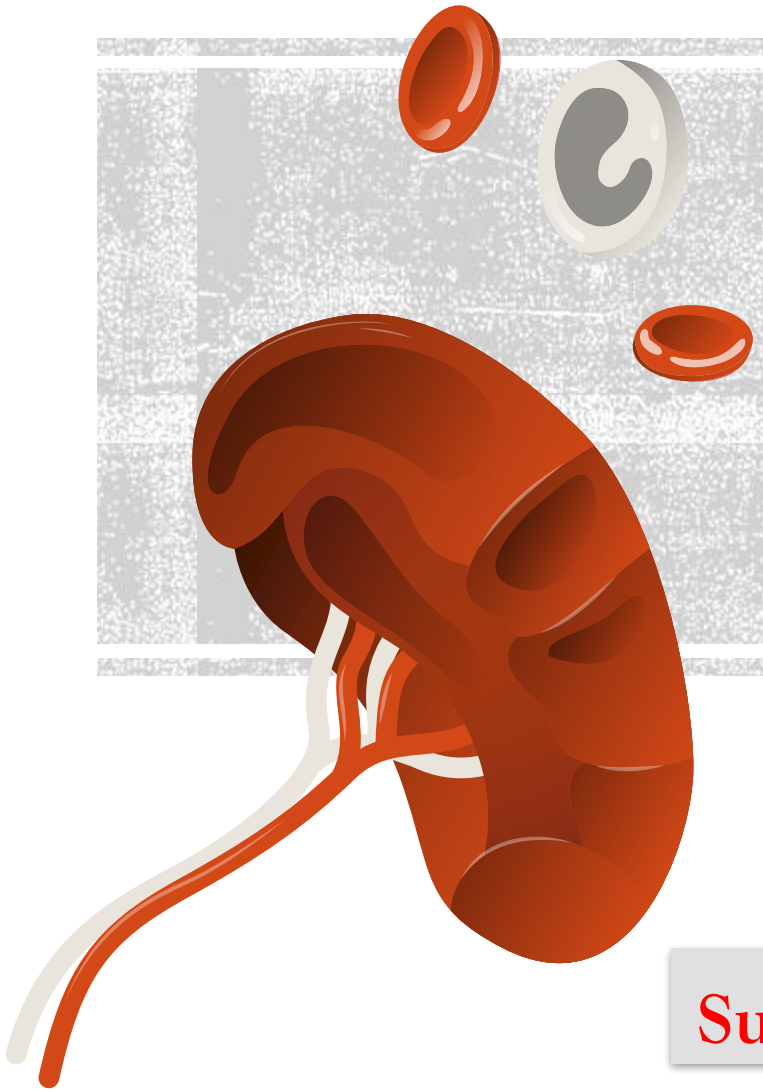
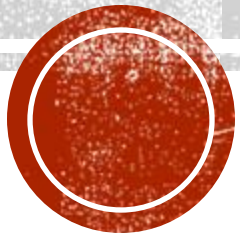


Splenic Injury

Done by:
Lama Abdalaal
Ahmed Irshaid
Asma'a Ahmad



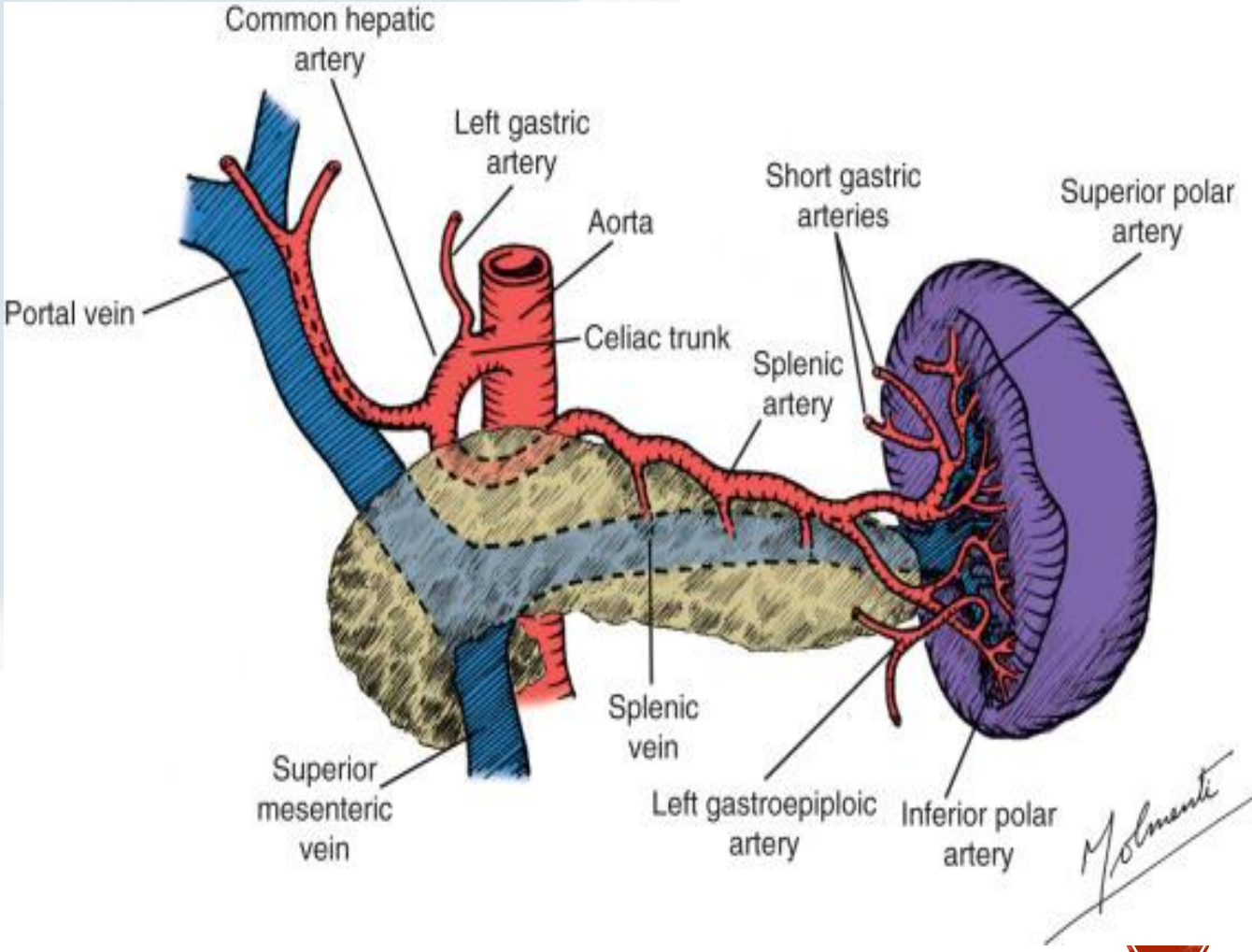
Supervised by Dr. Tariq Aladwan

spleen

- Largest lymphoid tissue. - foregut , intraperitoneal organ -Wt 75-250 gm (1500 if hypersplenism).
- Lies in the left lower thorax and it's normally protected by ribs 9, 10 and 11 between gastric fundus &L hemidiaphragm.> becomes palpable when 3* enlarged.
- Two surfaces, the diaphragmatic surface (which is roofed by the diaphragm separating it from the pleura) and visceral surface.
- Visceral surface is in close proximity to the greater curvature of stomach, splenic flexure of the colon, apex of left kidney, tail of the pancreas.

Vascular anatomy

- **Arterial:** Splenic artery from celiac trunk, moves in the lesser sac along upper border of tail of pancreas.
- **Vein:** Splenic vein at hilum behind pancreas. joins superior mesenteric vein to form portal vein
- **Lymphatics:** White pulp → Trabecular lymphatics → Splenic hilum → Pancreaticosplenic nodes → Retropancreatic nodes → Celiac nodes → Cisterna chyli → Thoracic duct



SPLENIC FUNCTION

- **Hematopoietic**: During 3 to 5 weeks of fetal life, the hematopoietic functions, which includes WBC and RBC production.
- **Reservoir:** one third of the platelets are pooled within the spleen.
- **Immunologic Function**: Contribute to humoral and cell-mediated immunity

- Filtration:

✓ In the closed system, blood flows directly from arteries to veins.

✓ In the open system, the blood flows through the arterioles and then trickles into the splenic sinuses before draining into the venous system

Splenic rupture

Clinical features

History of Trauma.

Pain upper left in abdomen.

Occasional distension and vomiting.

In severe bleeding associated with shock, syncope or dizziness.

Kehr's sign: Pain over left shoulder joint

Fixed dullness to percussion on the left, and shifting dullness right **(Ballance's sign)**.

Tenderness all over the abdomen with or without guarding and rigidity.

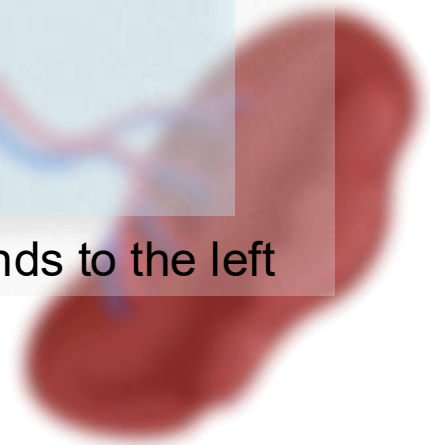
Bowel sounds are absent.

- Classically associated with left lower ribs fracture.
- Delayed rupture is a characteristic feature in Subcapsular hematoma
- A ruptured spleen can cause life-threatening bleeding into the abdominal cavity.

Etiology

Traumatic Injuries

- Major trauma
- Blunt abdominal trauma
- Motor vehicle collisions (most frequent)
- Contact sports
- Falls from height
- Left-sided blunt thoracic trauma with lower rib fractures
- Penetrating abdominal trauma (e.g., stab wounds, gunshot wounds to the left upper quadrant)
- Blast injuries
- Iatrogenic trauma (postsurgery or postendoscopy)



Atraumatic Injuries

Atraumatic splenic rupture is rare but can occur spontaneously if there is an underlying pathology, e.g :.

- Splenomegaly
- Other structural splenic abnormalities, e.g., cysts, hemangiomas
- Inflammatory tissue damage (e.g., adjacent pancreatitis)
- Coagulopathy

• In the stable patient, splenorrhaphy can be employed in an attempt to preserve immune function.

Splenorrhaphy: parenchyma saving operations of spleen.

- Prophylaxis. Presplenectomy immunization (2 weeks before splenectomy) is optimal but most often impossible for traumatic splenectomy.

• In unstable patients or in patients for whom splenic salvage fails, splenectomy done.

• Emergent splenectomy require postoperative immunization against Streptococcus pneumoniae, Haemophilus influenzae, and Neisseria meningitidis.

• It is recommended that vaccines be given 14 days following trauma splenectomy.

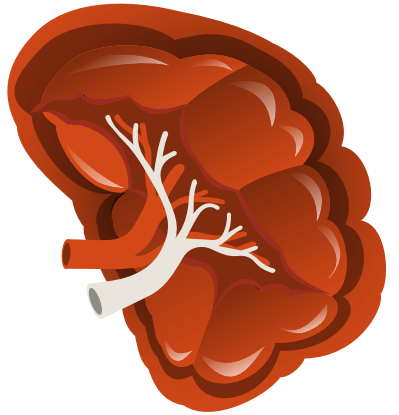
Investigation of the Spleen.

FBC, Reticulocytes tests for hemolysis.
LFT & OGD in splenomegaly + portal hypertension in liver cirrhosis.
Investigations for causes of splenomegaly including LN biopsy.

Radiology:

1. X ray (Calcification): splenic infarct, splenic aneurysm, hydatid cyst,TB.
2. US,CT with contrast, MRI.
3. Tc99:is spleen site of RBC destruction?.

Diagnosis & Evaluation



For stable patient :

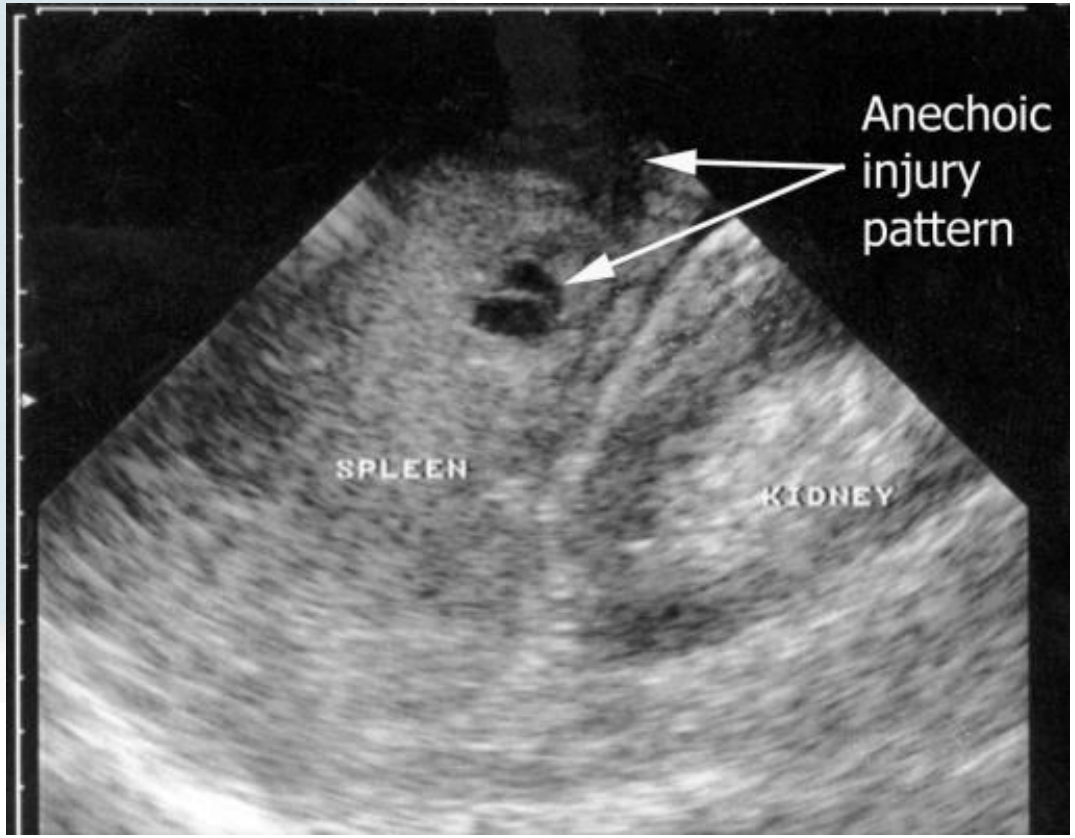
1. **UltraSound**
2. **CT**
3. **Angiography**
4. **Plain radiography/chest and abdomen.**

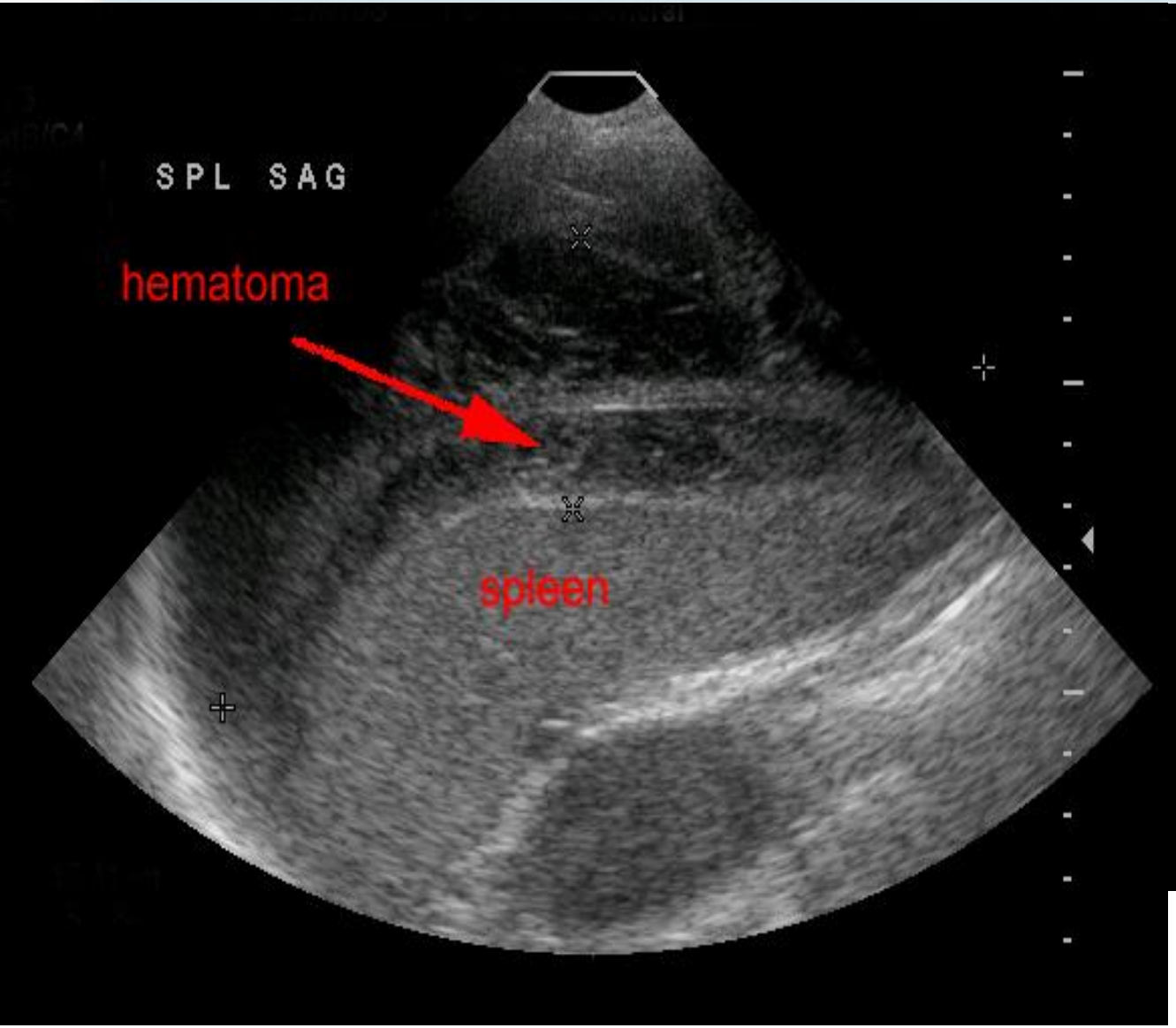
Unstable patient :

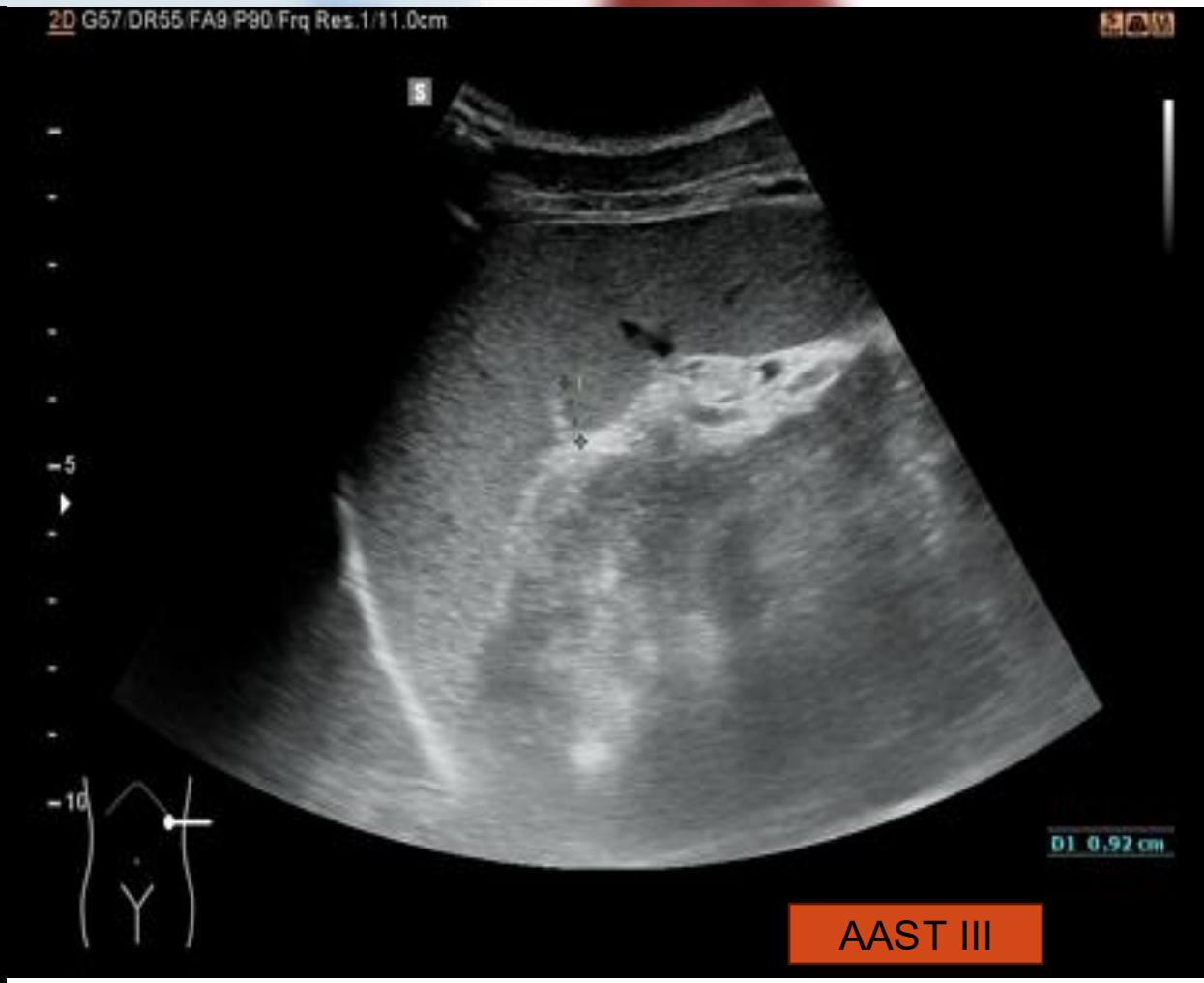
Open and See !
Peritoneal lavage
FAST

Focused Assessment with Sonography for Trauma (FAST)

- Identify free intraperitoneal fluid
- Considered positive if the fluid is identified as an anechoic band or a (black) rim around the spleen.
- Hemodynamic instability in the presence of free fluid requires immediate laparotomy.



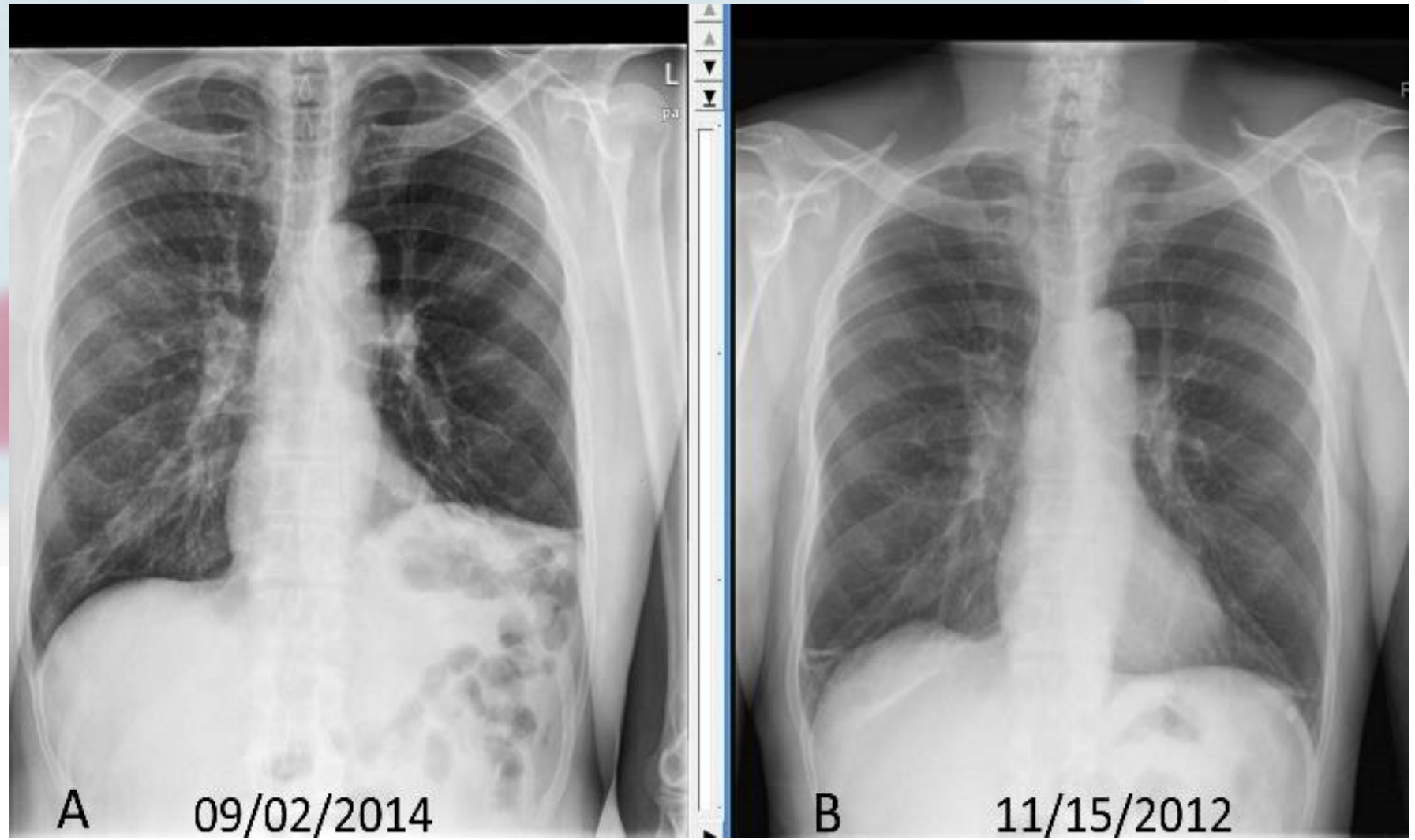

SPL SAG
hematoma
spleen


2D G57/DR55/FA9/P90/Frq Res.1/11.0cm
S
-5
-10
D1 0.92 cm
AAST III

- **The radiography signs of rupture are:-**

1. Obliteration of the splenic outline.
2. Obliteration of the psoas shadow.
3. Indentation of the left side of the gastric air bubble.
4. Fracture of one or more lower ribs on the left side (present 27 % of cases).
5. Elevation of the left side of the diaphragm.
6. Free fluid between gas filled intestinal coils.

Elevation of lt hemidiaphragm

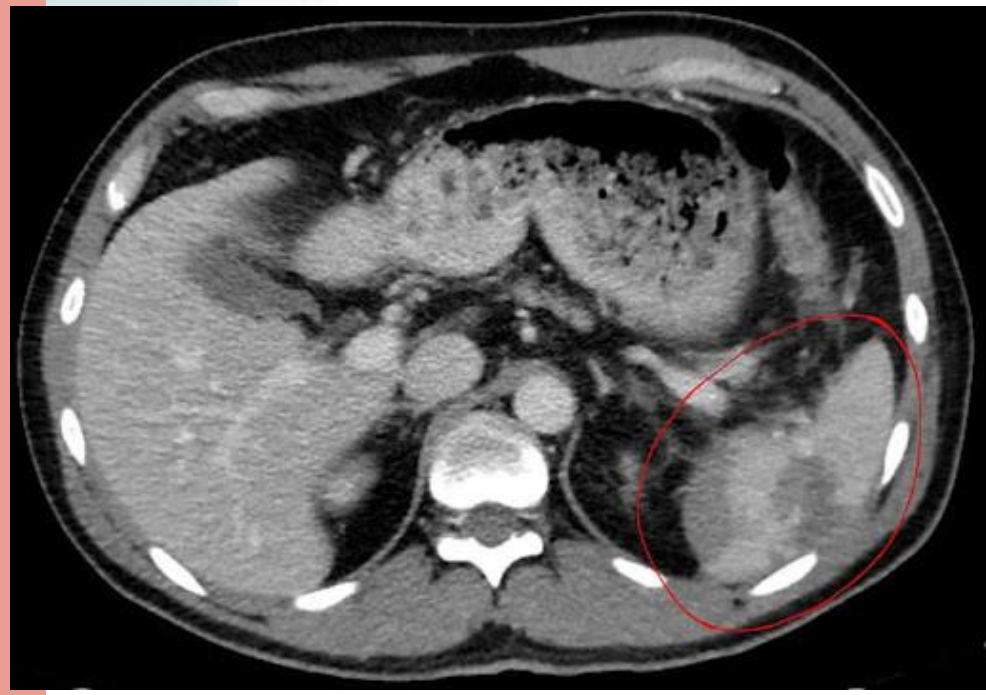


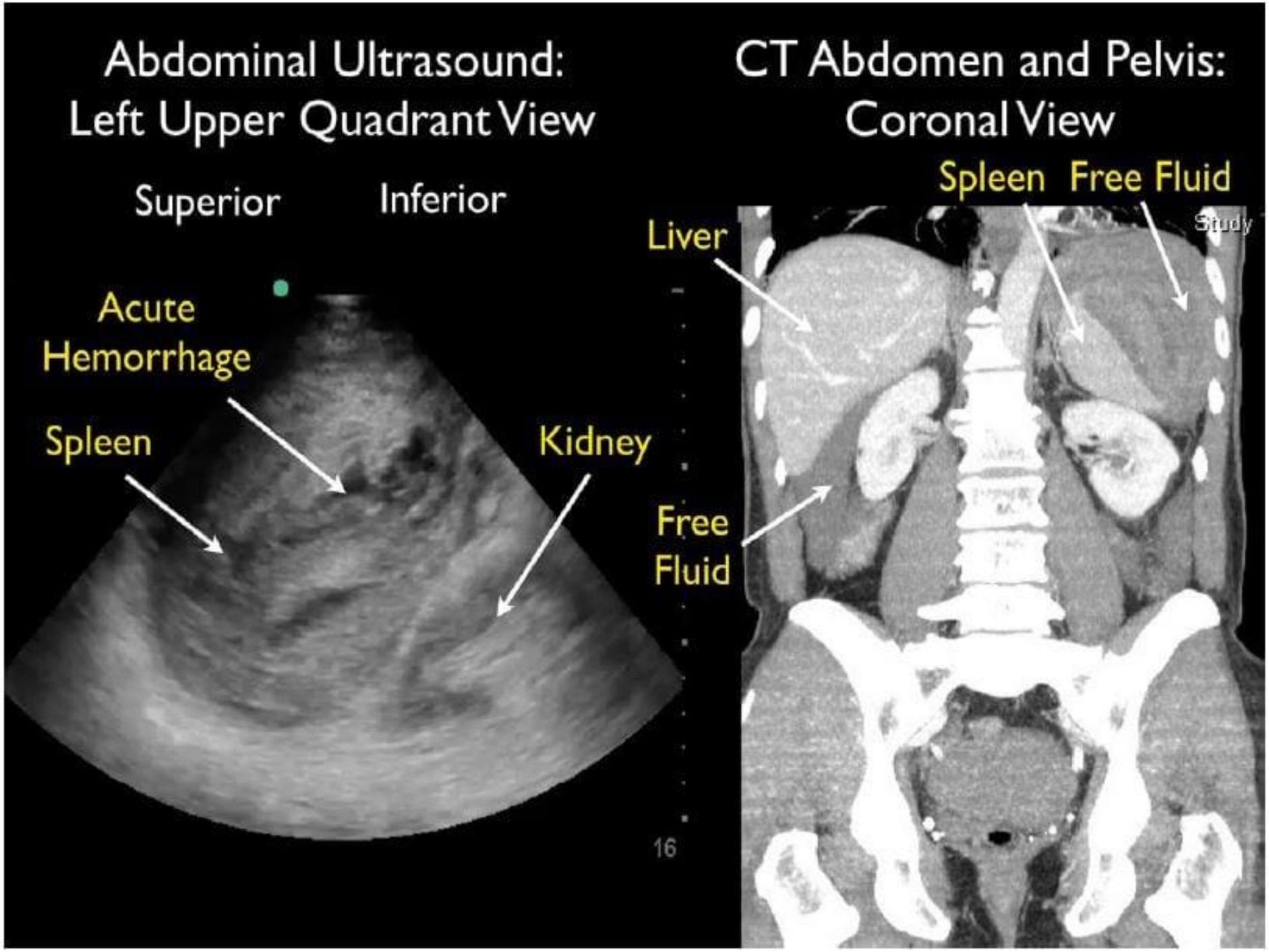
CT

Diagnostic modality of choice for detecting solid organ injuries.

- CT with IV contrast (sensitivity/specificity 96%-100%)

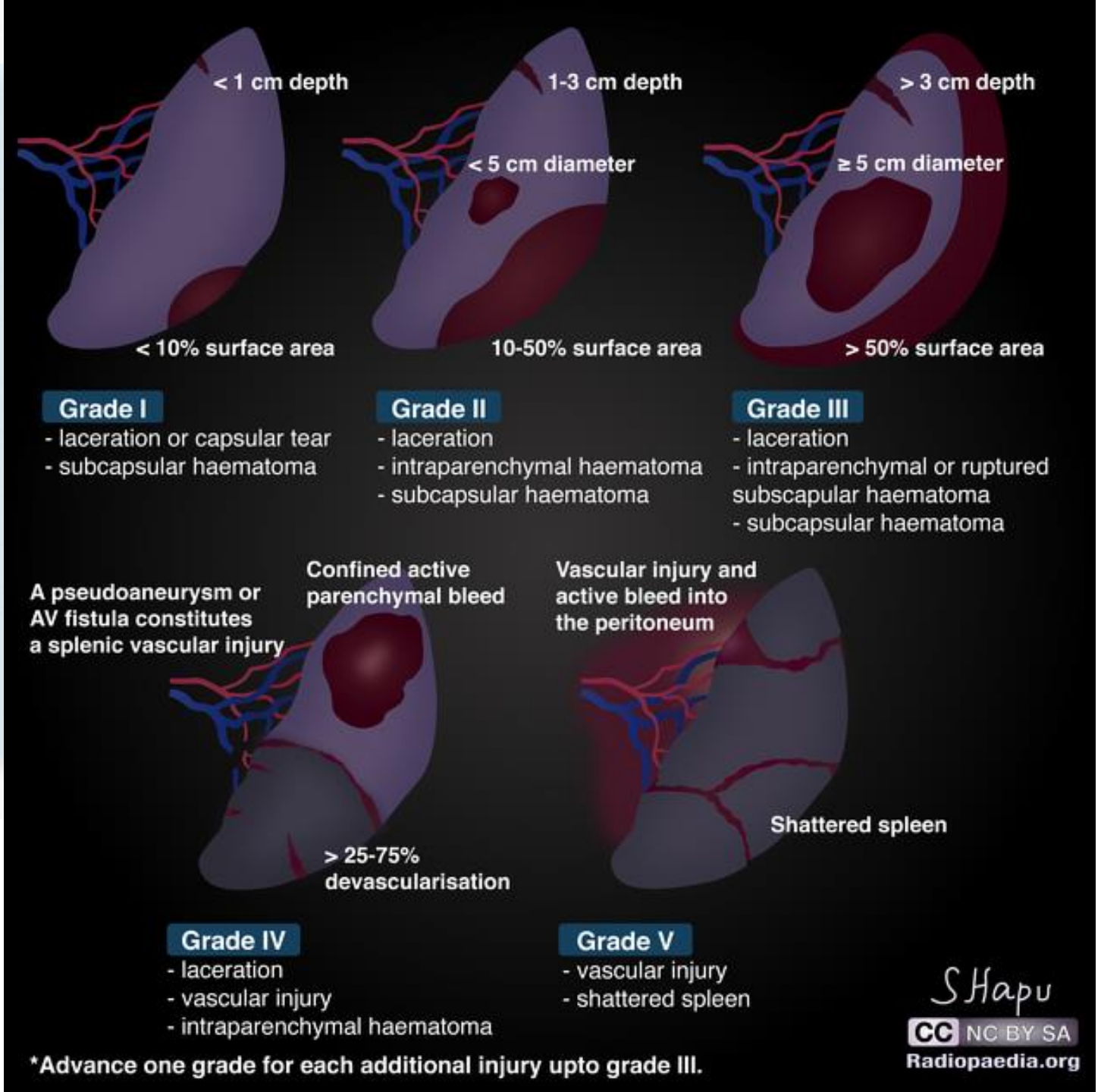
- Shows:
- Disruption in the normal splenic parenchyma free intra-abdominal blood.
- Lacerations : irregular hypodense area with no enhancement .
- Sub-capsular hematoma: regular shape, cresentric.
- Intraparenchymal hematoma.
- Fragmentation with autosplenictomy .
- A splenic injury with active extravasation into a pseudoaneurysm.




Abdominal Ultrasound:
Left Upper Quadrant View
Superior
Inferior
Acute
Hemorrhage
Spleen
Kidney
16
CT Abdomen and Pelvis:
Coronal View
Spleen
Free Fluid
Liver
Free
Fluid
Study

American Association for the Surgery of Trauma (AAST) splenic injury scale

AAST Grade and Type of Injury	Description
I	
Hematoma	Subcapsular, <10% of surface area
Laceration	Capsular tear, <1 cm of parenchymal depth
II	
Hematoma	Subcapsular, 10%–50% of surface area; intraparenchymal, <5 cm in diameter
Laceration	1–3 cm in parenchymal depth
III	
Hematoma	Subcapsular, >50% of surface area; ruptured subcapsular or parenchymal hematoma; intraparenchymal hematoma, >5 cm in diameter
Laceration	>3 cm parenchymal depth or involving trabecular vessels
IV	
Laceration	Laceration involves segmental or hilar vessels producing major devascularization (>25% of spleen)
V	
Laceration	Completely shattered spleen
Vascular	Hilar vascular injury that devascularized spleen


< 1 cm depth
1-3 cm depth
> 3 cm depth
< 5 cm diameter
≥ 5 cm diameter
< 10% surface area
10-50% surface area
> 50% surface area
Grade I
- laceration or capsular tear
- subcapsular haematoma
Grade II
- laceration
- intraparenchymal haematoma
- subcapsular haematoma
Grade III
- laceration
- intraparenchymal or ruptured subscapular haematoma
- subcapsular haematoma
A pseudoaneurysm or AV fistula constitutes a splenic vascular injury
Confined active parenchymal bleed
Vascular injury and active bleed into the peritoneum
> 25-75% devascularisation
Shattered spleen
Grade IV
- laceration
- vascular injury
- intraparenchymal haematoma
Grade V
- vascular injury
- shattered spleen
*Advance one grade for each additional injury upto grade III.
SHapu
CC NC BY SA
Radiopaedia.org

Stage 2 and above > admit to ICU > check vitals and Hb every 6-8 hrs then if become unstable > laparotomy If stable after 48 hr move to ward > avoid sport

conservative

1- Admit to ICU
2- Repeated ultrasound
3- For those with stage 1 or 2 .

Conservative splenorraphy

suturing of spleen to prevent further bleeding

Splenic artery embolization

- less mortality and morbidity than splenectomy
- mortality is related to % of splenic tissue Embolized .
- - Complications

1) Pancreatitis
2) Splenic Abscess
3) Pleural Effusion (most common)

Splenectomy

FACTORS CONTRIBUTING TO CHOICE OF OPERATIVE MANAGEMENT

Indication of operative splenic salvage	**Indications for splenectomy**
Blood loss <500 mL	Blood loss >1000 mL
Minimal associated injuries	Significant associated injuries
No hilar involvement	Hilar involvement
Minimal or moderate degree of splenic injury	Massive splenic disruption
No coagulopathy	coagulopathy

Splenectomy Techniques

Patient Preparation

1. Check CBC, coagulation, liver and renal function.

2. Correct anemia or coagulopathy before surgery.

3. Vaccinate at least 2 weeks pre-op:

Pneumococcal

Haemophilus influenzae type b

Meningococcal (± Men B)

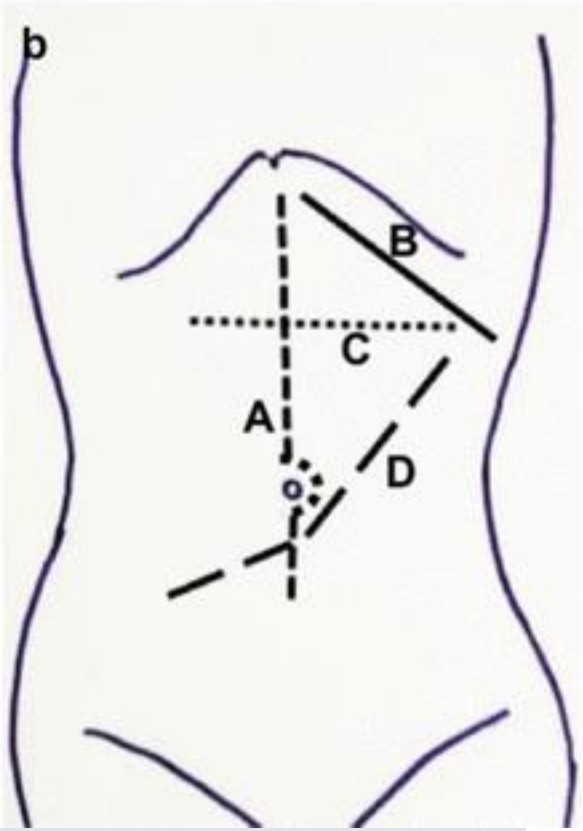
4. Cross-match 2–4 units of blood and prepare for possible transfusion.
5. Give prophylactic antibiotics at induction.

Open splenectomy

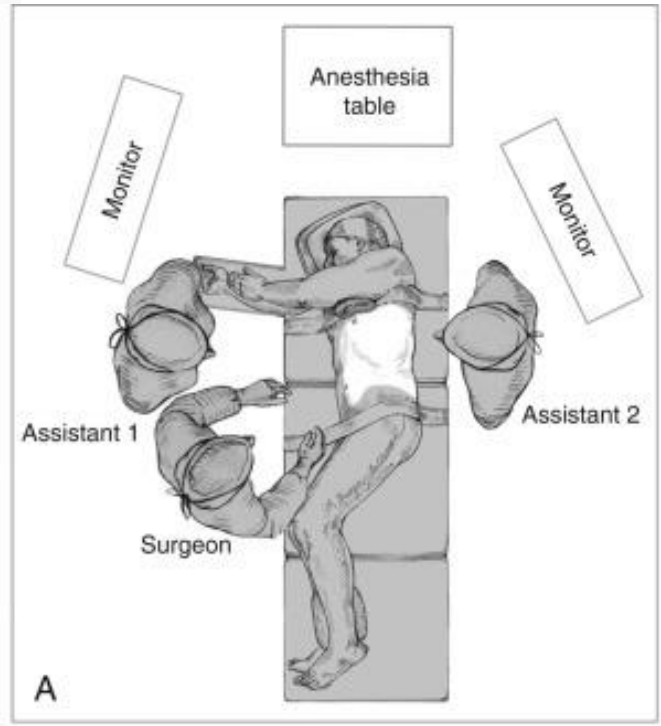
- Traumatic rupture is common indication for OS. Others including:
  - ✓ massive splenomegaly,
  - ✓ ascites, portal hypertension,
  - ✓ multiple prior operations,
  - ✓ extensive splenic irradiation,
  - ✓ possible splenic abscess.

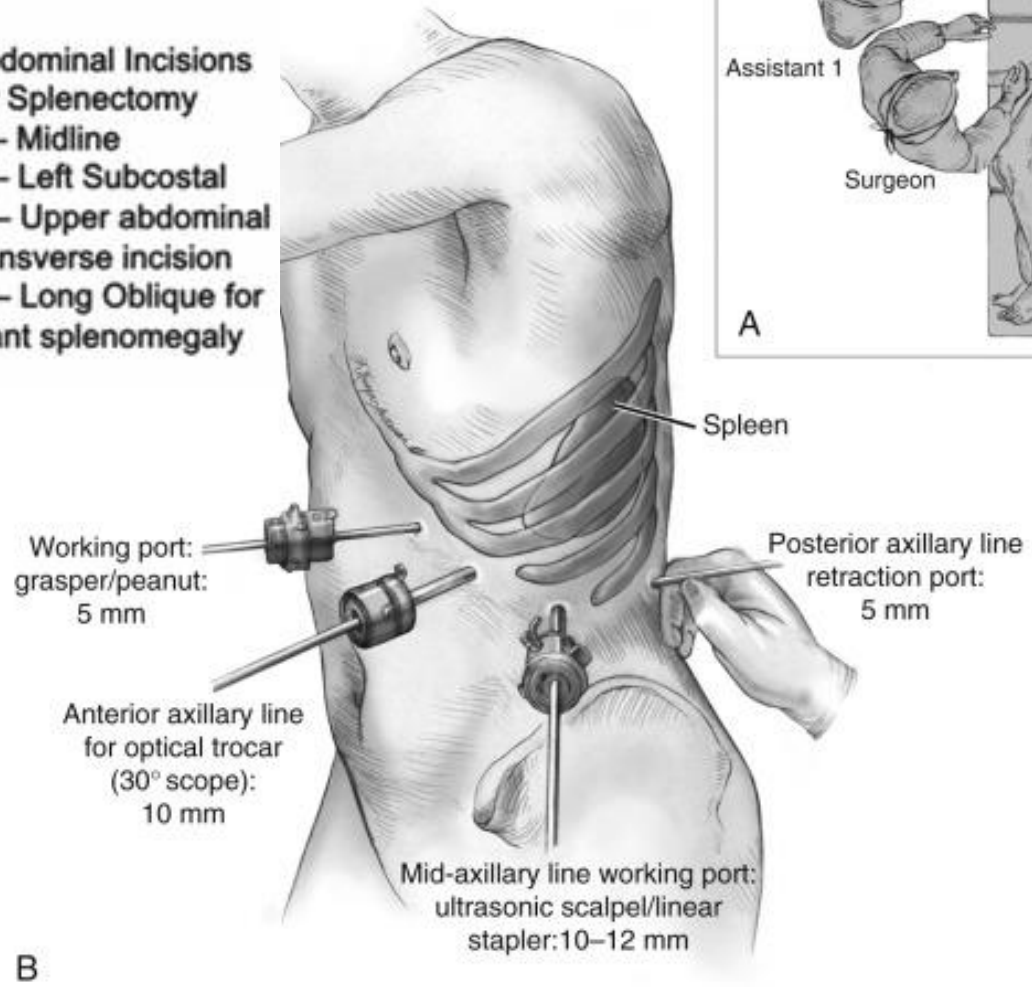
Laparoscopic splenectomy

- LS is the gold standard for elective splenectomy in patients with normal-sized spleens.
- Right lateral decubitus position (Lateral Approach)
- The lateral approach routinely involves the use of three or four trocars



Abdominal Incisions for Splenectomy
A – Midline
B – Left Subcostal
C – Upper abdominal transverse incision
D – Long Oblique for giant splenomegaly





Complications of splenectomy

- Left lower lobe atelectasis, Pleural effusion and pneumonia
- Subphrenic hematoma / abscess and wound infection
- Thrombocytosis if platelets are > 10,00,000
- Pancreatitis, pseudocyst, and pancreatic fistula.
- Post splenectomy septicemia

Higher Risk Groups for septecimia:
1-Young.
2-Chemoradiotherapy.
3-Splenectomy for blood dss.> in trauma spleen can reimplant in pelvis

OPSI : Overwhelming Post Splenectomy Infection

Rapid development of severe sepsis with hypotension, DIC , respiratory distress, and coma within hours of presentation Incidence. A rare complication of splenectomy. 50% to 70% of OPSI occurs less than 2 years after splenectomy.

Mortality 50%-70% for patients presenting with full-blown OPSI Organisms. S. Pneumoniae is responsible for 50% to 90% of infections. Others include N. Meningitides, H. Influenzae.

Treatment:
1-Prophylactic daily penicillin if under 5 y until they are 10.
2-Prophylaxis for 2-3 years if older than 5y.
Oral Penicillin, Erythromycin, Aomxicillin, Co-Amoxiclav. Or Cefotaxime, Ceftriaxone or chloramphenicol if allergic to Penicillin or Cephalosporine

Thank you

- References
- • Schwartz's Principles of Surgery
- • Sabiston Textbook of Surgery
- • Bailey & Love's Short Practice of Surgery, 28th Edition
- • Radiopaedia