General data

- Age: 31 y/o
- Gender: male
- Occupation: electronic worker
- Admission: 92/10/27~92/11/07,
  total 11 days

Chief Complaint

- Abdominal pain and vomiting since this morning (92/10/27)

Brief Illness – 1

- 31 y/o male
- Denied all systemic illnesses
- 2 wks ago, yellow discoloration of skin
- 92/10/26, abdominal fullness
- 92/10/27 morning, post-prandial vomiting induced by hiccups

Brief Illness – 2

- Periumbilical pain and left lumber pain
- Pain was relieved by sitting up
- Tea colored urine
- Denied HBV & HCV history, fever
- Multiple gallstones observed at OPD abd echo on 10/24
- ED, elevated amylase and lipase (1332/215) elevated GOT/GPT (96/363)

Family History

- Mother: DM

Personal History

- Smoking: ½ pack for 8 days
- Alcohol: denied
- Food allergy: denied
- Drug allergy: denied
- Betel nut eating: denied

Past History

- Medical history：Denied
- Surgical history：Denied

Physical Examination

- Body weight: 76 Kg
- Body height: 172 cm
- TPR: 36.8℃ / 87bpm/ 18/min
- BP: 139/96 mmHg
- Sclera: icteric
- Abdomen: flat and soft
- Hypoactive bowel sounds
- Tenderness (+)
- Murphy’s sign (+)

Laboratory Data – 1

- WBC 17.62 $x10^3$/uL
- Neut 86.8%
- RBC 5.74 $x10^6$/uL
- Hb 18.5 g/dL
- PLT 304 $x10^3$/uL

Laboratory Data – 2

- Hemolysis ++
- Jaundice +
- Sugar AC(血) 112 mg/dl
- Albumin(血) 4.2 g/dl
- ALK-P(血) 479 IU/L
- GOT(血) 350 IU/L
- GPT(血) 949 IU/L
- γ -GT(血) 734 IU/L
- Bilirubin D/T(血) 6.9/10.7mg/dl
- Amylase 414 IU/L
- Lipase 118 U/L

Radiography

- CXR
- KUB
- Ultrasound (US)
- CT of abdomen

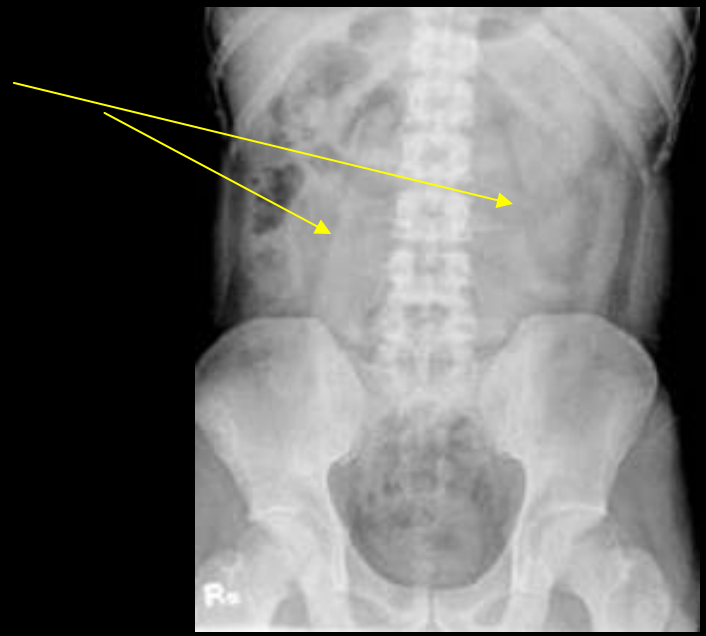
CXR

- No definite active lung lesion
- No significant abnormality in heart and diaphragm
- Intact bony thoracic cage

KUB

- 10/27
- Negative finding of the abdomen
- Well visible of bil.

  psoas outlines



KUB

- 11/09

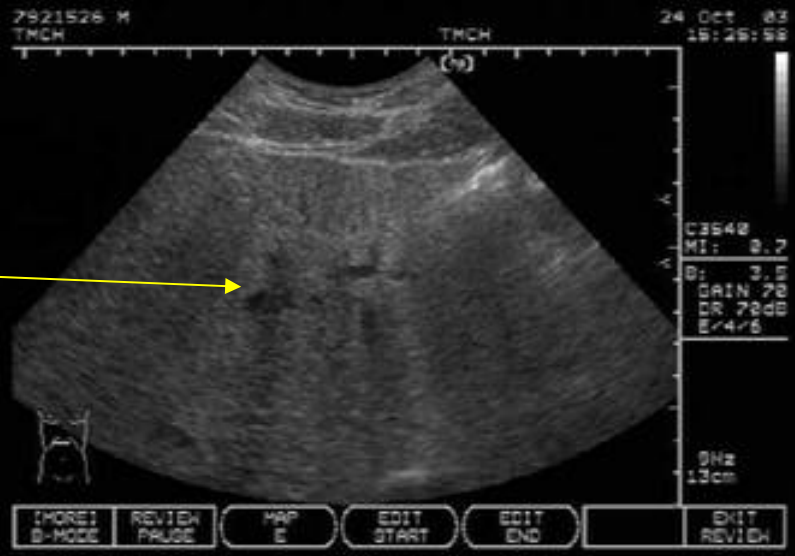
Gastric gas

Bowel gas in T-colon

Ultrasound

- Liver :
  Increased brightness of parenchyma
  No space-occupying lesion
- Fatty metamorphosis, Liver

Mild dilatation of IHD

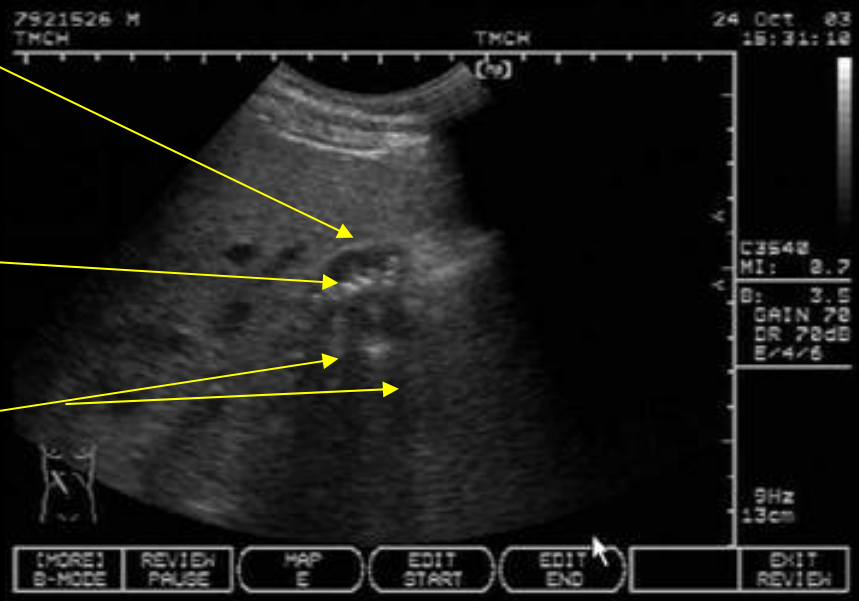


- Stones, Gallbladder, Multiple, R/O chronic cholecystitis

Chronic inflamamatory change of gallbladder wall

Multiple GB stone

Acoustic shadow



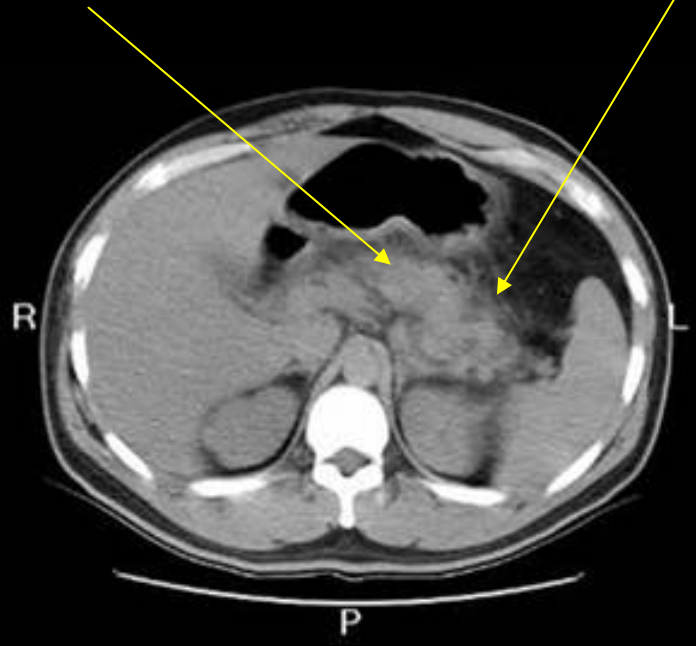
- Pancreas tail obscured by bowel gas

CT of Abdomen – 1

- Pre-contrast

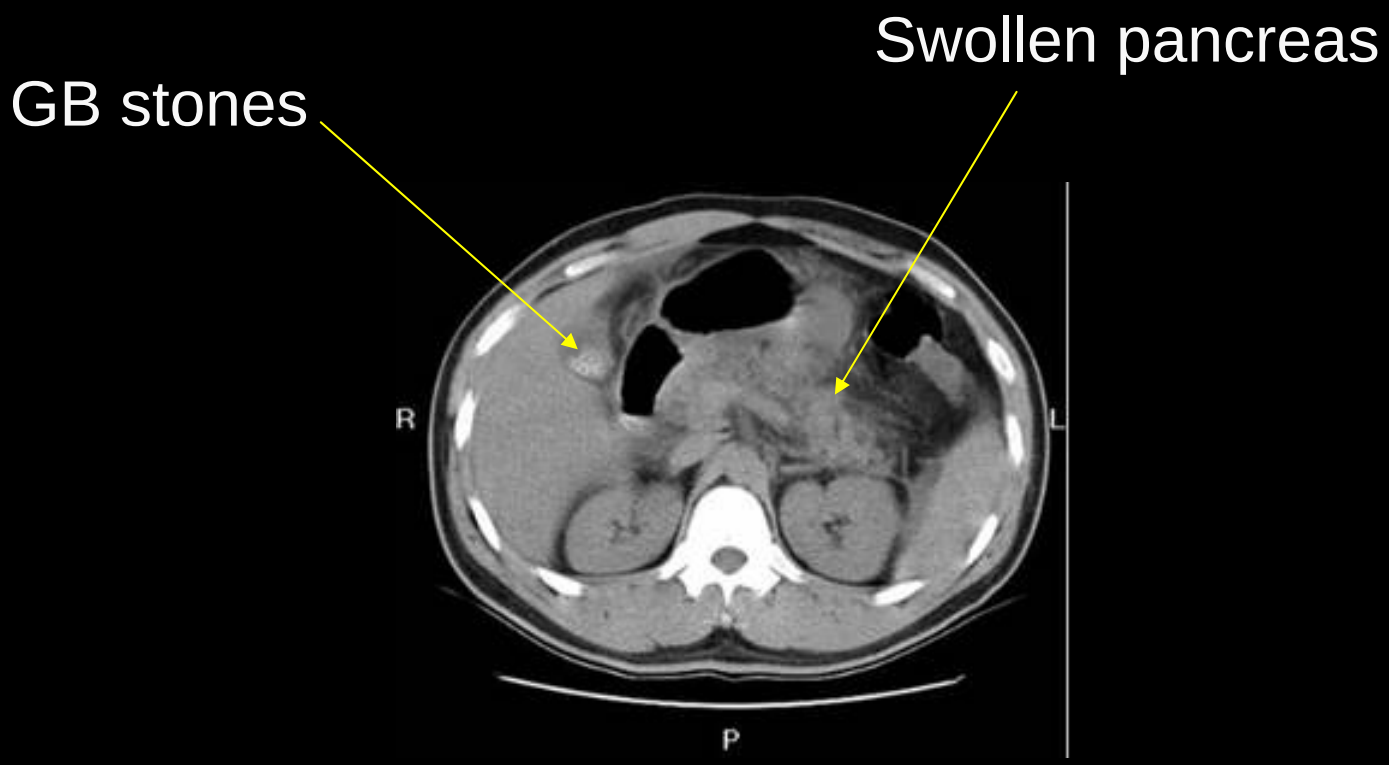
Swollen pancreas

Increased density of peripancreatic fat



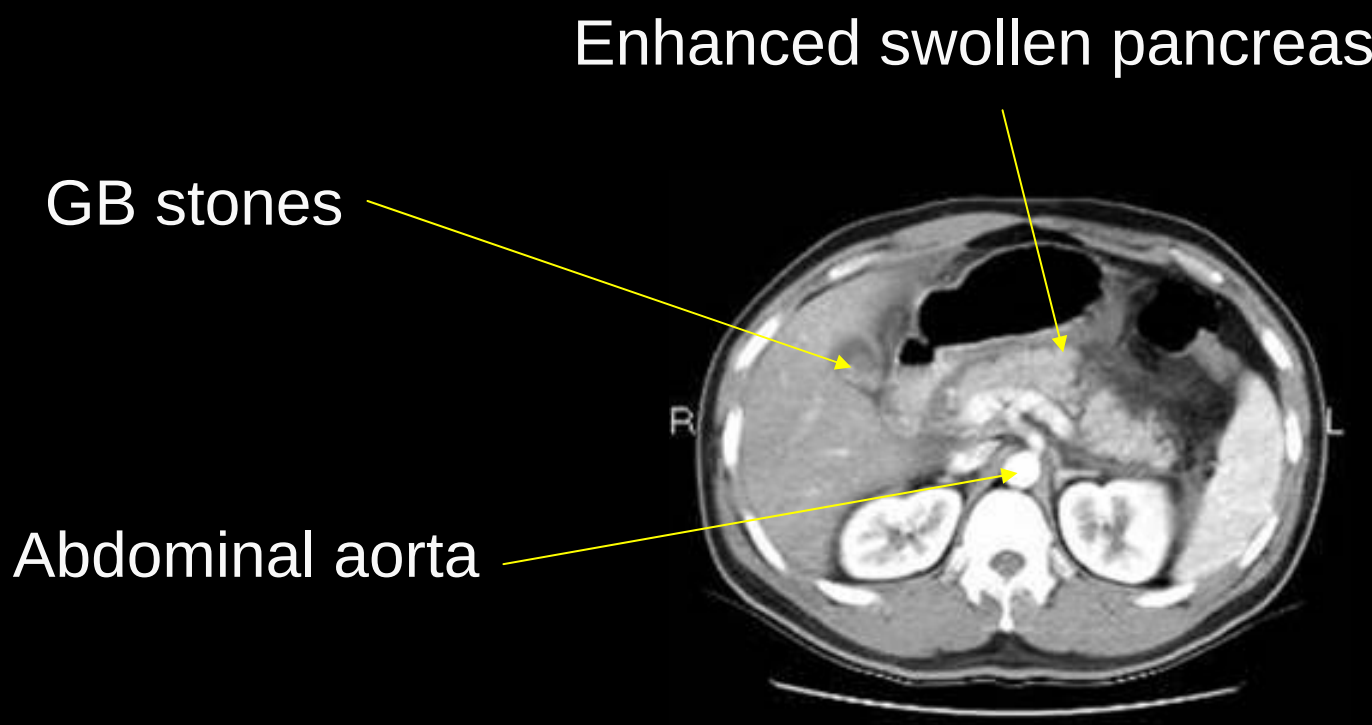
CT of Abdomen – 2

- Pre-contrast



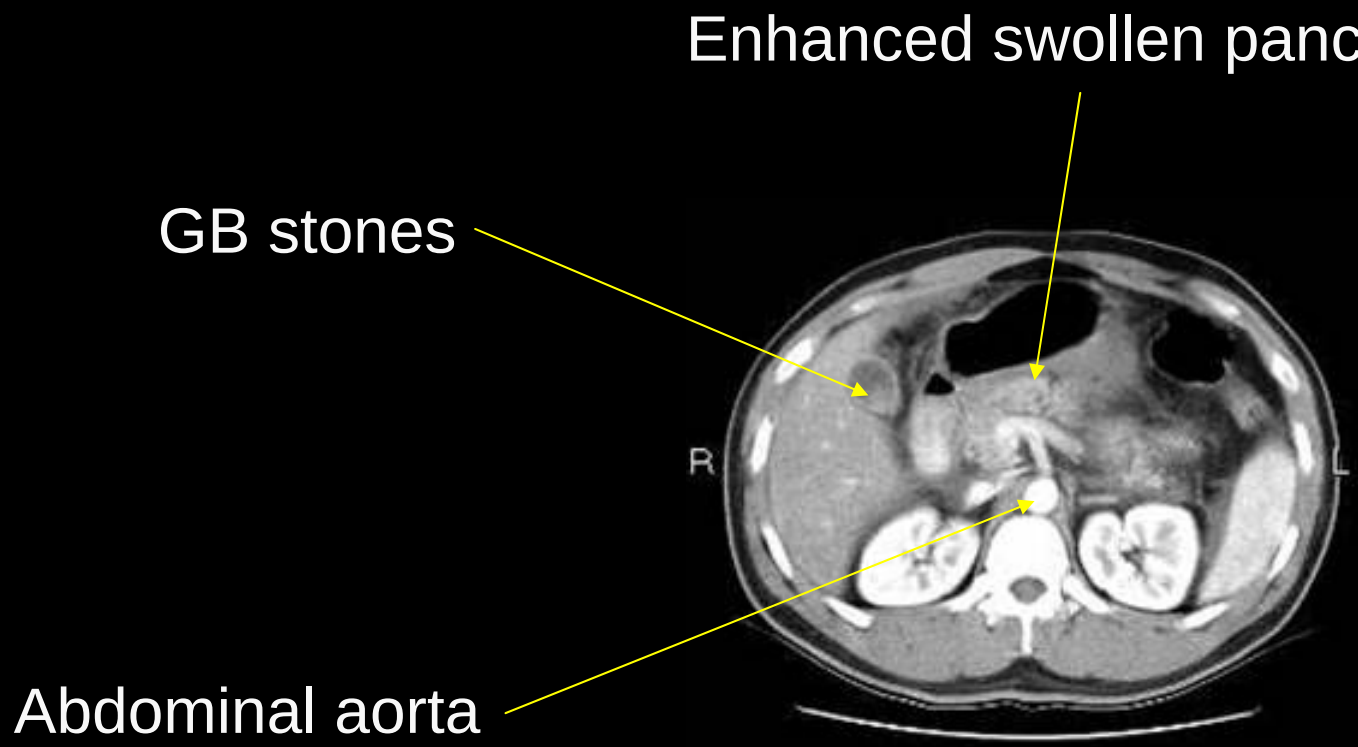
CT of Abdomen – 3

- Post-contrast



CT of Abdomen – 4

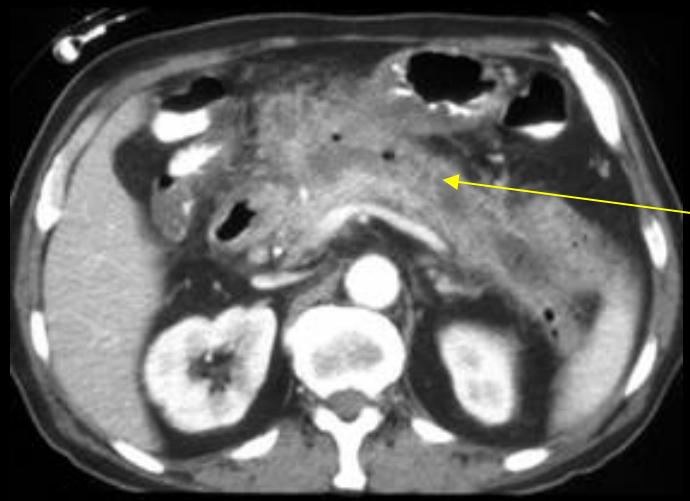
- Post-contrast



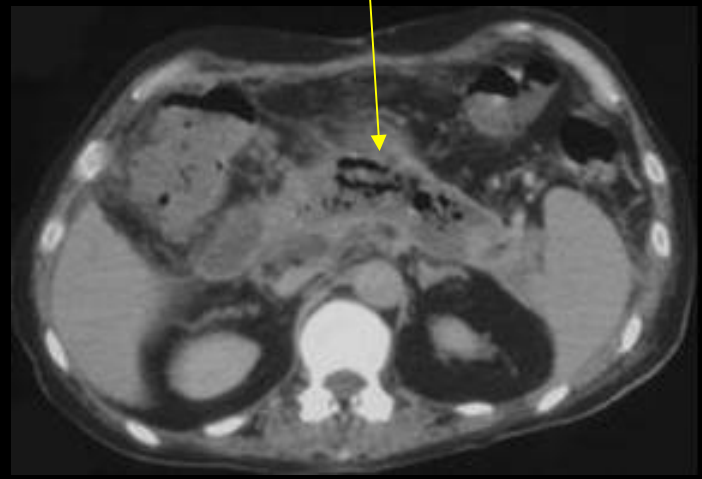
Differential Diagnosis for Abdominal Pain

- Acute pancreatitis
- Pancreatic abscess/necrosis
- Mesenteric ischemia
- Visceral perforation
- Leaking abdominal aortic aneurysm

Pancreatic abscess

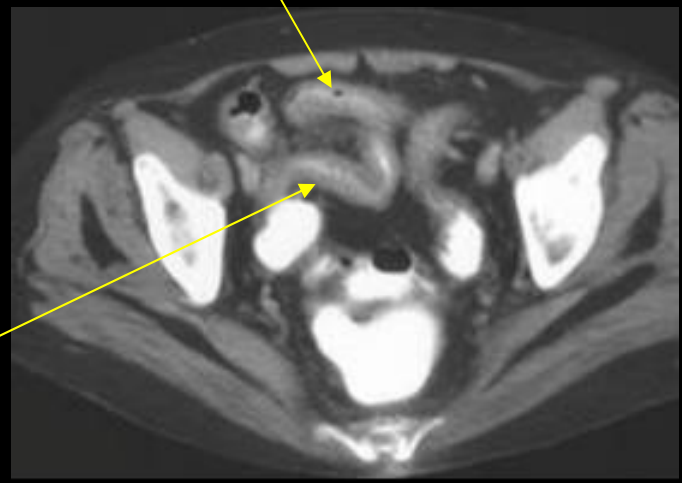


Pancreatic abscess



Mesenteric ischemia

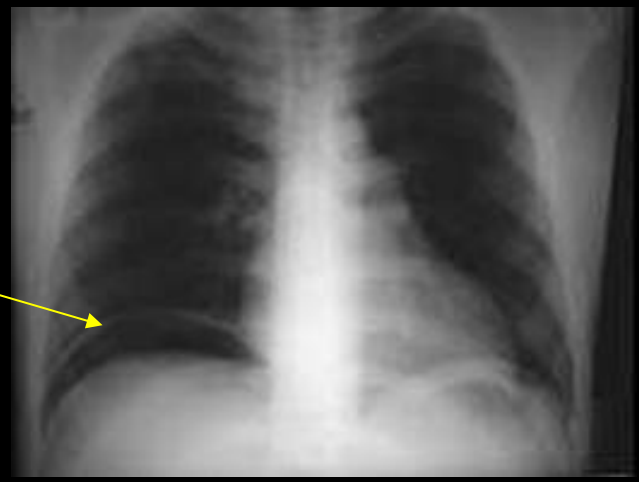
Ischemic bowel with intramural pneumatosis

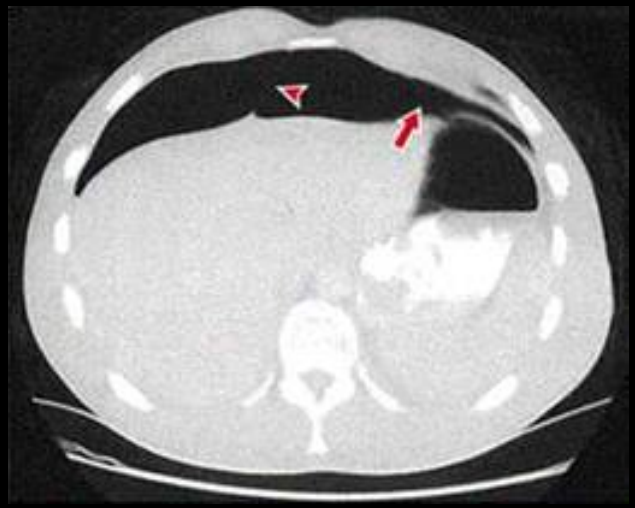


Bowel wall thickening

Visceral perforation

free air under right hemidiaphragm

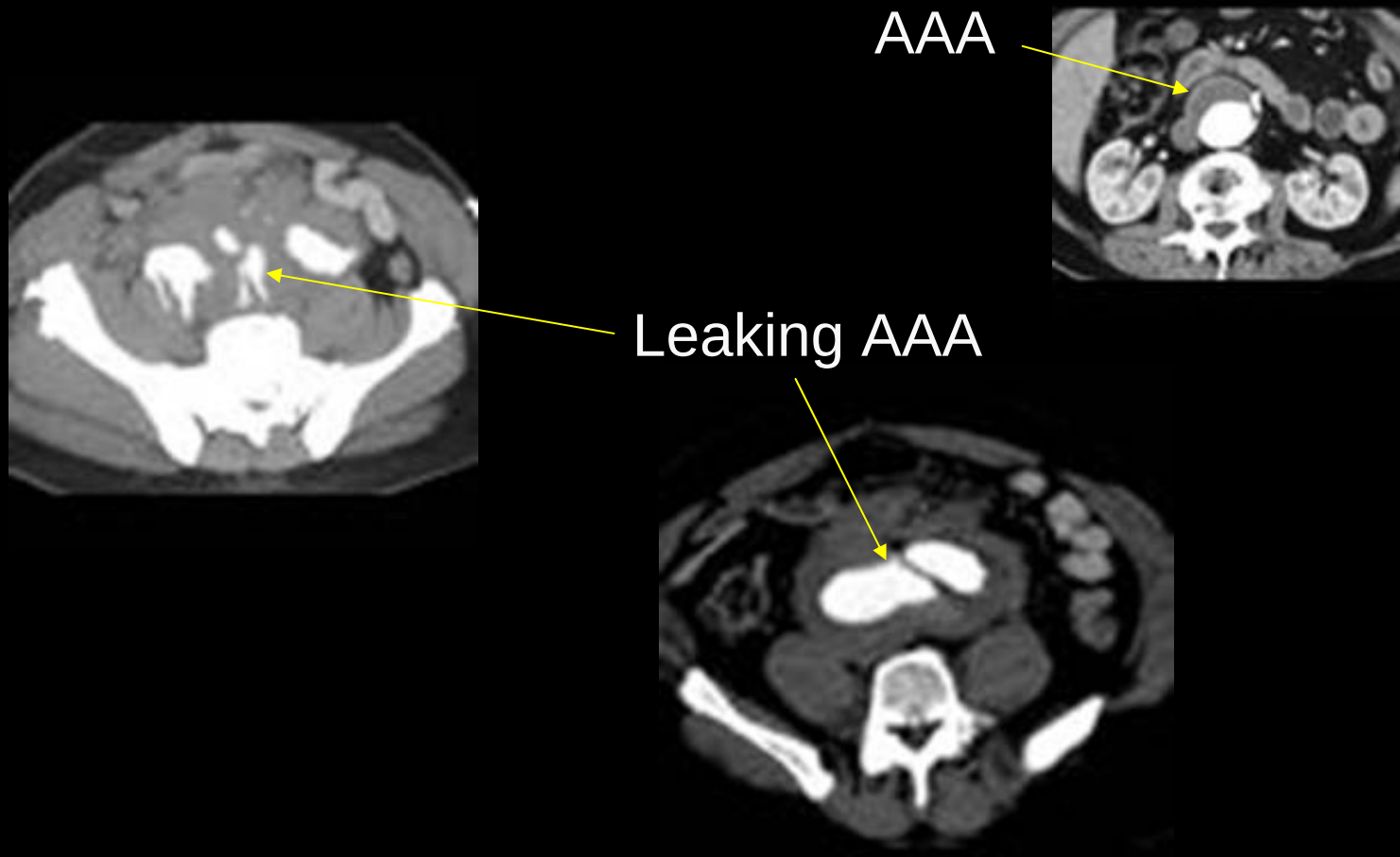




Large pneumoperitoneum (arrow)

Falciform ligament (arrowhead)

Leaking abdominal aortic aneurysm (AAA)



Discussion
for
Acute Pancreatitis

Etiology – 1

A. **Cholelithiasis**

   Most common cause (45%)

B. **Chronic alcohol ingestion** (35%)

C. **"Traumatic" causes**

   postoperative stress, ERCP, direct trauma, manometry of the sphincter of Oddi, endoscopic sphincter-otomy, and perforation of a duodenal ulcer

Etiology – 2

D. Metabolic insults

hypertriglyceridemia

hypercalcemia (e.g., hyperparathyroidism)

renal failure.

E. Drugs

DDI, DDC, azathioprine, mercaptopurine, valproic acid, acetaminophen, and others

Etiology – 3

F. Infectious causes

viruses (mumps, rubella, CMV, adenovirus, HIV, coxsackievirus B)

bacteria (mycoplasma, Campylo- bacter, legionella, Mycobacterium tuberculosis, M. avium complex)

parasitic (ascariasis, clonorchiasis)

G. Connective tissue disorders

(SLE, polyarteritis nodosa, Sarcoidosis)

H. Idiopathic causes

Symptoms & Signs – 1

- Mild to severe epigastric pain, with radiation to flank, back, or both: 50 ~ 90 %
- Characteristics:
  - constant, dull and boring worse in supine position
  - sitting or fetal position
  - heavy meal or drinking
- Nausea and nonfeculent vomiting: 75 ~ 90 %
- Retroperitoneal bleeding (hemorrhagic pancreatitis)
  - Cullen's sign (periumbilicus)
  - Grey-Tunner's sign (flank)

Symptoms & Signs – 2

- Tachycardia
- Tachypnea
- Hypotension
- Fever
- Mild jaundice
- Diminished or absent bowel sounds
- Basilar rales, especially in the left lung
- Muscular spasm ← hypocalcemia

History

- Alcohol-related pancreatitis
  - Early 30s: secondary to alcohol consumption
  - Estimated consumption of alcohol 150 g/day
  - On average, it develops after four to seven years of drinking
- Biliary pancreatitis
  - Older adults
  - History of cholelithiasis or intermittent, postprandial RUQ pain

Diagnostic Laboratory Factors

- Amylase
- Lipase
- Trypsin
- Elastase

Laboratory data – 1

Amylase

- Increase from 2 ~ 12 hours after the onset of symptoms
- Peak at 12 to 72 hours
- Return to normal within 1 week
- 4X high limit of normal range
- Urinary amylase activity

Laboratory data – 2

Lipase

- Increase within 4 ~ 8 hours after the onset of symptoms
- Peak at about 24 hours
- Decrease within 8 to 14 days
- Specificity (50 ~ 99%)
- Sensitivity (86 ~ 100%)
  - particularly in alcoholic pancreatitis
- 2X high limit of normal range

Laboratory data – 3

Trypsin/Elastase

- Elevated trypsin level: most accurate
- Serum trypsin assay: not widely available
- Urinary trypsin activity: new
- Elastase level: not better

Prognosis

- Glasgow scoring system
- APACHE II scoring system
- Ranson/Imrie criteria

Glasgow Scoring System

Glasgow System to Predict Severity of Acute Pancreatitis[†]

Poor prognostic factors in patients with acute pancreatitis

White blood cell count	>15,000/μL
Serum glucose concentration	>180 g/dL (10 mmol/L) with no history of diabetes
Blood urea nitrogen	>45 mg/dL (16 mmol/L) with no response to fluids
pO2	<60 mmHg
Serum calcium concentration	<8 mg/dL (2 mmol/L)
Serum albumin concentration	<3.2 g/dL (32 g/L)
Lactate dehydrogenase	>600 U/L
Aspartate aminotransferase (AST)	>200 U/L

The presence of three of more of these criteria within the first 48 hours is indicative of severe pancreatitis

[†]Adapted from Corfield, AP, Williamson, RCN, McMahon, MJ, et al, Lancet 1985; 24:403.

APACHE II Scoring System

Acute physiology and chronic health evaluation scoring system

Table 2 APACHE II scoring system

	Acute physiology score								
	High normal range					*Low normal range*			
Variable	*+4*	*+3*	*+2*	*+1*	*0*	*+1*	*+2*	*+3*	*+4*
Temperature (°C)	>41	39–40.9		38.5–38.9	36–38.4	34–35.9	32–33.9	30–31.9	<29.9
Mean arterial pressure (mm Hg)	>160	130–159	110–129		70–109		50–69		<49
Heart rate (ventricular; beats/min)	>180	140–179	110–139		70–109		55–69	40–54	<39
Respiratory rate	>50	35–49		25–34	12–24	10–11	6–9		<5
Oxygenation (mm Hg)									
A_{aDO_2} when F_{iO_2} >0.5	>500	350–499	200–349		<200				
P_{aO_2} when F_{aO_2} <0.5					PO_2 >70	PO_2 61–70		PO_2 55–60	PO_2 <55
Arterial pH	>7.7	7.6–7.69		7.5–7.59	7.33–7.49		7.25–7.32	7.15–7.24	<7.15
Serum Na (mmol/l)	>180	160–179	155–159	150–154	130–149		120–129	111–119	<110
Serum K (mmol/l)	>7	6–6.9		5.5–5.9	3.5–5.4	3–3.4	2.5–2.9		<2.5
Serum creatinine (mg/100 ml) Double score for ARF	>3.5	2–3.4	1.5–1.9		0.6–1.4		<0.6		
Packed cell volume (%)	>60		50–59.9	46–49.9	30–45.9		20–29.9		<20
White blood cell count ($\times 10^3/mm^3$)	>40		20–39.9	15–19.9	3–14.9		1–2.9		<1
Glasgow coma scale*									

*Score = 15 – actual Glasgow coma scale.

Ranson/Imrie Criteria

Ranson Criteria to Predict Severity of Acute Pancreatitis[†]

0 hours	
Age	>55
White blood cell count	>16,000/mm3
Blood glucose	>200 mg/dL (11.1 mmol/L)
Lactate dehydrogenase	>350 U/L
Aspartate aminotransferase (AST)	>250 U/L
48 hours	
Hematocrit	Fall by ≥10 percent
Blood urea nitrogen	Increase by ≥5 mg/dL (1.8 mmol/L) despite fluids
Serum calcium	<8 mg/dL (2 mmol/L)
p02	<60 mmHg
Base deficit	>4 MEq/L
Fluid sequestation	>6000 mL

The presence of 1 to 3 criteria represents mild pancreatitis; the mortality rate rises significantly with four or more criteria

[†]Adapted from Ranson, JHC, Rifkind, KM, Roses, DF, et al, Surg Gynecol Obstet 1974; 139:69.

Prognosis According to Ranson/Imrie Criteria

Score of Criteria	Mortality
$\leqq$ 2	< 5%
3~4	15~20%
5~6	40%
$\geqq$ 7	> 99%

Management

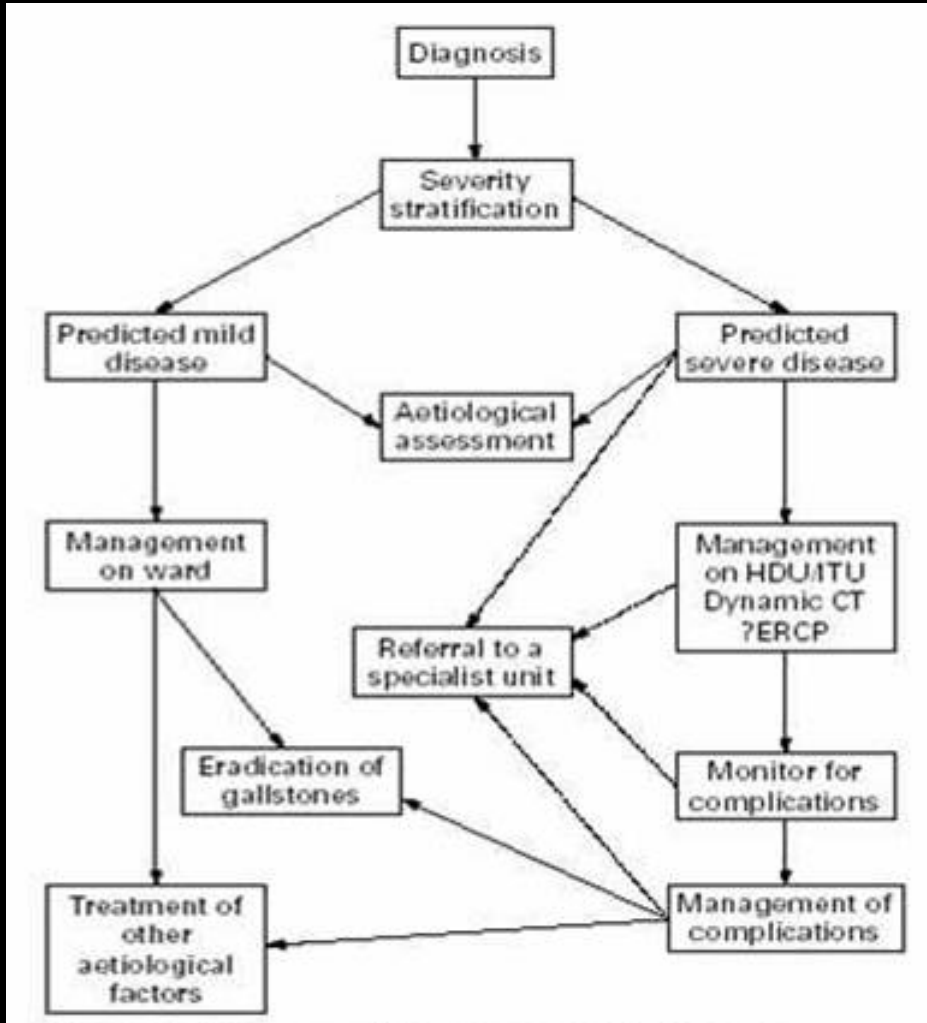


Figure 1 Summary of management steps in acute pancreatitis.

Radiologic Studies of Acute Pancreatitis

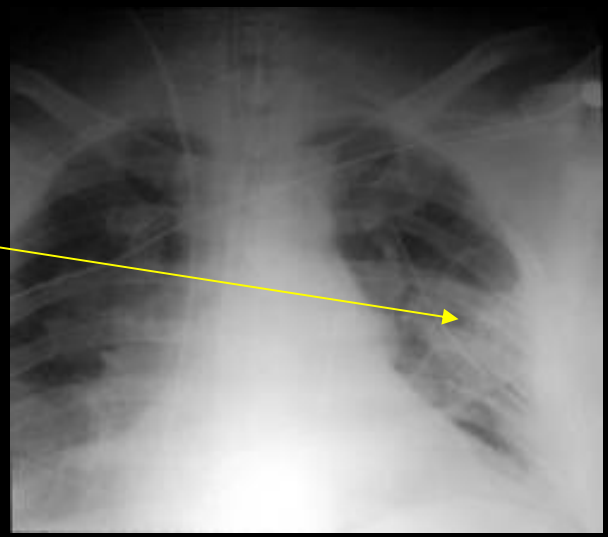
- Chest x ray films
- Plain radiography
- Ultrasound
- Computed tomography (CT)
- Endoscopic Retrograde Cholangiopancreatography (ERCP)

Radiologic studies – 1

Chest x ray films

- Pleural effusion
- Diffuse alveolar interstitial shadowing
  - ARDS

Pleural effusion



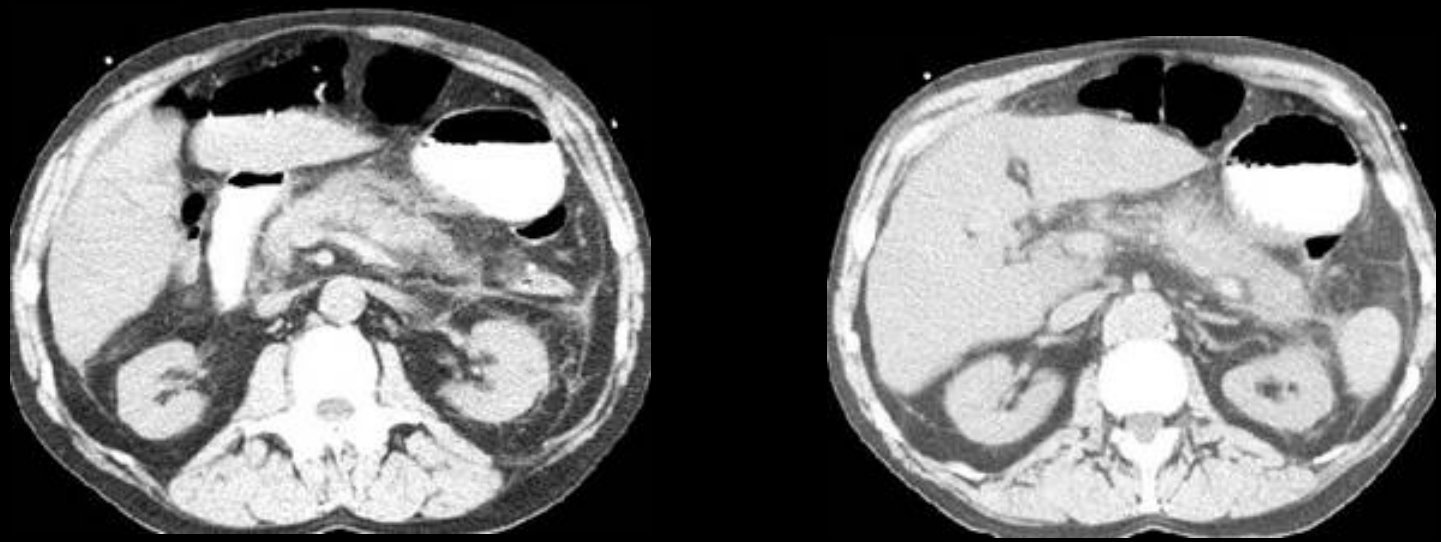
Radiologic studies – 2

Plain Radiographs

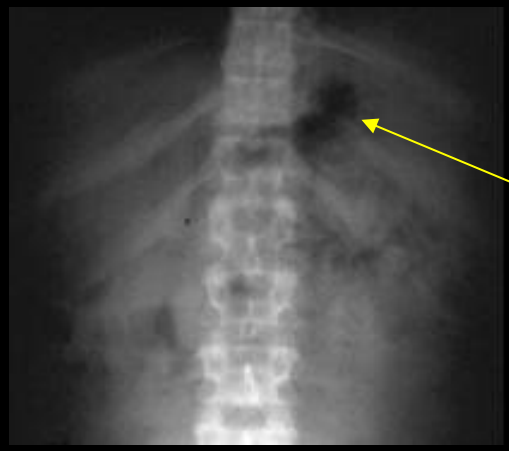
- None for specific diagnostic purposes
- Gas-filled duodenum (sentinel loop)
- Colon cut off
- Renal halo sign
- Retroperitoneal gas: infection
- GB stones
- Calcification

Cut off sign

- Gaseous distention of colon from right colon with an abrupt termination at the level of splenic flexure
- No gas below this point in colon or in small bowel

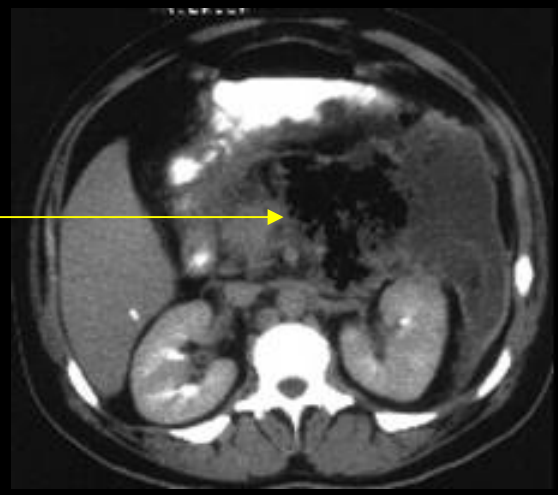


Retroperitoneal gas



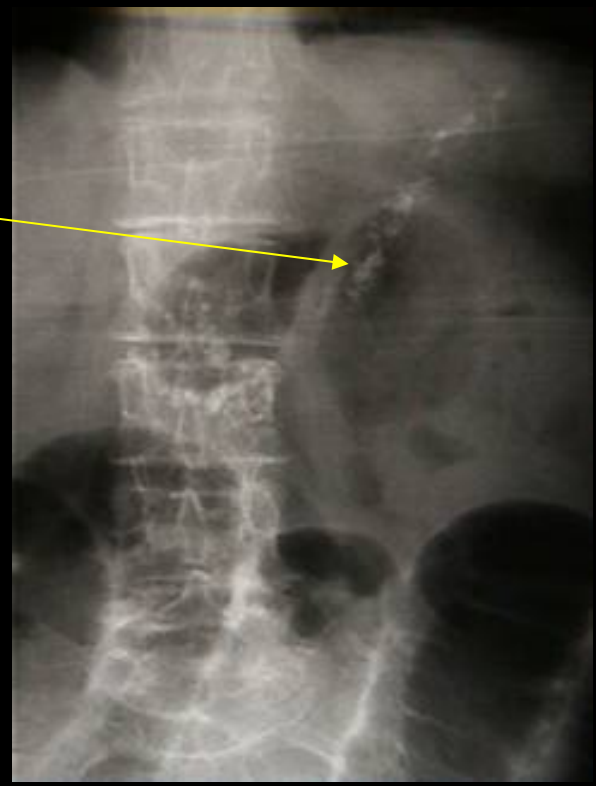
mottled gas to left of spine

large gas collection in lesser sac with fluid laterally



Pancreatic calcification

Calcification of pancreas



Radiologic studies – 3

Ultrasound

- Swollen pancreas
- Peritoneal fluid
- Pancreatic calcification
- GB stones
- Dilatation of bile duct

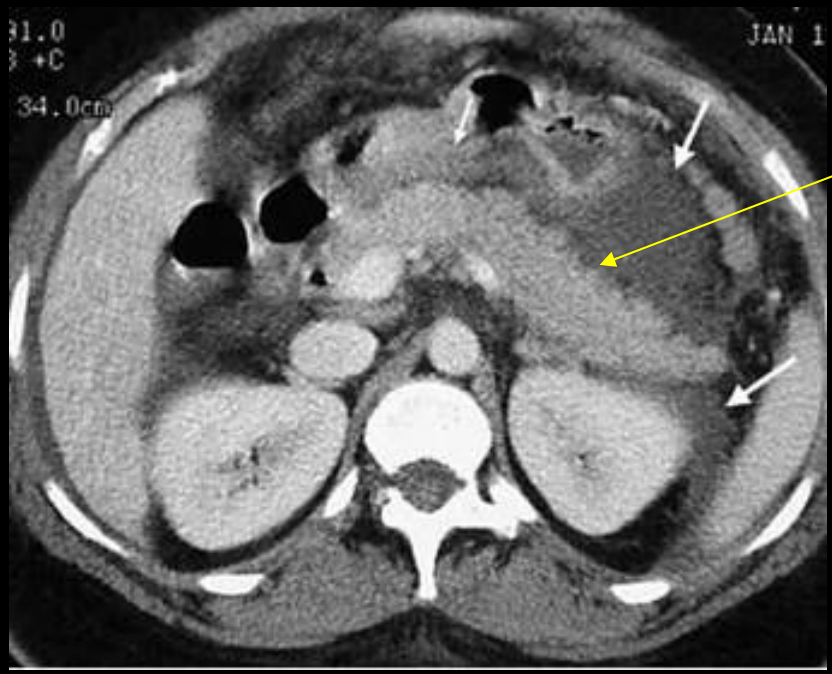
Radiologic studies – 4

Computed Tomography (CT)

- Pancreatic glandular edema
- Peripancreatic fat stranding
- Pancreatic/peripancreatic fluid collections
- Necrosis
- Pseudocyst
- Advantage
  - severe symptoms, fever or persistent leukocytosis
  - assess complications

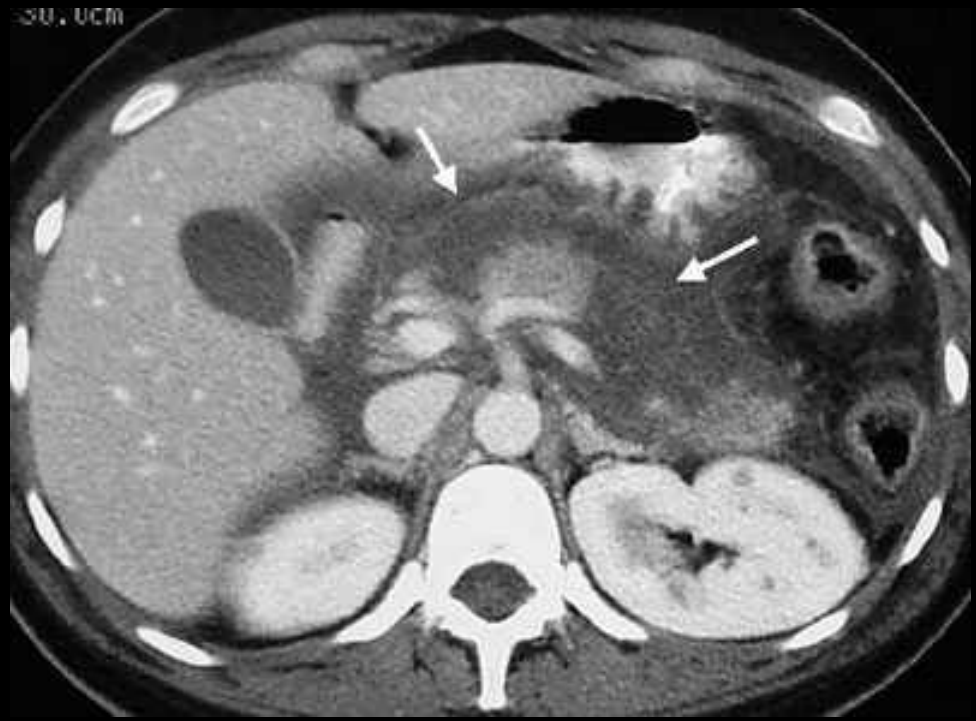
Peripancreatic fat stranding

- Peripancreatic fat *(arrows)*
- Pancreas: relatively normal



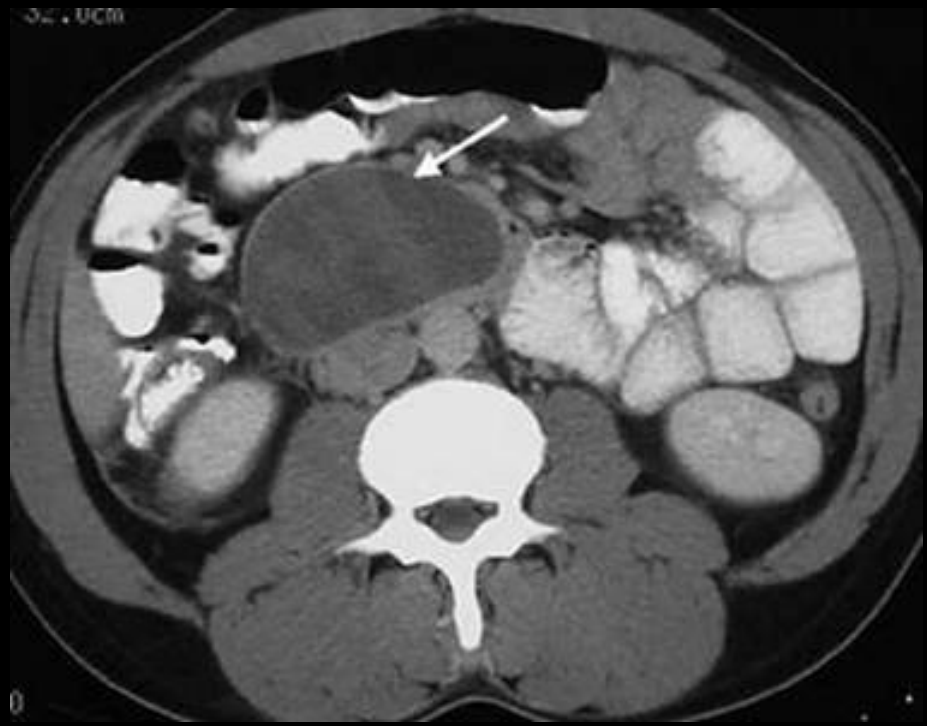
Necrosis

- Peripancreatic and retroperitoneal edema
- Large non-enhancing areas of necrosis in the body and neck of the pancreas *(arrows)*.



Pancreatic pseudocyst

- A well defined fluid collection *(arrow)* in retroperitoneum just below pancreas

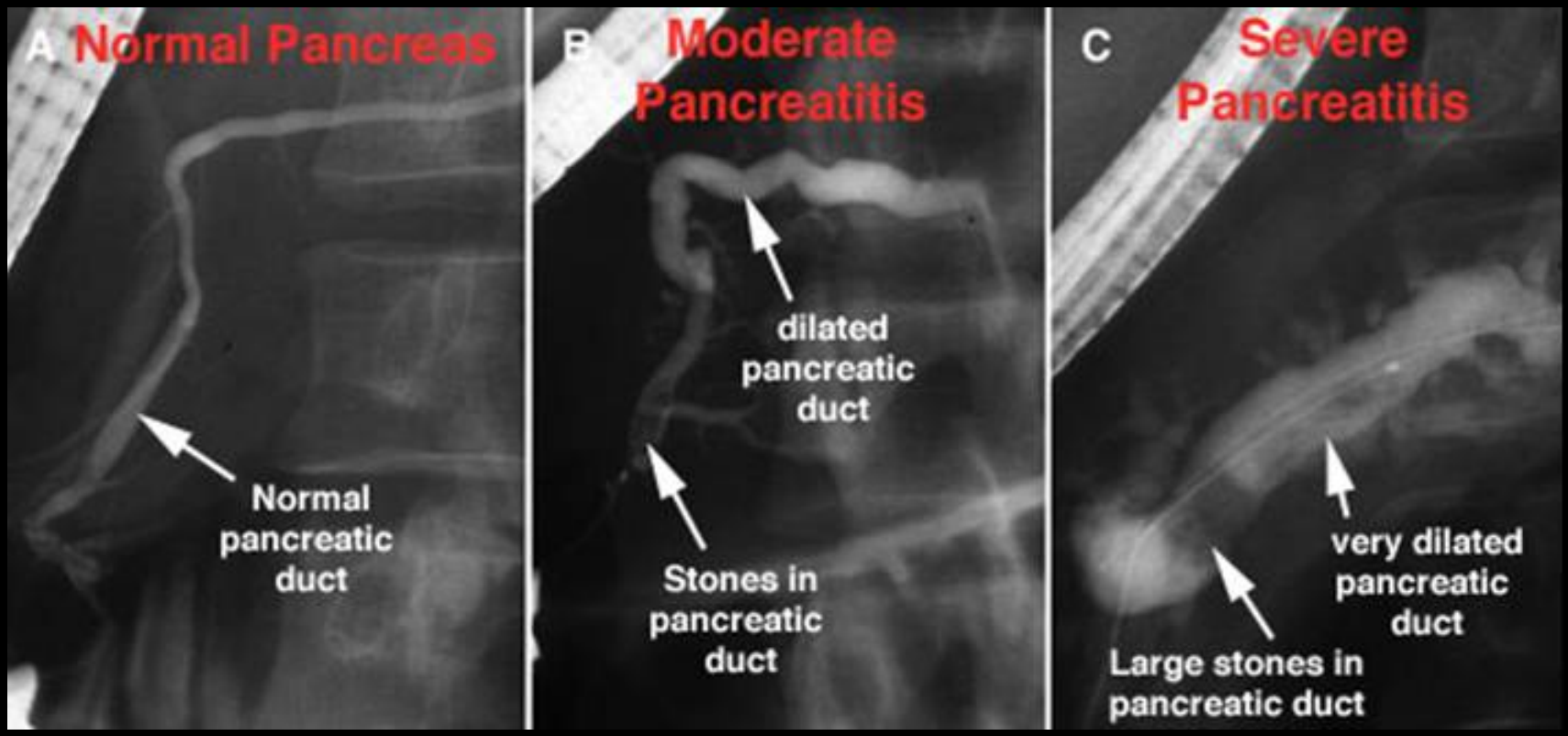


Radiologic studies – 5

Endoscopic Retrograde Cholangiopancreatography (ERCP)

- Primarily indicated in biliary obstruction
- Enable endoscopic sphincterotomy and remove impacted stones
- Risks:
  - precipitating an acute episode of pancreatitis
  - infection
  - hemorrhage and perforation

ERCP


A Normal Pancreas
Normal pancreatic duct
B Moderate Pancreatitis
dilated pancreatic duct
Stones in pancreatic duct
C Severe Pancreatitis
very dilated pancreatic duct
Large stones in pancreatic duct

CT Severity Index (CTSI)

- Balthazar et al
- Grade of pancreatitis with the extent of pancreatic necrosis

CT Findings and Grading of Acute Pancreatitis (CT Severity Index [CTSI])[1]

Grading based upon findings on unenhanced CT

Grade	Findings	Score
A	Normal pancreas – normal size, sharply defined, smooth contour, homogeneous enhancement, retroperitoneal peripancreatic fat without enhancement	0
B	Focal or diffuse enlargement of the pancreas, contour may show irregularity, enhancement may be inhomogeneous but there is on peripancreatic inflammation	1
C	Peripancreatic inflammation with intrinsic pancreatic abnormalities	2
D	Intrapancreatic or extrapancreatic fluid collections	3
E	Two or more large collections of gas in the pancreas or retroperitoneum	4

Necrosis score based upon contrast enhanced CT

Necrosis, %	Score
0	0
<33	2
33-50	4
≥50	6

CT severity index equals unenhanced CT score plus necrosis score: maximum = 10, ≥6 = severe disease

[1]Adapted from Balthazar, EJ, Robinson, DL, Megibow, AJ, Ranson, JH, Radiology 1990; 174:331.

Prognosis According to CTSI

CTSI	Mortality	Complication rate
0-3	3%	8%
4-6	6%	35%
7-10	17%	92%

Degree of Confidence

Clavien et al

- Prospective study of 202 patients
- Sensitivity 92% and specificity 100%

Balthazar et al

- Overall accuracy of 80-90% (pancreatic necrosis)

Block et al

- Positive predictive value 92% (CECT for pancreatic necrosis)

Reference

- Matthew Freedman: *Clinical imaging: an introduction to the role of imaging in clinical practice*, pp. 375-382, 1998
- Dr.葉偉成: 基礎腹部影像學 (3rd ed.), 2002, 中華中西醫學影像研究中心
- Peter Armstrong, Martin L. Wastie: *Diagnostic imaging* (4th ed.) 1998, Blackwell Science Ltd., pp. 212-217
- *United Kingdom guideline for the management of acute pancreatitis*. Gut 1998; 42 (suppl 2): S1-S13
- Braunwald, Fauci, Kasper, Hauser, Longo, Jameson. Harrison*'s principles of internal medicine, sec. 3 Disorder of the pancreas* (15th ed.), pp. 1788-1804, 2001, McGraw-Hill Co., Inc.
- American family physician – Diagnosis and management of acute pancreatitis (http://www.aafp.org/afp/20000701/164.html)
- Ghattas Khoury, MD: *eMedicine – Pancreatitis* (http://www.emedicine.com/EMERG/topic354.htm)

- Glenda Romero-Urquhart, MD: *eMedicine – Acute pancreatitis* (http://www.emedicine.com/radio/topic521.htm)
- Pancreas.org – patients>pancreas test>*ERCP* (http://www.pancreas.org/patients/patients_ercp_main.html)
- CUHK Department of diagnostic radiology & organ imaging – g*astrointestinal imaging: acute pancreatitis* (http://www.cuhk.edu.hk/med/dri/default.htm)
- *CT is us* (http://www.ctisus.org/index.html)
- Balthazar EJ, Ranson JH, Naidich DP, Megibow AJ, Caccavale R, Cooper MM. *Acute pancreatitis: prognostic value of CT*. Radiology 1985; 156(3):767-772
- Balthazar EJ, Robinson DL, Megibow AJ, Ranson JH. *Acute pancreatitis: value of CT in establishing prognosis*. Radiology 1990; 174(2):331-336
- Balthazar EJ: *Acute pancreatitis: assessment of severity with clinical and CT evaluation.* Radiology 2002; 223:603-613


Thanks for your attention!!
For Angelline