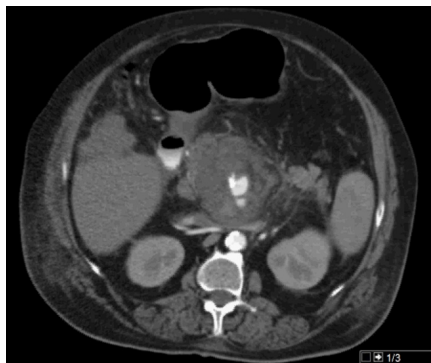
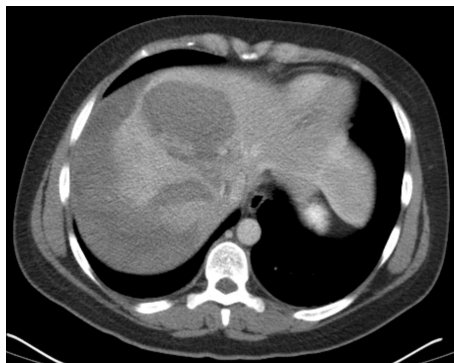




8th Nordic Course in Emergency Radiology
May 8-11, 2023 – Aarhus, Denmark

NORDICFORUM www.nordictraumarad.com
TRAUMA & EMERGENCY RADIOLOGY

Cases of Spontaneous Hemoperitoneum



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Disclosure

Nothing to disclose pertaining to this presentation, except:

Thanks to:

Prof. Martijn Meijerink

Dr. Jan Hein van Waesberghe

Amsterdam University Medical Centers, Netherlands



Content

- Some references
- Definition and general background
- CT protocol
- Cases with background per organ

Some references

Blood in the Belly: CT Findings of Hemo- peritoneum¹

CME FEATURE

See accompanying
test at [http://
www.rsna.org
/education](http://www.rsna.org/education)

*Meghan Lubner, MD • Christine Menias, MD • Creed Rucker, MD
Sanjeev Bhalla, MD • Christine M. Peterson, MD • Lisa Wang, MD
Brett Gratz, MD*



Some references

EDUCATION EXHIBIT

109

RadioGraphics

Emerg Radiol (2007) 14:65–75
DOI 10.1007/s10140-007-0594-0

REVIEW ARTICLE

Spontaneous hemoperitoneum: a bloody mess

Brian C. Lucey • Jose C. Varghese •
Stephan W. Anderson • Jorge A. Soto



Some references

RadioGraphics

EDUCATION EXHIBIT

109

Emerg Radiol
DOI 10.1007

REVIEW

Spont

Brian C. I
Stephan W

Gastrointestinal Imaging • Pictorial Essay

Spontaneous Abdominal Hemorrhage: Causes, CT Findings, and Clinical Implications

Alessandro Furlan^{1,2}
Saeed Fakhran¹
Michael P. Federle^{1,3}

OBJECTIVE. The purpose of this article is to present the most common causes of spontaneous abdominal hemorrhage and to review the CT findings that are important in establishing the correct diagnosis and in guiding appropriate therapy.

CONCLUSION. Knowledge of the common CT manifestations of various causes of spontaneous abdominal hemorrhage allows their accurate diagnosis and has a direct impact on clinical decision making.



Some references

RadioGraphics

EDUCATION EXHIBIT

109

Emerg Radiol
DOI 10.1007

REVIEW

Spont

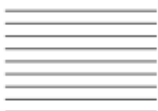
Brian C. I
Stephan W

Gastrointestinal Imaging • Pictorial Essay



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0736-4679/\$—see front matter

doi:10.1016/j.jemermed.2007.11.080



Clinical Communications: Adults

Alessan
Saeed F
Michael

ABDOMINAL APOPLEXY: A CASE REPORT AND REVIEW

John C. Cawyer, MD and C. Keith Stone, MD, FACEP

Department of Emergency Medicine, Texas A&M University Health Science Center, College of Medicine, Scott & White Clinic,
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Medicine, Scott & White Clinic, 2401 South 31st St., Temple, TX 76508



Definition Spontaneous Hemoperitoneum

Hemorrhage in the peritoneal cavity, without:

- trauma
- recent procedure

Definition Spontaneous Hemoperitoneum

Hemorrhage in the peritoneal cavity, without:

- trauma
- recent procedure

Location pain may indicate organ





General Background

- Rare, uncertain incidence, but low
- M / F ratio:
 - Older literature more men (2-3 : 1)*
 - Newer literature more women than men:
 - More imaging with better documentation of smaller volume, especially in setting of hemorrhagic ovarian cysts[#]
 - Hepatic source in Western countries more in women^{\$}

* Cawyer JC, *J Emerg Med*, 2007

Lucey BC, *Emerg Radiol*, 2007

\$ Battula NB, *HPB*, 2012



CT protocol

- If expected (preceding imaging – US / POCUS / outside):
 - optional unenhanced (VNC in DECT)
 - post contrast CTA and CTPV abdomen + pelvis
- If unexpected, often only CTPV abdomen + pelvis



CT signs to look for

Hounsfield units hemorrhage:

- Hyper acute, unclothed (or anticoagulants): 30 – 45 HU
- After 2-3 hours formation of clots: 40 – 70 HU
- After 2-3 days with lysis: 20 – 30 HU

Look for:

- Sentinel clot
- Hematocrit sign (anemia)
- Possible lesion, though often hard to see on initial CT

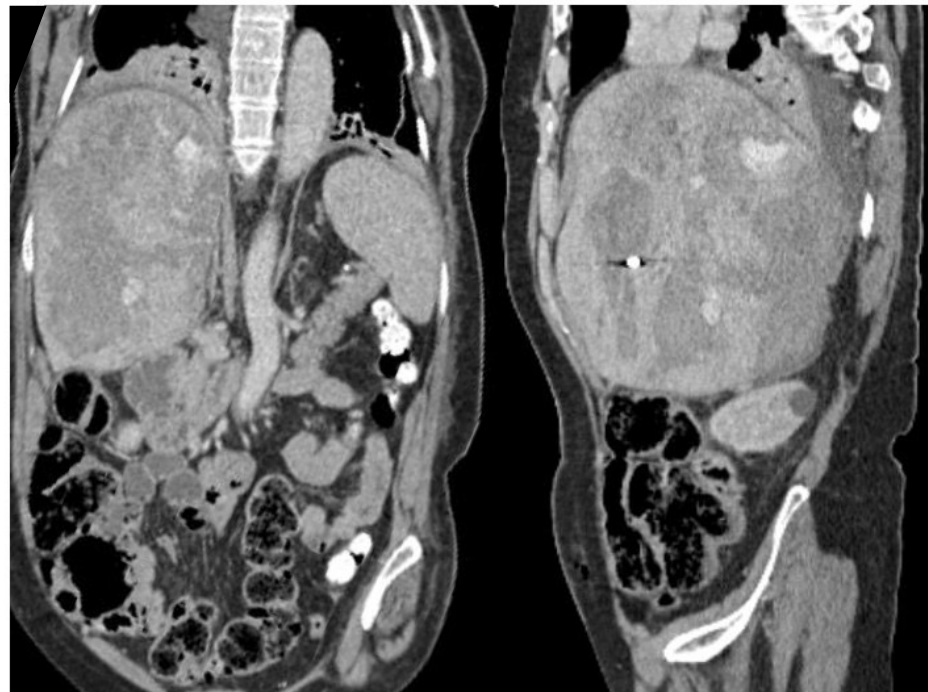
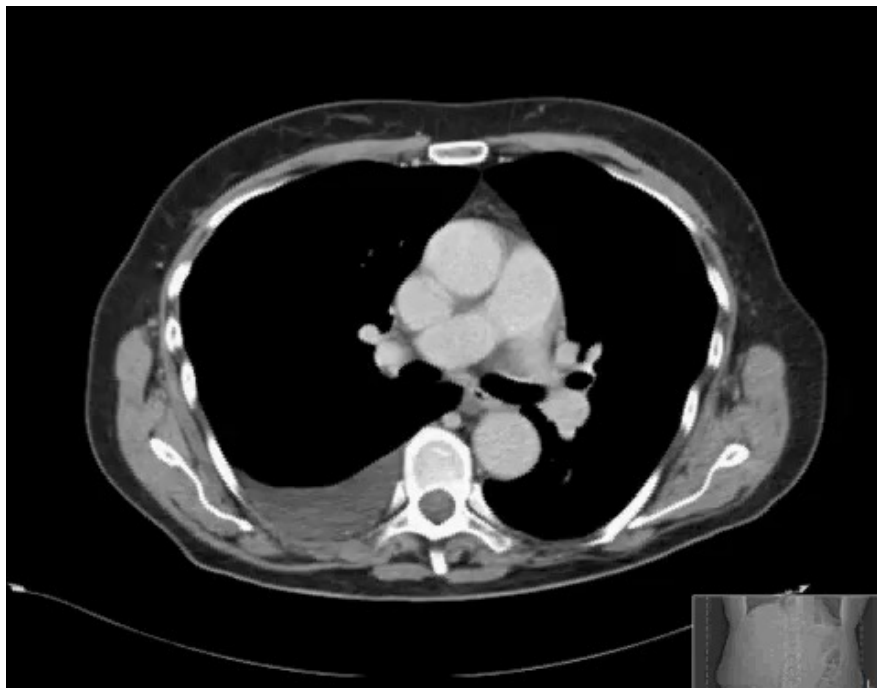


Case – Liver – F, 69 yo





Case – Liver – F, 69 yo



2 day FU

SH from liver

- 1st organ in males
- 2nd organ in females (1st is gynecological etiology)
- Sometimes after unnoticed trauma or in pregnancy
- 50% → intraperitoneal extension
- Pain more often in the RUQ



* Chen ZY, *World J Gastroenterol*, 2002



SH from liver

Malignant:

- HCC (85% in 70*, 25% in 67\$)
- Metastasis (more rare < 2%, very high mortality)

Benign:

- Adenoma (6%*, 40%\$ risk ↑ in OAC / steroids)
- Adenomatosis
- Hemangioma (84% = Giant, mortality with surgery 36%)
- FNH

Diffuse:

- Cirrhosis
- (necrotic) hepatitis / HELLP
- Amyloid



* Chen ZY, *World J Gastroenterol*, 2002

\$ Battula NB, *HPB*, 2012

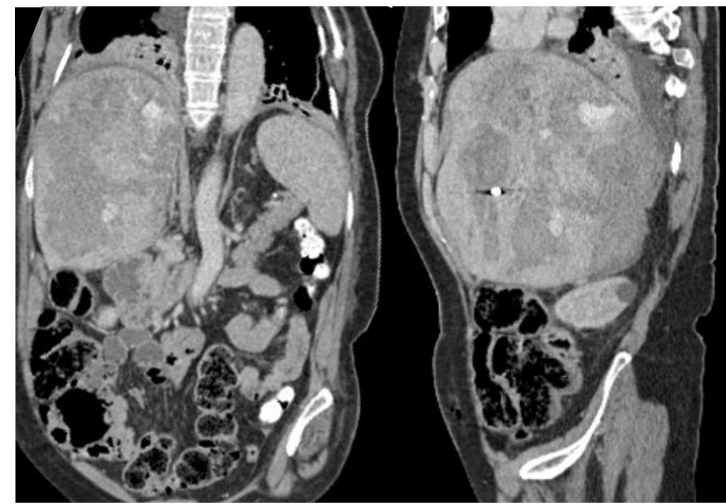


SH in HCC

- 1st suspect if lesion in Eastern world, 2nd in West (1st = Adenoma)
- Older literature SH: happens in 4-12% of HCC, improved screening ↓
- Mortality very high if rupture:
 - management = primary support
 - often poor candidate for open surgery → angio-embolization
 - no surgery if Δ liver function or if lesion was not resectable before hemorrhage

Liver rupture in Amyloid

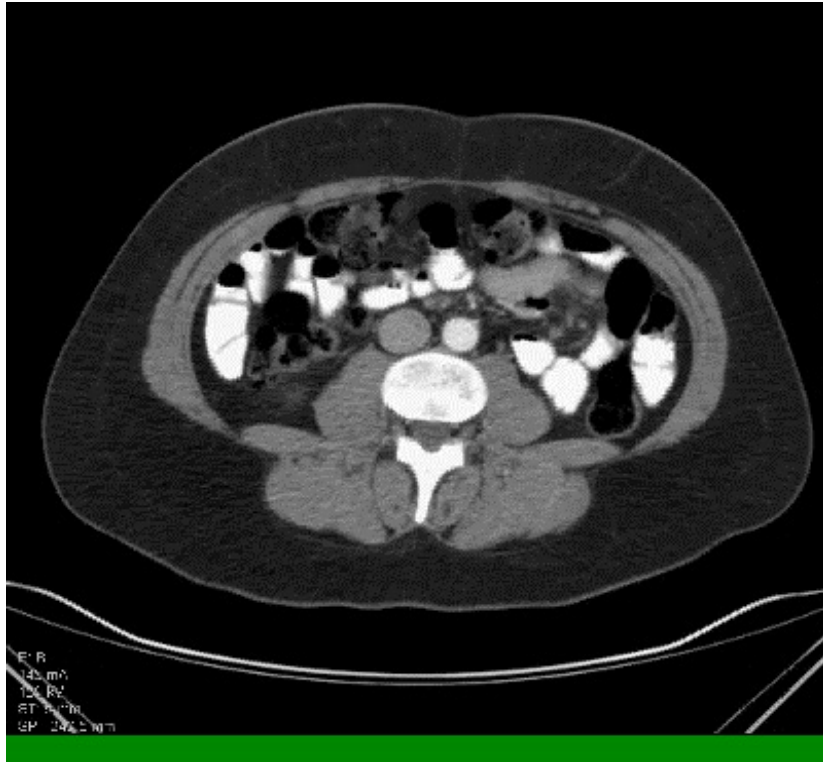
- Amyloid deposits in tissues / organs
- Most often heart and kidneys
- Liver involved in 9%
- Very rare, only a few cases in literature
- Often fatal (3 documented survivors, embolization or urgent transplant)
- Hepatomegaly / lab are poor correlates of liver involvement
- Liver biopsy = reference standard (4-8% incidence of hemorrhage)



Park MA, *Medicine*, 2003
Naito KS, *Amyloid*, 2008
Tam M, *Amyloid*, 2009



Companion Case – F, 39 yo

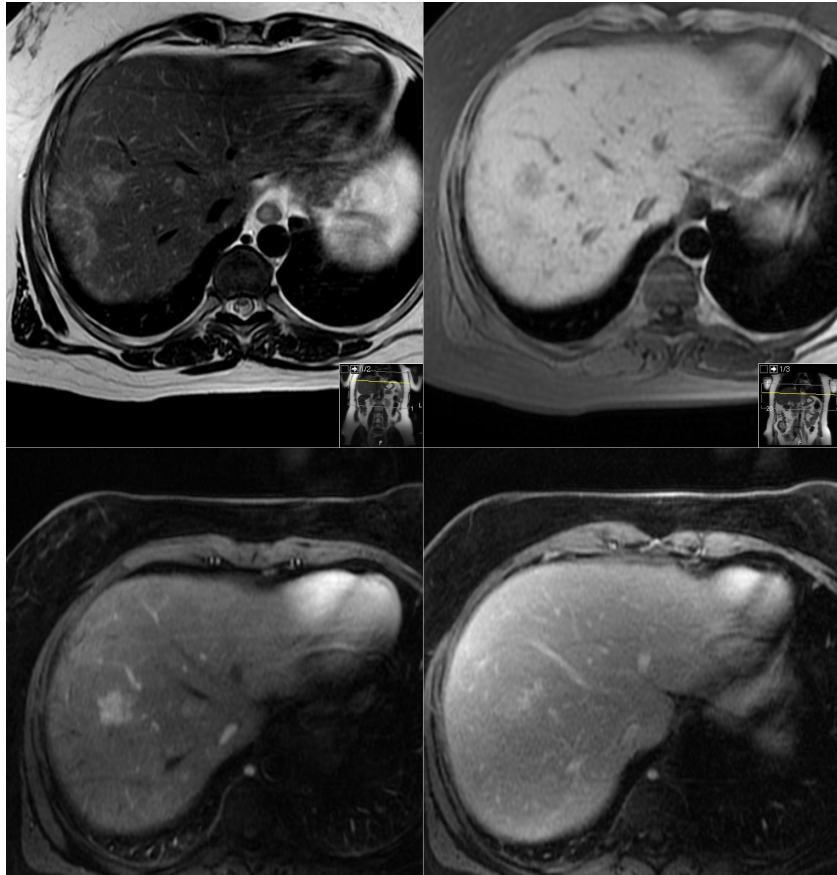


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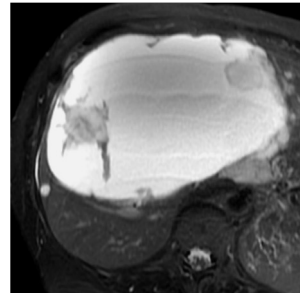
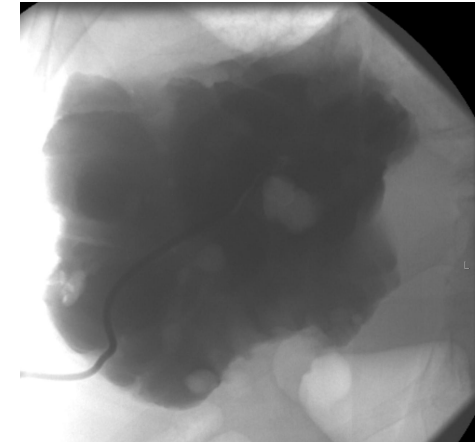
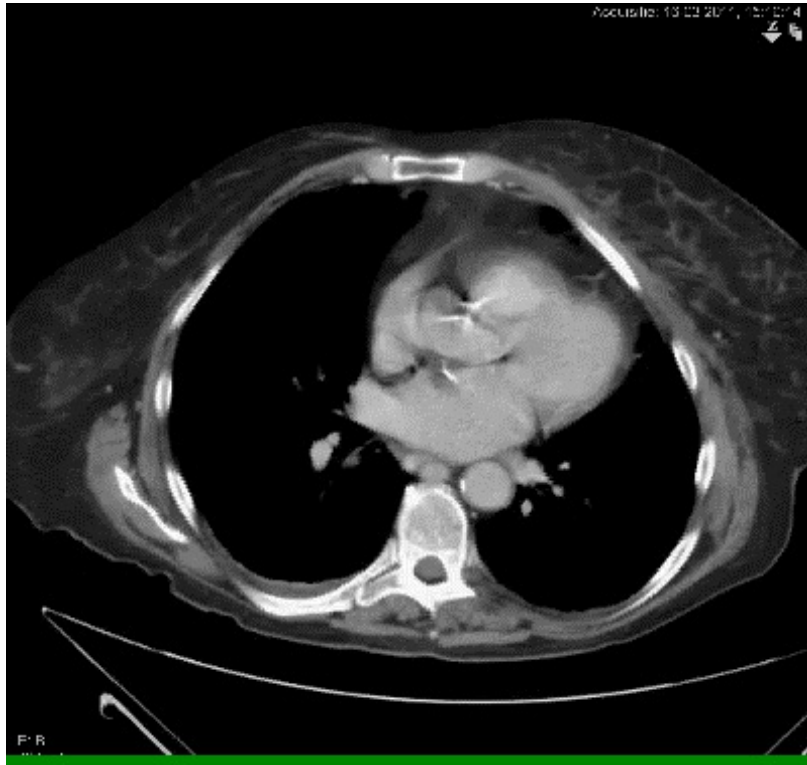
Companion Case – F, 39 yo



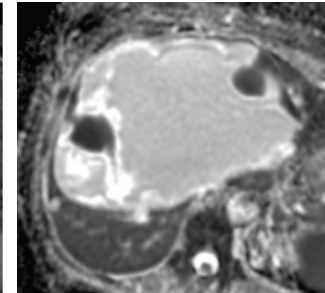
Adenoma with use of oral contraceptives



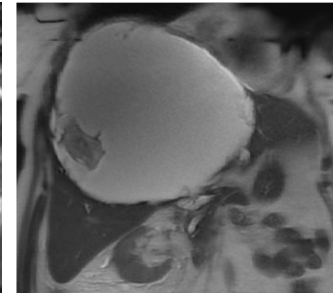
Companion Case – F, 72 yo



T2 frFSE fs



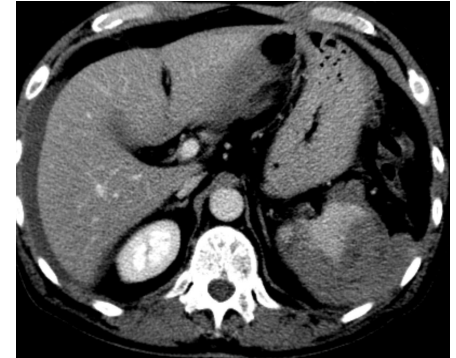
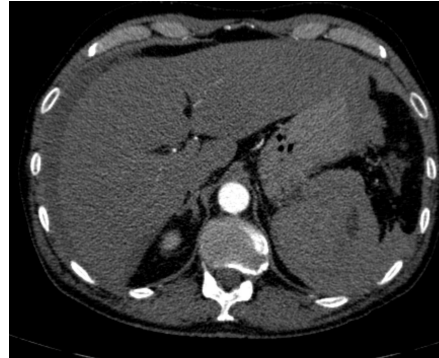
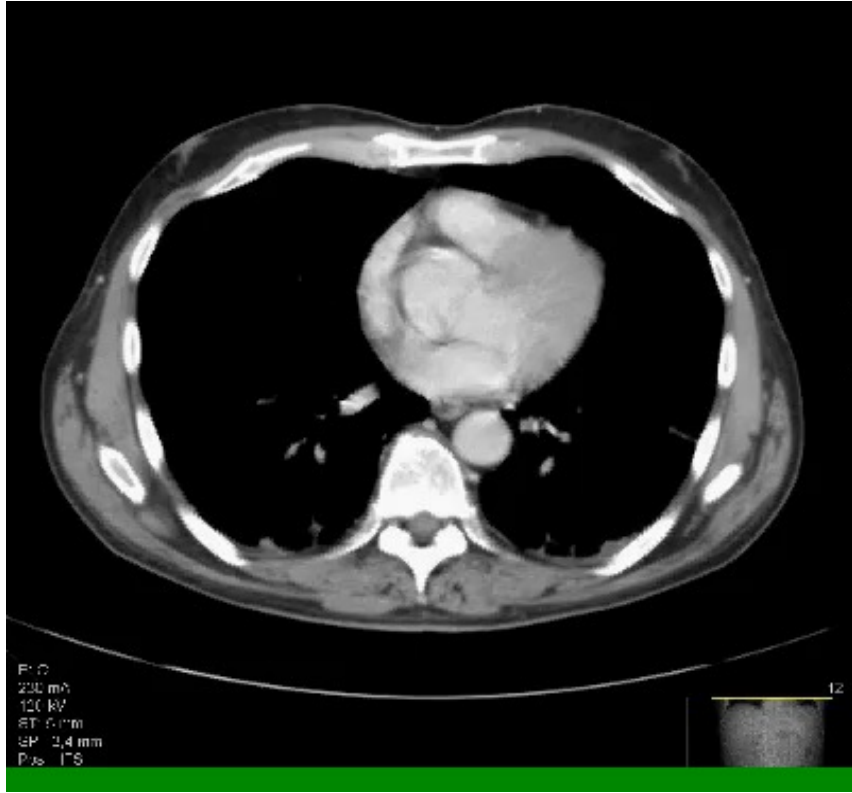
ADC



SSFSE BH



Case – Spleen – M, 58 yo



SH from Spleen

Table 1 The six major aetiological groups

	No. of factors (n = 926)*
Neoplastic disorders	
Malignant haematological disorders	152 (16.4)
Acute myelogenous leukaemia ¹⁻¹⁸	21
Acute lymphoblastic leukaemia ¹⁹⁻³⁰	12
Various leukaemias ³¹⁻⁵¹	24
Hodgkin's lymphoma ⁵²⁻⁵⁵	4
Non-Hodgkin's lymphoma ^{5,32,34,41,56-97}	55
Myeloproliferative disorders ^{5,33,98-111}	24
Myelodysplastic syndromes ^{34,98-111}	12
Non-malignant haematological disorders	19 (2.1)
Histiocytosis ^{33,120-127}	4
Idiopathic thrombocytopenic purpura ^{33,128-130}	4
Various ^{5,131-135}	6
Primary neoplastic disorders	75 (8.1)
Angiosarcoma ¹³⁶⁻¹³⁵	31
Peliosis ^{111,114,116,128,129,132,166-167}	18
Cystic lesions ³³	7
Haemangioma ^{33,171-175}	7
Various ^{33,177-185}	12
Secondary metastatic neoplastic disorders	35 (3.8)
Choriocarcinoma ¹⁶⁶⁻¹⁹²	7
Lung cancer ^{33,189,193-196}	6
Melanoma ^{5,197-199}	4
Various ^{5,79,200-213}	18
Infectious disorders	
Viral infectious disorders	137 (14.8)
Infectious mononucleosis ^{5,163,214-262}	102
Cytomegalovirus infection ²⁶³⁻²⁹⁴	13
Human immunodeficiency virus infection ^{75,104,185,295-298}	8
Dengue fever ^{246,299-304}	6
Various ^{5,305-310}	7
Bacterial infectious disorders	61 (6.6)
Endocarditis ^{5,208,311-318}	16
Q fever ²¹⁹⁻³²⁵	7
Tuberculosis ^{33,135,172,297,326-328}	7
Typhoid fever ²⁷⁹⁻³³¹	5
Various ^{5,243,332-335}	26
Protozoal infectious disorders	54 (5.8)
Malaria tertiana (<i>Plasmodium vivax</i>) ^{246,336-372}	23
Malaria tropica (<i>Plasmodium falciparum</i>) ^{296,336,373-389}	20
Various ^{190,390-400}	11
Fungal infectious disorders	1 (0.1)
Aspergillosis ¹	1
Inflammatory, non-infectious disorders	
Local inflammatory and neoplastic disorders	101 (10.9)
Chronic pancreatitis ^{33,95,104,401-425}	65
Acute pancreatitis ^{33,104,131,400,401,436-450}	20
Pancreatic cancer ^{104,432,451-454}	7
Various ^{5,33,455-457}	9
Amyloidotic disorders	35 (3.8)
Primary amyloidosis ⁵²⁸⁻⁴⁷⁵	22
Secondary amyloidosis ^{327,476,477}	4
Various ^{123,478-484}	9
Vascular disorders	20 (2.2)
Wegener's granulomatosis ⁴⁸⁵⁻⁴⁸⁹	5
Polyarteritis nodosa ⁴⁹⁰⁻⁴⁹²	3
Various ^{53,493-499}	12

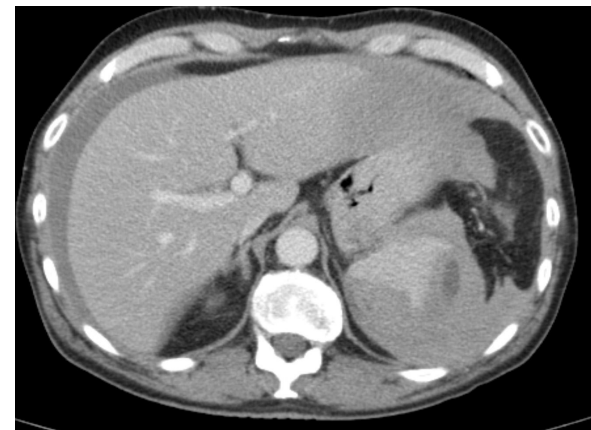
Table 1 (Continued)

	No. of factors (n = 926)*
Genetic disorders	16 (1.7)
Haematological disorders ^{5,104,106,208,243,500-506}	12
Storage diseases ^{194,127,226,243}	4
Autoimmune disorders	13 (1.4)
Rheumatoid arthritis ^{345,507,508}	5
Systemic lupus erythematosus ^{5,450,509,510}	4
Various ^{33,135,511}	4
Drug- and treatment-related disorders	
Drug-related splenic rupture	67 (7.2)
Granulocyte colony-stimulating factor ^{8,14,49-51,112,115,223,460-462,506,512-520}	22
Anticoagulation ^{5,33,202,315,316,521-536}	22
Thrombolytic therapy ^{173,249,537-542}	9
Various ^{16,17,110,165,177,461}	14
Dialysis-related splenic rupture	18 (1.9)
Haemodialysis ^{5,57,162,386,442,478,479,482,496,523,543,544}	13
Continuous ambulatory peritoneal dialysis ^{103,481,545-547}	5
Mechanical disorders	
Pregnancy-related splenic rupture	40 (4.3)
During pregnancy ^{14,38,126,329,548-558}	15
During labour and postpartum ^{18,30,169,170,559-563}	9
Postcaesarean section ^{104,198,560,564-567}	7
Intrasplenic pregnancy ⁵⁶⁸⁻⁵⁷⁶	9
Congestive splenomegaly	23 (2.5)
Liver cirrhosis (portal hypertension) ^{33,133,181,548,577-582}	16
Hepatic inflow occlusion (Prlingle manoeuvre) ⁵⁸³⁻⁵⁸⁷	7
Normal spleen	
Normal spleen	59 (6.4)
With no triggering factor ^{104,100,163,208,478,588-617}	41
With triggering factor ^{226,523,578,603,618-632}	18

Renzulli P, *Br J Surg*, 2009

SH from spleen

- Much rarer than liver
- Most often in the setting of splenomegaly:
 - Hematologic:
 - Leukemia
 - Lymphoma
 - Infectious:
 - CMV, EBV
 - Malaria
- Deposition disease / inflammation:
 - Gaucher disease
 - Amyloid



Furlan A, *AJR*, 2009
Lukey BC, *Emerg Radiol*, 2007
Renzulli P, *Br J Surg*, 2009

SH from spleen

IF there is a focal splenic lesion:

- infarct
- hamartoma
- focal lymphoma or leukemic infiltrate
- metastasis
- hemangiopericytoma



Furlan A, *AJR*, 2009

Lucy BC, *Emerg Radiol*, 2007

Renzulli P, *Br J Surg*, 2009



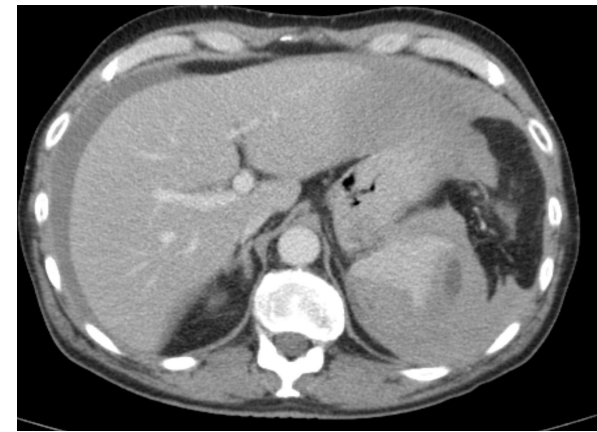
Non-traumatic splenic rupture

Epidemiology (845 pts in 28.5 yr):

M : V = 2 : 1

age = 45 yr (18 – 86)

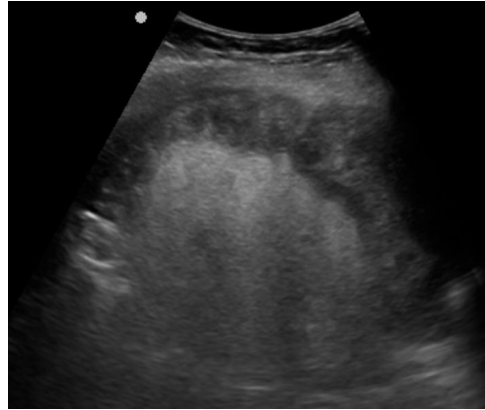
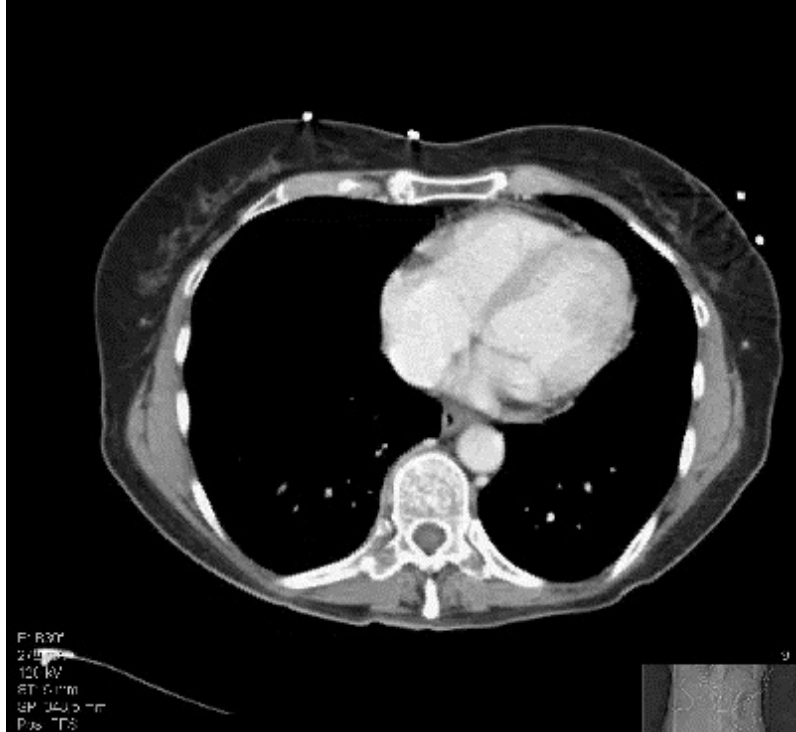
- known splenic path: 22%
- splenomegaly: 55% (30% no info)
- mortality: 12%
 - neoplastic 21%
 - infectious 9%
- Risk mortality: Splenomegaly & age > 40 yr



Renzulli P, *Br J Surg*, 2009



Case – Kidney – F, 57 yo



SH from kidney

65% related to tumor (often visible on CT):

- AML (35 – 40%)
- RCC (30 – 35%)

On occasion related to:

- coagulopathy
- vasculitis (PAN / Wegener's granulomatosis)
- vascular lesions (aneurysm / AVM / AVF / venous thrombosis)
- infection / infarct
- cyst



Furlan A, AJR, 2009

Katabathina VS, JCAT, 2011

Halpenny D, Clin Radiol, 2010



In angiomyolipoma

up to 25% will bleed, higher risk if:

- tumour > 4 cm
- intra-lesional aneurysm > 5 mm
- vascularity on angiography:

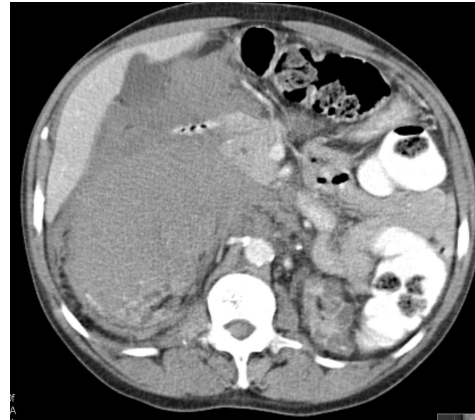
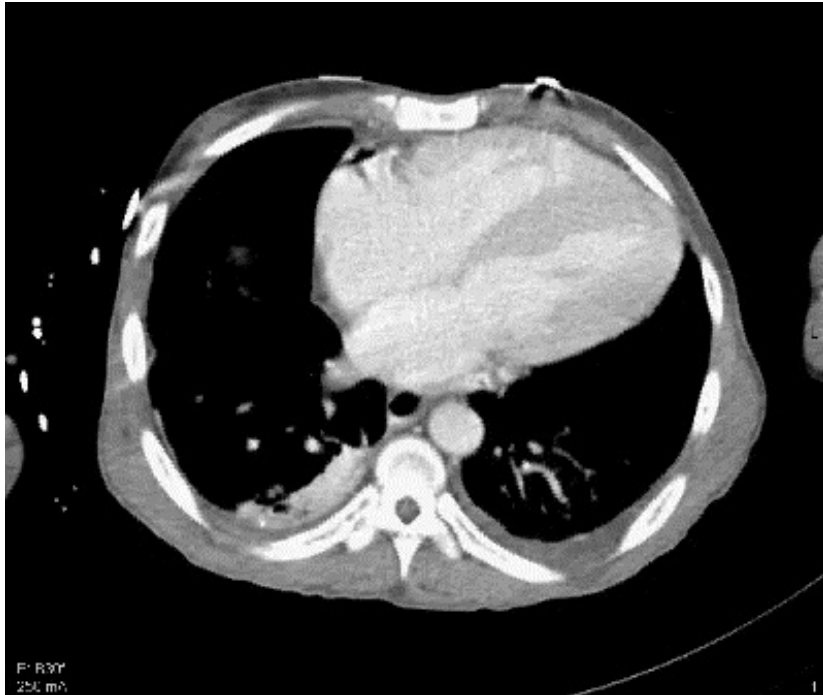
- minimal 15% risk
- moderate
- significant 50% risk



Furlan A, AJR, 2009
Katabathina VS, JCAT, 2011
Halpenny D, Clin Radiol, 2010



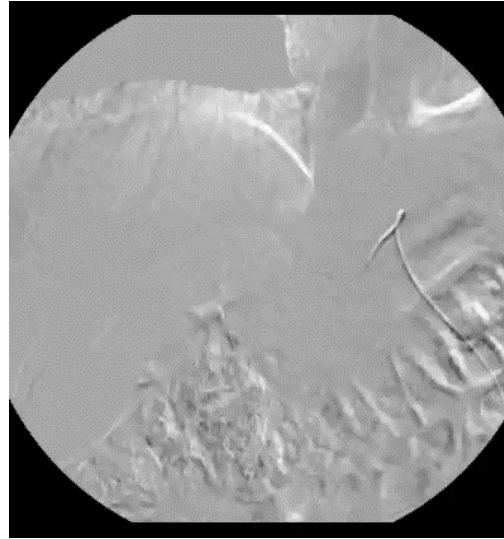
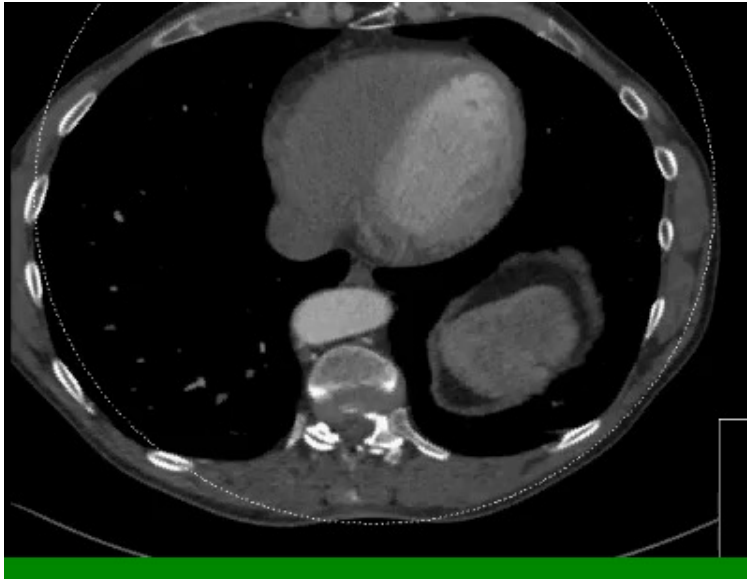
Companion Case – M, 48 yo



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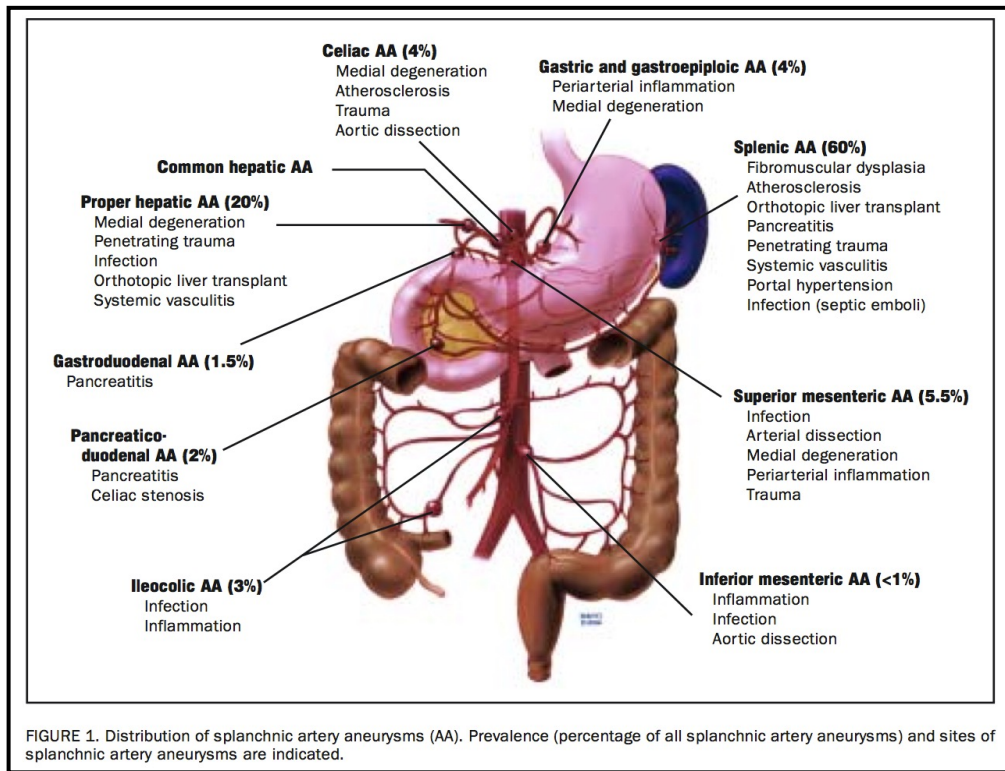
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Case – Splanchnic aneurysm – M, 57 yo



Splanchnic aneurysms

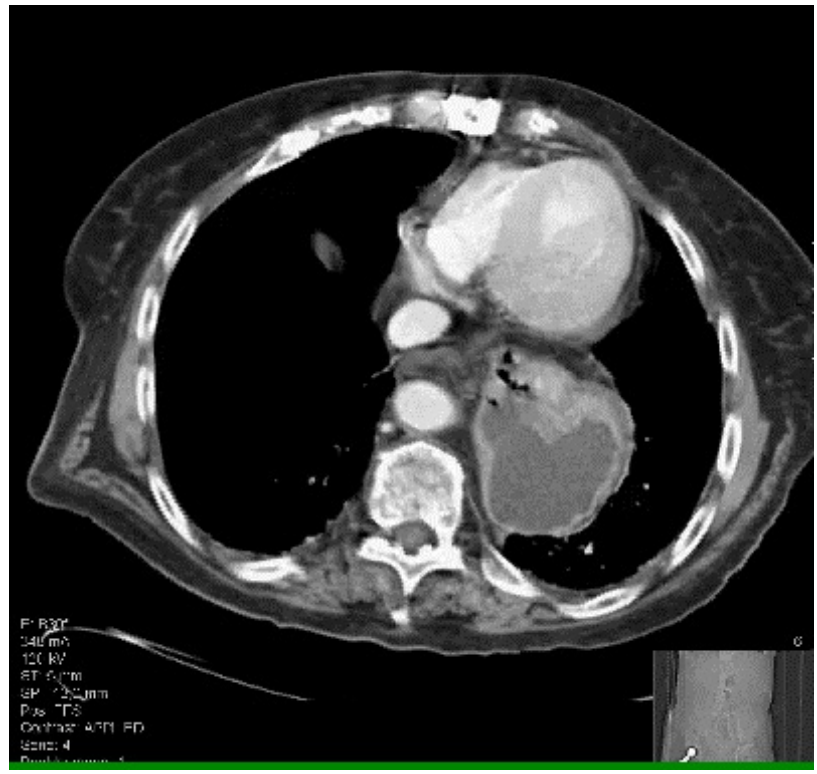
- Incidence 0.1 – 10%
- multiple in 20%
- mortality rupture 25 - 70%
- treat if:
 - > 2 cm
 - pregnancy (?)
 - fast growth



Pasha SF, *Mayo Clin Proc*, 2007
 Sachdev-Ost U, *Mt Sin J Med*, 2010
 Cochenec F, *Eur J Vasc Endovasc Surg*, 2011



Case – Gallbladder – F, 86 yo



Gallbladder rupture

20 - 30 cases in literature

2 - 11% cholecystitis → perforatie (≠ bleed):
mortality without bleed up to 42%

Hemorrhagic cholecystitis rare, extrav usually to lumen, clinically can resemble GI-bleeding due to hemobilia + melaena

Hemoperitoneum related to:

- bleeding gallbladder
- transhepatic rupture



Date RS, *Int J Surg*, 2012

Tavernaraki K, *Abdom Imag*, 2011

Nural MS, *Emerg Radiol*, 2007

Gallbladder rupture

Risk for gallbladder perforation (\neq bleed):

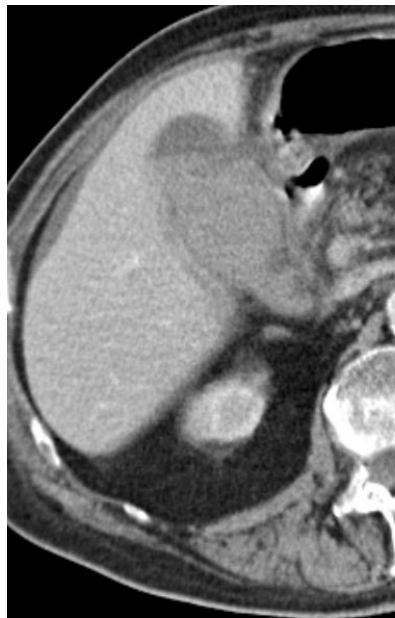
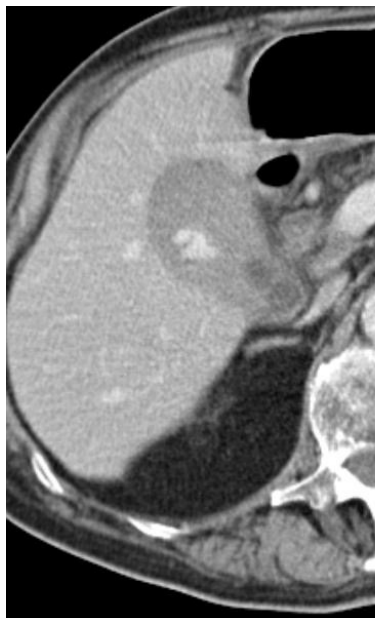
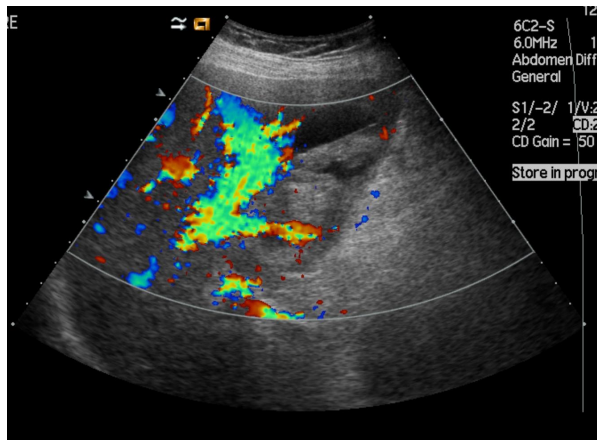
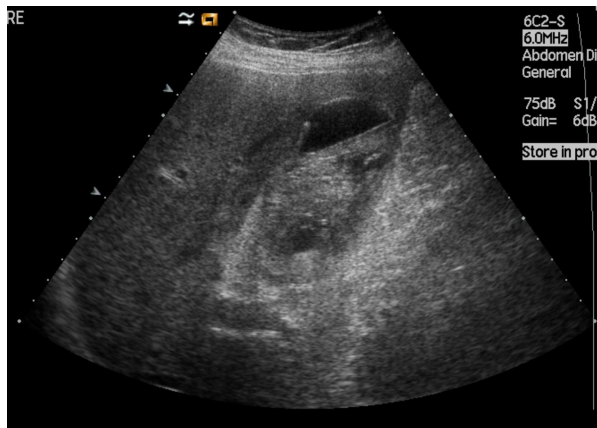
- > 60 jr
- man
- prior cholecystitis
- systemic comorbidity (CAD, DM, renal, obesity, malignancy)
- arteriosclerosis
- immunosuppression
- lonterm use of steroids



Date RS, *Int J Surg*, 2012
Tavernaraki K, *Abdom Imag*, 2011
Nural MS, *Emerg Radiol*, 2007



Companion Case – M, 87 yo

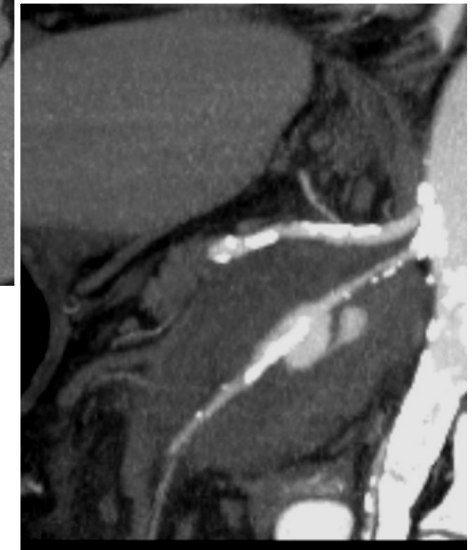
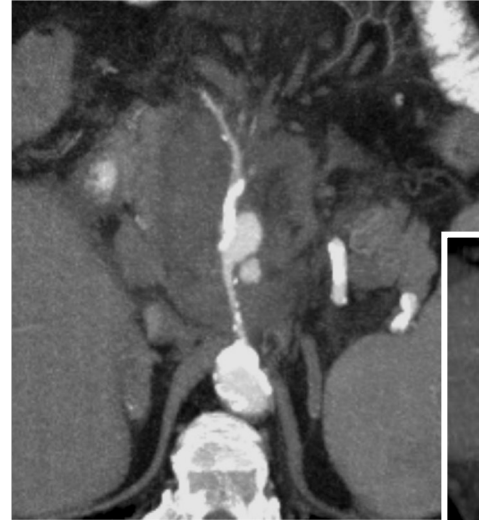


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Case – PsA – F, 86 yo





Case – PsA – F, 86 yo





PsA in pancreatitis

local “arteritis” by aggressive enzymes

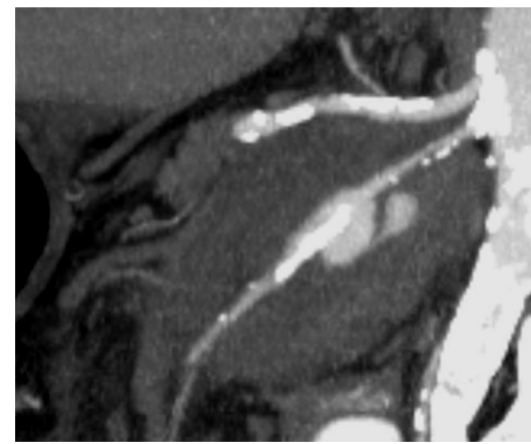
bleeding PsA up to 10% in severe pancreatitis:

- 5% in chronic
- 12% in necrotic

high mortality:

- 90% if no Tx
- 12 – 50% if Tx

splenic > gastroduod > pancr-duod > AMS > hepatic > gastric



Bergert H, Surgery, 2005
Klauss M, J Radiol Case Rep, 2012

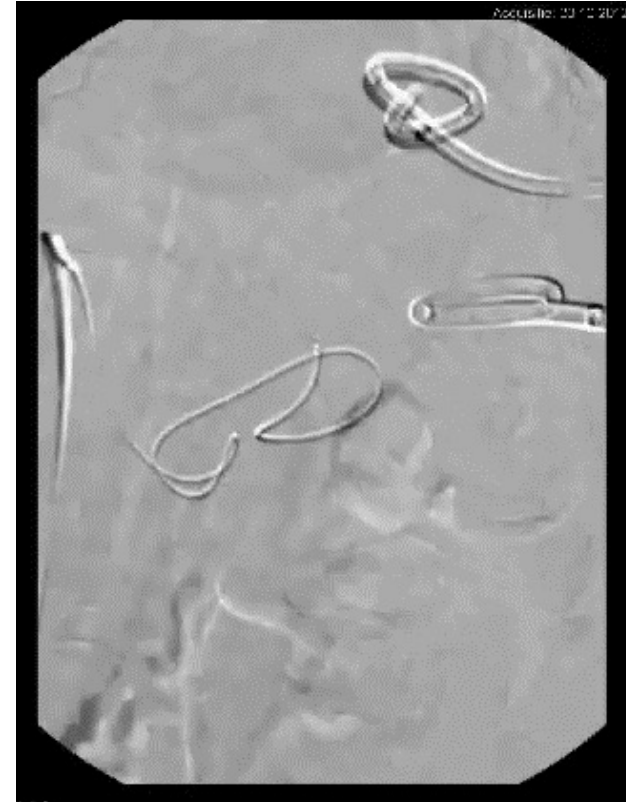


Companion Case – F, 34 yo





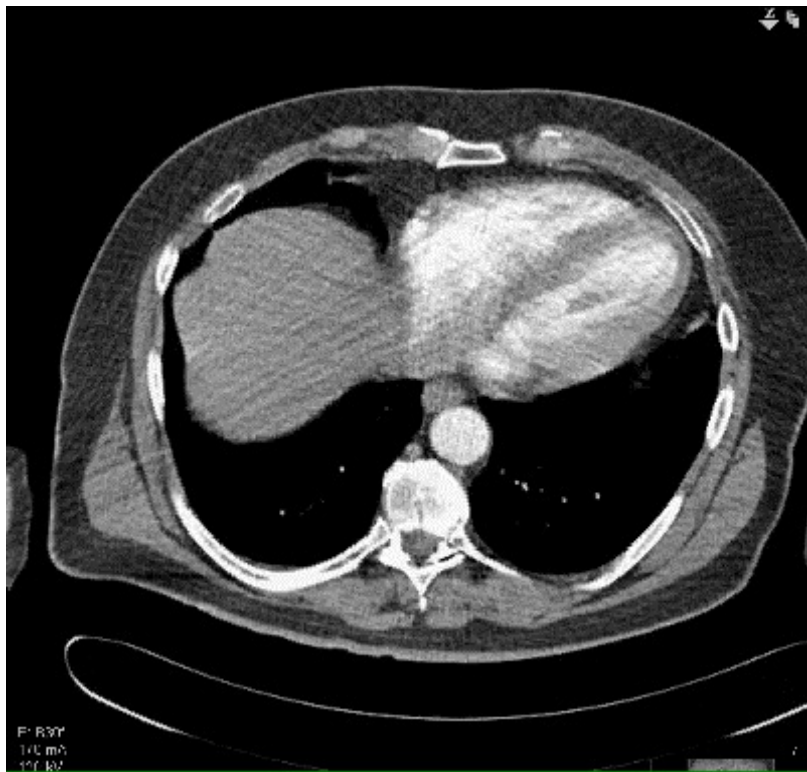
Hemorrhage PsA splenic abscess



Acetabular 2011 2011



Case – Adrenal – M, 60 yo



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SH in adrenal

M : V = 2 : 1

Age = 40 - 80 yr

Unilateraal:

tumor: metasasis

primary: pheochromocytoma
adrenocortical ca
myelolipoma, adenoma

Bilateraal:

abnormal clotting, stress or sepsis





Summary

Spontaneous hemoperitoneum is:

- very rare
- life-threatening – very high mortality
- often best treatment with angio-embolization

Look for:

- active extravasation
- sentinel clot
- possible underlying lesion

