (surgical approach by necrosectomy in emphysematous pancreatitis) and prognosis.

Images for this section:
Fig. 7: Case 2. Acute fluid collections. Irregular and blurry pancreas borders and several fluid collections at minor sac and surrounding the mesenteric vessels that are most compatible with acute fluid collections.
**Fig. 8:** Case 2. Acute fluid collections. Irregular and blurry pancreas borders and several fluid collections at minor sac and surrounding the mesenteric vessels that are most compatible with acute fluid collections within the first 4 weeks.
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Fig. 1: Case 1. Acute Pancreatitis. Abdominal CT using IV contrast is realized in a 50 y.o. male patient suffering from abdominal pain and leucocytosis. It shows only fat stranding surrounding the pancreas tail.
Fig. 2: Case 1. Pseudocyst. Control CT that shows increase in the fat stranding at the pancreas tail and mesenteric, also enlarged left lateroconal fascia. It has developed a liquid collection well delimited at the pancreas body, considering the 4 weeks timing from the first CT, it is compatible with a pseudocyst.
Fig. 3: Case 1. Pseudocyst. Control CT that shows increase in the fat stranding at the pancreas tail and mesenteric, also enlarged left lateroconal fascia. It has developed a liquid collections well delimited at the pancreas body, considering the at least 4 weeks timing from the first CT, it is compatible with a pseudocyst.
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Fig. 12: Case 3. Necrosis. Enlarged pancreas with a fluid collection at the body and tail, not visualizing property pancreatic gland at the tail this finding can correlate with tail necrosis.
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Fig. 6: Pseudocyst. Patient with history of acute pancreatitis that shows at the CT exam, after 5 weeks from the last episode, a well defined fluid collections, at the pancreatic body.
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Fig. 17: Case 4. Emphysematous pancreatitis. Pancreas presenting irregular and not well defined borders predominantly at the pancreatic head: also adjacent fat stranding. Gas presence is visualized at the peripancreatic region, minor sac, hepatic helix, hepatic fissure and at the right pararenal anterior space.
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Fig. 21: Case 5. Emphysematous pancreatitis. Patient with clinical diagnosis of acute pancreatitis that at the CT exam shows gas presence at the retroperitoneum (anterior-posterior pararenal spaces, mesenterium) and at the hepatic hilium, adjacent to the gallbladder and in periportal spaces. Gas is also surrounding the internal wall of the colon. Observe too free fluid at the peritoneal cavity and at retroperitoneum.
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Conclusion

This review has remembered us the real importance of the imaging study in acute pancreatitis complications. It makes possible a prompt diagnosis, an adequate location description, extent, and severity grading of these entities, as well as a reliable follow up. All of these radiological findings can correlate in the patient prognosis as they help guiding the clinics into a rapid and better management decision.

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References


Tyler Stevens. Acute pancreatitis: Problems in adherence to guidelinesCleveland Clinic Journal of Medicine December 1, 2009 76:697-704

Young S., Thompson J. Severe acute pancreatitisCEAC CP August 1, 2008 8:125-128.


