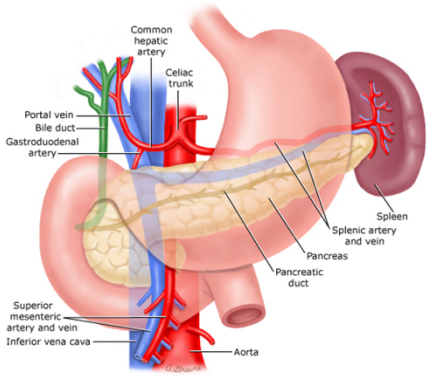
**General characteristics:**

- Spleen is the **largest lymphatic organ** that is **located in LUQ**
- It follows **the odd numbers rule** → (1, 3, 5 / 7, 9, 11) → (1×3×5 = L / W/H) ➤ (7: Weight) (9-11: location )
- Size = size of fist
- It is supplied by **splenic artery** from **celiac artery**
- 🔸 Note that children have thicker **splenic capsule**
- it has a 3 to 7 **segments** with each having its own blood supply
- 🔸 Size of spleen correlates with **sex** / **height** / **weight** of the patient
- Connected by 4 ligaments:
    - splenorenal
    - splenogastric
    - spleenocolic
    - splenodiaphragmatic
- **Main function**: Antibodies against infections **(especially encapsulated bacteria)**

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**Non-traumatic splenectomy:**

- **Indications?**
    1. Hemolytic or thrombocytopenia
    2. Malignant or infectious disorders localized to the spleen (especially the **tail of pancrease**)
    3. Rare complications when there's **massive splenomegaly**

✅ possibly indicated:

- Hereditary spherocytosis
- Cancer surgery
- Felty syndrome
- Pyruvate kinase (PK) deficiency
- Immune thrombocytopenia (ITP)
- Splenic marginal zone lymphoma
- Splenomegaly (massive or symptomatic)
- Splenic vien thrombosis with bleeding gastric varices
- Transfusion dependent thalassemia
- Warm autoimmune hemolytic anemia (AIHA)
- Splenic abscess

❌ Rarely indicated:

- ABO or HLA  desensitization for kidney transplant
- Chronic lymphocytic leukemia (CLL)
- Hairy cell leukemia
- Primary myelofibrosis
- Splenic infarctions
- Splenic sequestration crisis in sickle cell disease
- Thrombotic thrombocytopenic purpura (TTP)

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**Surgical considerations (whether traumatic or not):**

- **Indications preoperatively:**
  1. **Vaccinations** → against **encapsulated organisms** (Strep. pneumoniae, H. influenzae, Neisseria meningitidis)
     - You would need vaccinations **2 weeks prior**, but the ideal is (10–12 weeks) with annual vaccinations
  2. **VTE prophylaxis** (from portal / mesenteric / splenic) → it carries a **higher risk** than other abdominal surgeries (10%)
  3. **Hemoglobin** (before surgery) + **Platelets on operative table**

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**Open vs. Laparoscopic:**

- Use proper open when:
  1. **Massive splenomegaly**
  2. **Lack of equipment**
  3. **Accessory spleen (if you don't remove it, you will have a recurrent condition that you did splenectomy for)**
  4. **Cancer or other conditions where spleen is adjacent to them**, in which they need laparotomy

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**Traumatic spleen:**

- Most affected organ along with the **liver**, mostly due to **blunt trauma**, BUT it could be due to → **Iatrogenic trauma** (in endoscopy for the organs that are attached to spleen by a **ligament**)
- **Kehr's sign = Left shoulder pain (worsening with inspiration) due to phrenic nerve irritation**
  - Could happen after splenectomy due to a **collection**

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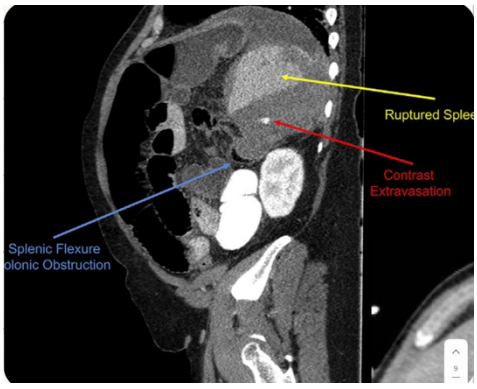
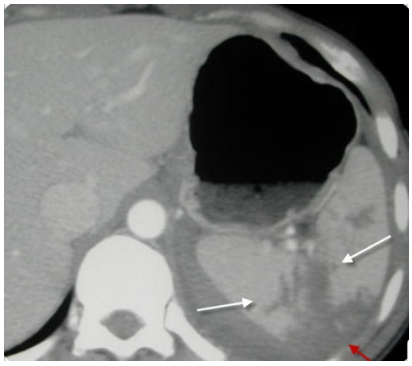
**Diagnostic?**

1. Start with **FAST** (done in the ER) → you'll see **hypoechoic rim around the spleen**
2. **CT with IV contrast** (only if the patient is **stable**) → you'll see:
   1. Hemoperitoneum (fluid collections around the spleen)
   2. Hypodensity = Areas of parenchymal disruption, subcapsular hematoma, intraparenchymal hematoma
   3. Extravasation or contrast blush = traumatic disruption or pseudoaneurysm of splenic vasculature
   4. **Active extravasation = <u>active</u> bleeding** → needs urgent intervention

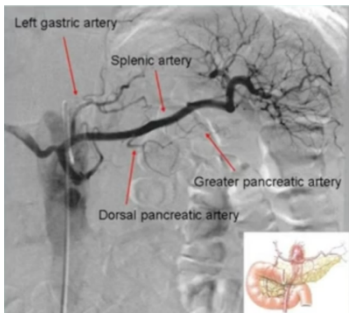
Grades : From **I(minimal) to V(most severe)**, depending on **injury and laceration** // **hematoma and laceration** or **laceration and vascular**



**FAST : Focused assessment with sonography in trauma** is a rapid bedside ultrasound examination performed by surgeons, emergency physicians, and paramedics as a screening test for blood around the heart (pericardial effusion) or abdominal organs (hemoperitoneum) after trauma.

**Management approach?**




**Non-operative** →**(Start with this unless proven otherwise)**

- Stable
- No abdoinal organs injuries
- You need ICU monitoring → if not available ? ➤ go to **operation immediately**
- **Splenic artery embolization** = closure of splenic artery to stop the bleeding
  There are **2 types**:
  1. **Distal**: at the nearest site of the bleeding
     → better but harder used when theres **extravasation** or **pseudoaneurysm**
  2. **Proximal**: below the pancreatic artery → lowers distal systolic pressure by 40 mmHg to **reduce bleeding** its also called **preventive embolization**, used with **high grade injury** (Grade 4 and 5) → it decreases splenectomy by (16–18%)

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***Risk of failure*:**

1. Age
2. Grade 3
3. Concomitant solid organ injury
4. Vascular abnormality (Pseudoaneurysm / Contrast blush / AV fistula)

➤ **Failure = (10–15%)**, and **success is 90% in adults** and **95% in children**

Observation **( grade +/- 1):** → • 5 days (Grade ≥ 3) • 1–2 days (Grade 1)

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**If the patient is 1- unstable or transient responder or + FAST 2- peritonitis ( viscous perforation), you need surgery immediately regardless of the grade**

Signs of unstable patient:

1. SBP < 90
2. HR > 120
3. ↓ Level of consciousness
4. SOB
5. Transient responder
6. Evidence of skin vasoconstriction
   (cold clammy, decreased capillary refill)

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**Splenectomy vs. Salvage?**

- Splenectomy is the **fastest** option since most patients are →acidotic / hypothermic / coagulopathic
- So they **won't handle another attack**

🟢 **Pros and Cons of NOM (Non-Operative Management)**

✅ **Advantages:**

- Preservation of functional spleen
- overwhelming post-splenectomy infection (OPSI)
- surgical risks and potential complications
- Shorter hospitalization and a concomiant reduction in costs

❌ **Disadvantages:**

- Risk of delayed splenic rupture or re-bleeding
- Increased risk of missed injuries (e.g., hollow viscus)
- Transfusion related complx

**SAE (Splenic Artery Embolization) Risks**:

- Splenic infarction
- Splenic / Subdiaphragmatic abscess
- Inadverent embolization of other organs (ex: pancrease) or lower extremitis
- **Allergic** reaction to contrast
- Contrast-induced renal insufficiency

🟨 *Note: NOM with SAE is **reducing surgical salvage operations***

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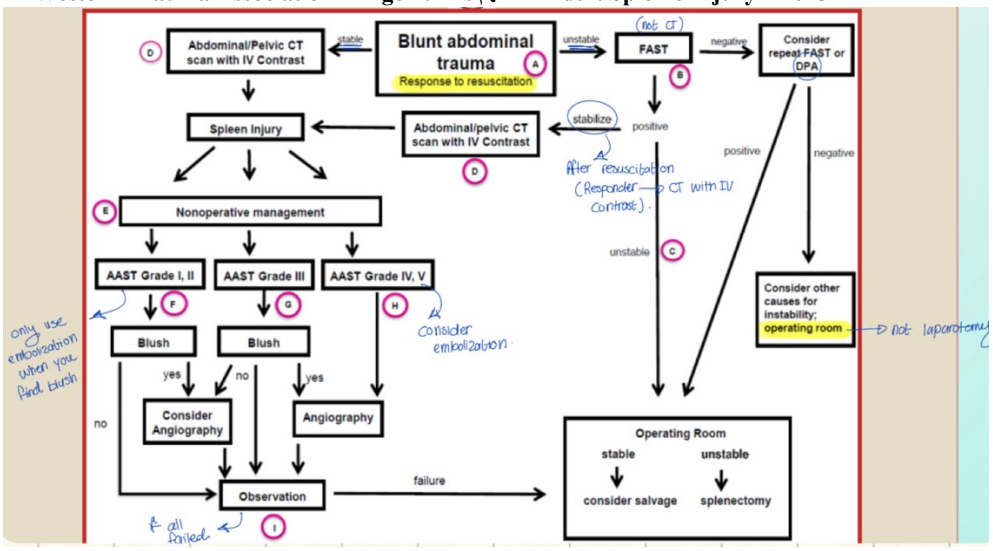
📊 **Western Trauma Association – Algorithms مهم → Adult Splenic Injury – 2015**




🧠 *Algorithm includes steps for **blunt** abdominal trauma and decision-making about NOM vs surgery*
➡️ Flowchart outlines: FAST, hemodynamic stability, CT grading, need for embolization, or laparotomy

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Splenorrhaphy →refers to the <u>suture repair of the spleen with or without splenic wrapping.</u>

Hemostasis can be achieved with **topical hemostatic agents, electrocutery, or argon beam coagulation**

Partial splenectomy → is a form of splenic salvage and refers to the removal of a portion of the spleen **based upon its segmental blood supply**

## 📌 Surgical Outcomes and Complications:

The mortality rate for patients undergoing surgery for isolated splenic injury is dependent on the **grade of injury**, as well as **the presence or absence of shock**.

Mortality can be as high as **22 % for grade V injury**

1. postoperative bleeding
2. perioperative infx : **Pulmonary complications** = m/c postoperative infx /// **Intra-abdominal abscess**
3. Gastric perforation **Uncommon** but can result from **necrosis of the gastric wall**
4. Pancreatic fistula
5. Vascular thrombosis→**Portal, mesenteric, and splenic** veins appear to be affected more often. **DVT and PE** are still a risk
6. **Thrombocytosis→ Usually peaking between 7 and 20 days postoperatively, and then falling to normal levels over weeks to months, but sometimes over years**
7. Splenosis ( بشيل جزء من الطحال وبنمو الى طحال الصغير) →latrogenic rupture of the spleen during splenectomy can cause subsequent implantation of splenic tissue within the peritoneal cavity, also referred to as splenosis
   This generally does not require any intervention, but it could cause abdominal pain, partial return of splenic function, or other complications
8. Risk for malignancy

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## 💊 Long Life Prophylactic Antibiotics

Recommendations for prophylactic antibiotics vary:

A common recommendation for children <5 years of age is for antibiotic prophylaxis for at least two years following splenectomy

For children and adults with concurrent immunocompromising conditions→ daily antibiotics until at least ag 18 or for life.

For children or adults with history of sepsis or other severe infections caused by encapsulated organisms→ lifelong prophylaxis.

For adults→ at least one year following splenectomy (due to a trauma) .

The disadvantages of long-term antibiotic use are not insignificant

These include the potential for **hypersensitivity reactions**, **alteration of the microbiome**, the **emergence of drug-resistant pathogens**, difficulty with **adherence and incomplete protection**

**Postsplenectomy sepsis** Overwhelming post-splenectomy infections (**OPSI**)

Fever in a patient with impaired splenic function is a warning sign for possible sepsis and should be treated as a medical emergency

Postsplenectomy sepsis is a fulminant and rapidly fatal illness due to encapsulated pathogens

The incidence of postsplenectomy sepsis associated with splenic injury appears to be lower than that for splenectomy performed for other indications.

**Immunizations**

Immunisation against encapsulated organisms.

Following splenorrhaphy or partial splenectomy, the need to immunize is unclear