Diagnostic Imaging Pathways - Pancreatitis (Acute)

Population Covered By The Guidance

This pathway provides guidance on the investigation of adult patients with suspected acute pancreatitis and its complications.

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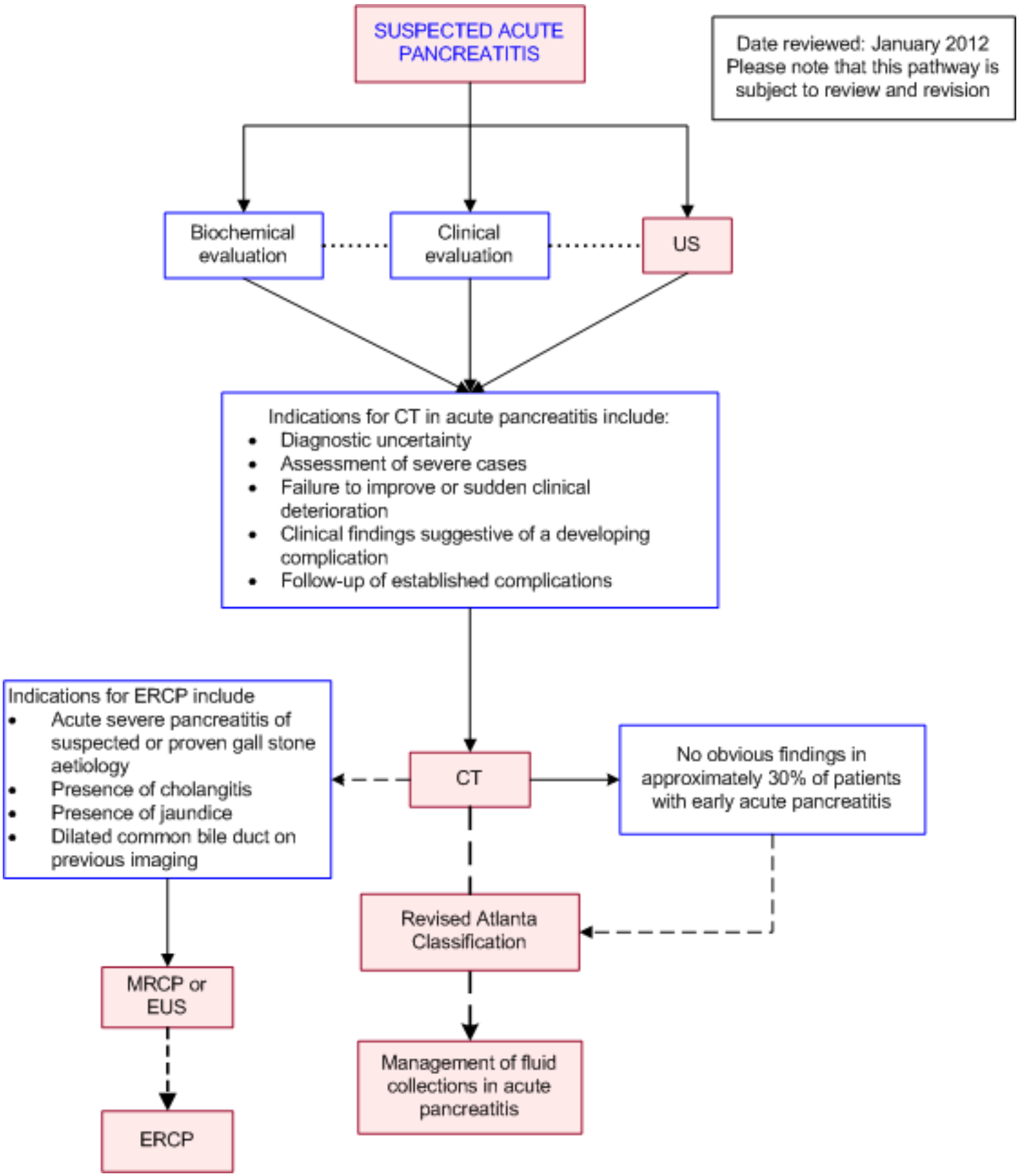
Quick User Guide

Move the mouse cursor over the PINK text boxes inside the flow chart to bring up a pop up box with salient points.
Clicking on the PINK text box will bring up the full text.
The relative radiation level (RRL) of each imaging investigation is displayed in the pop up box.

SYMBOL	RRL	EFFECTIVE DOSE RANGE
	None	0
	Minimal	< 1 millisieverts
	Low	1-5 mSv
	Medium	5-10 mSv
	High	>10 mSv

Pathway Diagram



Teaching Points

Role of Imaging in acute pancreatitis

- Exclude an underlying cause (e.g. gallstones)
- Assess severity
- Detect complications
- Guide treatment of complications (e.g. fluid collection drainage)

CT SCAN - routine CT scan is not indicated. Indications include

- Where diagnosis is in doubt
- Clinically severe cases to assess degree of pancreatic necrosis
- Failure to improve or sudden deterioration
- Imaging complications of pancreatitis

US Scan

- To help determine aetiology of pancreatitis
- Assess for gallstone-induced pancreatitis
- Assess bile duct if abnormal liver function

ERCP (Endoscopic Retrograde Cholangiopancreatography) - indications include

- Severe pancreatitis of proven or suspected gallstone aetiology
- Presence of cholangitis
- Presence of jaundice

Acute Pancreatitis

- The diagnosis of pancreatitis is usually made clinically and biochemically 1
- In suspected acute pancreatitis, imaging is used to 1
  - Exclude an underlying cause (e.g. gallstones)
  - Assess severity
  - Detect complications
- Clinical definition of acute pancreatitis (whether or not chronic pancreatitis is present) requires at least 2 out of 3 of the following 2
  - Abdominal pain strongly suggestive of acute pancreatitis
  - Serum amylase / lipase levels of ? 3 times normal level
  - Characteristic imaging findings on imaging (US / CT / MRI)

Revised Atlanta Classification

- In 2008, acute pancreatitis Classification Working group revised the 1992 Atlanta classification to clarify previous areas of confusion, improve clinical assessment & management, standardise the description of patients for reporting clinical studies and to offer a standardised means of data collection for future studies to allow objective evaluation of new therapies 2
- **Summary of Revised Atlanta Classification** 17,18

Morphologic Type	Associated Collections
<4 weeks	
Interstitial edematous pancreatitis	Sterile / Infected Acute Peri-pancreatic fluid collection

	(APFCs)
Necrotizing pancreatitis	Sterile / Infected Acute parenchymal necrotic collections or Sterile / Infected Acute Peri-pancreatic necrotic collection or Sterile / Infected combined pancreatic and peri-pancreatic necrotic collection (ANCs)
?4 weeks	
Interstitial edematous pancreatitis	Sterile / Infected pseudocyst
Necrotizing pancreacitis	Sterile / Infected walled-off necrosis (WON)

- Clinical severity and organ failure is calculated using scoring systems like Marshall system, SOFA, APACHE–II or Ranson scoring systems 19,20,21,22

Computed Tomography (CT)

- Contrast enhanced CT (CE-CT) is the imaging modality of choice for evaluating pancreas and the surrounding tissues 3,7 and is often the first radiological investigation for suspected acute pancreatitis in many institutions
- Routine CT is not indicated in mild acute pancreatitis unless there are clinical or other signs of deterioration 1,7,8,9, and there is no advantage of performing early imaging to predict the clinical severity of acute pancreatitis more than a clinical evaluation 9
- 14-28% of CT scans are normal in mild pancreatitis 7,8
- Ideal time for CE-CT is 48 hours after onset of symptoms for better accuracy in detecting pancreatic necrosis but in practice, patients with undiagnosed abdominal pain CE-CT is often performed on admission or the diagnosis of AP would have been made on CE-CT
- Indications for CT scan include 1,3,8
    - Diagnostic uncertainty
    - Assessment of severity and to detect complications
    - Failure to improve on treatment (>48 hrs)
    - Clinical findings suggesting a developing complication (e.g. fever, pain, hypotension, decreasing haematocrit)
    - Sudden deterioration in clinical status following an initial response to medical treatment
    - Follow-up and monitoring of established complications
    - Guidance of interventional procedures such as percutaneous fine needle aspiration and/or catheter drainage of fluid collections
- Combination of pre and post-contrast enhancement appearances permits the assessment of the degree of pancreatic necrosis and surrounding peri-pancreatic and intra-abdominal fluid collections. The severity of disease as demonstrated on CT (CT severity index) correlates with the risk of morbidity and mortality 10
- Disadvantages - exposure to ionising radiation with repeat scanning

Endoscopic Retrograde Cholangiopancreatography (ERCP)

- Mainly used to locate and remove gallstones in the common bile duct among patients with severe pancreatitis attributable to gallstones 1
- Other indications for ERCP in the setting of acute pancreatitis include 1
    - Presence of ascending cholangitis
    - Presence of jaundice
    - Dilated common bile duct on previous imaging
- Urgent ERCP and sphincterotomy is indicated in patients with severe gallstone pancreatitis who fail to respond to treatment within 48 hours 14,15
- Similarly patients with gallstone acute pancreatitis who develop ascending cholangitis stand to benefit from early ERCP and endoscopic sphincterotomy 16

Fluid Collections In Acute Pancreatitis

- The RAC classifies fluid collections in acute pancreatitis based on both the morphologic classification they are associated with and the disease timeframe
- Collections can be sterile or infected at any time and can occur in all the collection types
- Fluid collections associated with IEP in the first 4 weeks of onset are called acute peri-pancreatic fluid collections (APFC). If these collections progress / persist for 4 weeks or more, they are termed pancreatic pseudocysts. Pseudocysts occur in 10-20 % of patients as a complication of acute pancreatitis 17
- Fluid collections associated with necrotizing pancreatitis are called acute necrotic collections (ANC) if occurring within 4 weeks and walled-off necrosis (WON) after 4 weeks. ANCs can be further divided based on the morphological classification of the pancreatitis they are associated with. Parenchymal collections occurring within the first 4 weeks should also be classified as necrotic collections 17
- The question of intervention (usually percutaneous aspiration/drainage) for relatively symptomatic pseudocysts/fluid collections is a balance between on the one hand, the risks of introducing infection into a sterile collection and draining an "immature" cyst and on the other hand, the complications of a large untreated, unresolved fluid collection

- Fluid collections in acute pancreatitis can be categorised into the following (general guidelines only)

1. Acute peri-pancreatic fluid collections (APFCs)
    - Infection is extremely rare
    - Majority get reabsorbed with no complications
    - Fine needle aspiration (FNA) is only indicated if strong suspicion of infection. Otherwise no active invasive treatment is necessary
2. Pancreatic pseudocysts 23
    - A pancreatic pseudocyst consists of enzyme-rich fluid surrounded by a wall of granulation or fibrous tissue
    - May be localised to the pancreas or located remotely. Communication with the pancreatic ductal system is present in up to 80% of cases
    - Spontaneous regression occurs in 30-50% of cases and most pseudocysts less than 4cm in diameter resolve within 6 weeks
    - Infection can be noted by the presence of gas locules within pseudocyst. If no gas is visible on CE-CT, FNA can be done to rule out infection but risk of introducing infection by performing FNA should be taken into consideration
    - Drainage is indicated for pseudocyts larger than 5cm, that are growing, symptomatic or infected

3. Necrotic collections (ANCs and WONs)
    - FNA is useful to distinguish between infected and sterile necrosis, with a sensitivity of 88-96% and specificity of 90-96% 24,25
    - Indications for FNA include: failure to impove within 48-72 hours of commencing medical therapy, persistent symptoms for more than 7 days with greater than 30% necrosis or clinical suspicion of sepsis with less than 30% necrosis
    - Sterile ANCs may be drained based on patient's clinical condition. Percutaneous drainage is preferable though surgery and endoscopic procedures may be done rarely
    - Infected ANCs are drained with percutaneous drainage but surgery / endoscopic procedure may be needed later if recurs / inadequate
    - Sterile WON are drained based on clinical circumstances and percutaneous drainage is preferred but surgical drainage / endoscopic drainage may be needed for a cure
    - Infected WON are drained with percutaneous drainage as an interim with surgery to follow

- Indications for aspiration/drainage include 26,27,28,29

1. Diagnosis of possible infection/abscess. If aspiration confirms infection, possible therapeutic options are dependent on the morphology of the collection and the clinical status of the patient. They include
    - Percutaneous catheter drainage either as a definitive procedure or as a "holding" measure pending surgery
    - Surgical drainage/debridement as a first-line treatment
    - Endoscopic drainage via the stomach or duodenum
2. Continuing symptoms considered due to the mass effect of the fluid collection
3. Cyst enlarging on serial follow-up imaging. In this situation ERCP may be useful. If communication between the pancreatic duct and the fluid collection is demonstrated, the need for prolonged drainage is likely and surgery may be a better option
4. Some authorities suggest size alone as a criterion for drainage (usually around 5 cm)

Ultrasound

- Recommended to help determine the aetiology in all patients with suspected acute pancreatitis 1,2,3
- Primarily used to assess the biliary tree for gallstones, duct dilatation/obstruction and to exclude other pathology 1,2,3
- Helps distinguish fluid collections from solid inflammatory masses
- Useful for follow-up of pancreatic fluid collections if seen well on initial ultrasound 4
- Limitations
    - Visualisation of the pancreas is usually sub-optimal due to overlying bowel gas from a coexistent ileus 5,6
    - Detection of intra-parenchymal and retroperitoneal fluid collections correlates poorly with pancreatic necrosis 3
    - Often underestimates the presence, extent and complexity of fluid collections

Magnetic Resonance Cholangiopancreatography (MRCP) and Endoscopic

Ultrasonography (EUS)

- In many centres MRCP and EUS are performed following CT scanning if gall stone pancreatitis is being suspected prior to patients undergoing invasive ERCP if needed
- MRCP is reported to have a high negative predictive value of 100% for CBD stones 11,12
- MRCP is non-invasive and has no ionising radiation risk compared to CT. It is reported to have a sensitivity of around 62% and specificity of around 98% for CBD stones 12
- EUS is an invasive imaging method but is reported to have a higher diagnostic yield (51% vs 20%) compared to MRCP in a prospective study looking for causes of idiopathic pancreatitis following traditional cross-sectional imaging 11
- Some studies report higher diagnostic yield for EUS and MRCP compared to ERCP in idiopathic pancreatitis 13

Endoscopic Ultrasonography (EUS)

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