

spleen

1×3×5×7×9×11 rule

- **Size**

1 inch thickness

3 inch wide

5 inch long

- **Weight**

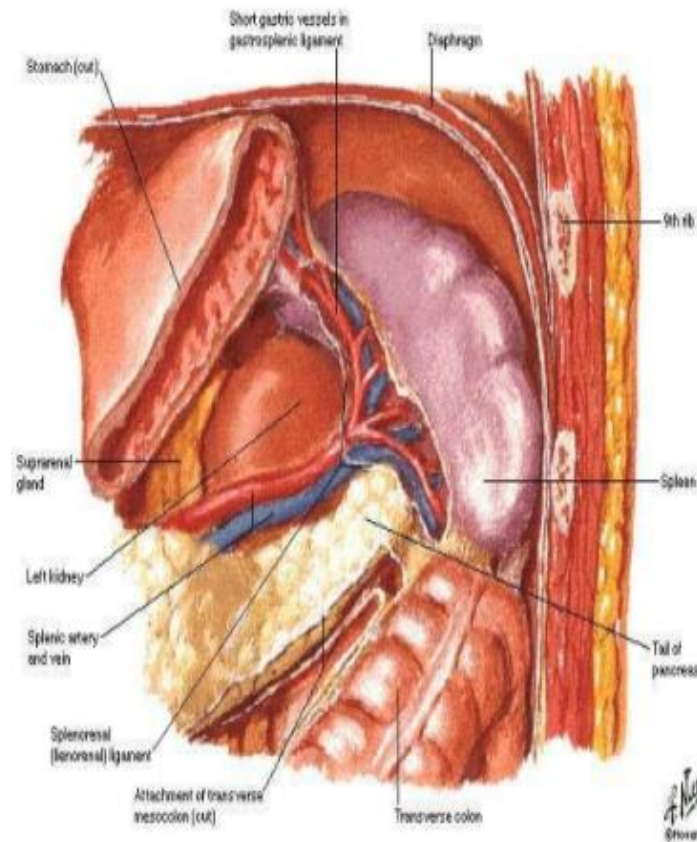
7 ounce= 200gm.

- **Related ribs**

9-11 (along long axis of 10th rib)



## Spleen in Situ



### **ANTERIOR:**

Stomach

### **POSTERIOR:**

Left diaphragm

Lung

Costodiaphragmatic  
recess

9-11 ribs

### **INFERIOR:**

Left colic flexure

### **MEDIAL:**

Left kidney and pancreas



### *Splenic injury:*

- Splenic injury most commonly occurs following blunt trauma due to motor vehicle collisions
- Penetrating splenic trauma is less common than blunt injury
- Iatrogenic traumatic injuries to the spleen can result from surgical or endoscopic manipulation colon, stomach, pancreas, Kidney.
- Primary mechanism is capsular tear, laceration from retraction devices, or tension on the spleen during manipulation of the colon

- Importance of history- victims located on the left side of car
- Type & nature of weapon is important in penetrating injuries
- Caliber of the gun

## Types of Injury:

- Splenic Hematoma

Subcapsular  
Intraparenchymal

- Lacerated wound
- Clean incised wound
- Hilar/vascular injuries

### *Associated Injuries:*

- Fracture Left lower ribs (30 %)
- Left sided hemothorax
- Left lung and diaphragm injury
- Left lobe liver injury
- Tail of pancreas injury
- Left kidney
- Left colonic injury
- Small bowel injury



## Presentation

- Pain abdomen
- Shock
- Pain in lower part of chest on left side
- Abdominal distension
- Wound in left upper quadrant
- Symptoms of associated injuries

- Tachypnea
- Anemia

*Examination :*

- Tachycardia
- Feeble pulse
- Hypotension
- Tachypnea
- Anemia

## Investigations: USG

- FAST.
- Look for position of spleen, hematoma, lacerration, hilar structures, vascularity, hemoperitoneum.
- Associated injuries to stomach, colon, Lt Kidney, Pancreas, Lt lobe of Liver, lower segments of Lung,

## AAST 1



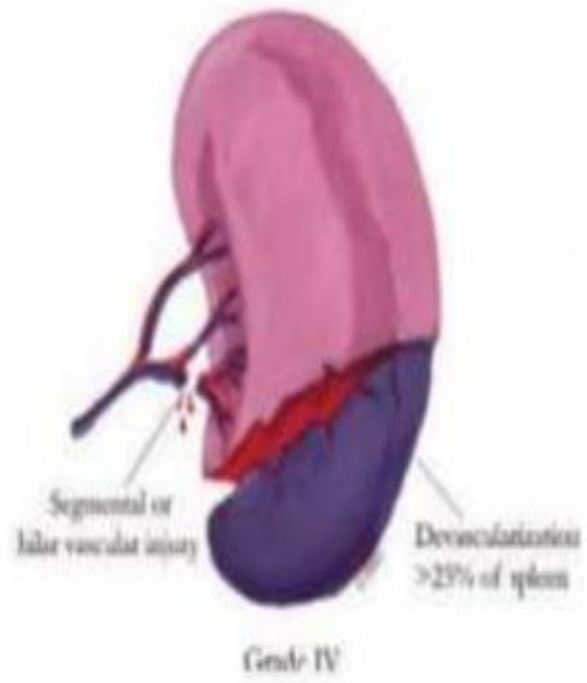
## AAST 2



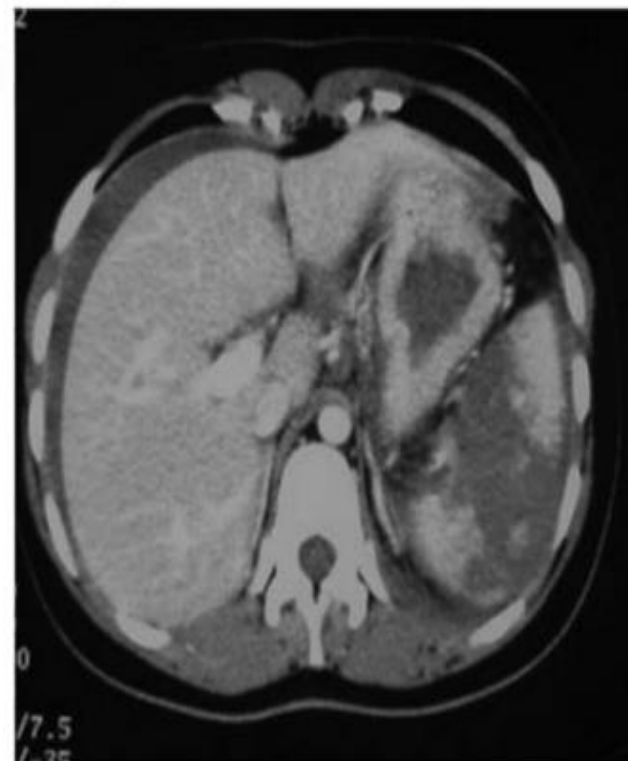
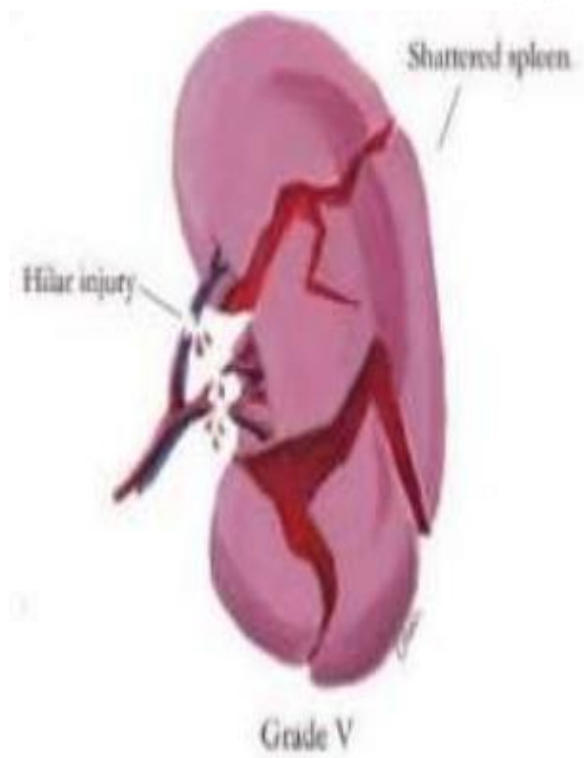
# AAST 3



## AAST 4



## AAST 5





## Management

Non-operative management of splenic injury (NOMSI)

- Conservative
- Interventional radiology: Splenic artery angio embolization

Operative management

- Splenorrhaphy: procedure to preserve spleen done in past, now replaced by NOMSI
- Splenectomy

The standard criteria for NOM are:

- Hemodynamic stability/ readily stabilizable
- Lack of rebound and guarding
- Blood transfusions  $\leq$  4 units
- No lack of consciousness;
- Age <55 yrs.

- The only absolute indication for emergency laparotomy is hemodynamic instability
- Complex/severe splenic injuries, age, preexistent splenic diseases, number of units of transfused blood, brain injuries are no longer considered absolute contraindications for NOM

## Splenic artery angioembolization:

- Adjunct to NOM of high grade injuries
  1. Proximal splenic artery embolization: Distal to dorsal pancreatic artery.
  2. Distal selective embolization: High failure rate.

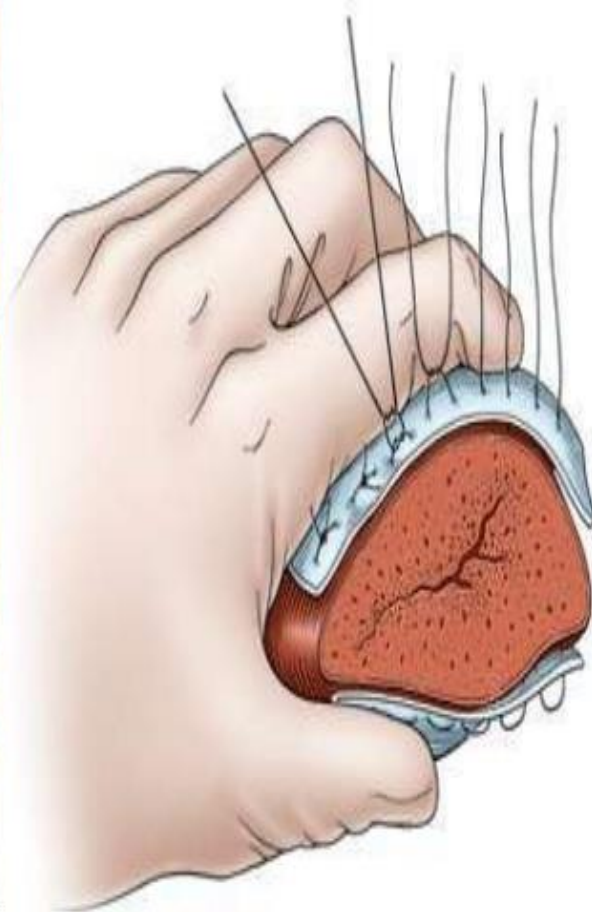
Indicated in pts with evidence of active extravasation of dye or pseudo aneurysm

*Unsuccessful* NOM: **Occurs in**

- Hemodynamic instability (systolic BP < 90 mmHg despite adequate resuscitation)
- Age > 55 years old
- > 4 units of transfused blood to maintain a Hb level over > 10 g/dl
- Persistent leucocytosis
- The onset or aggravating signs of peritoneal irritation
- Worsening imaging signs of splenic injury (repeated US exams)-post-traumatic splenic defect
- Intra-abdominal compartment syndrome (intravesical pressure > 20 cm H<sub>2</sub>O).

## Splenorrhaphy:

- Parenchyma saving surgery of spleen
  - The technique is dictated by the magnitude of the splenic injury
1. superficial hemostatic strategies like fibrin glue, gel foam, argon beam coagulation, diathermy, topical thrombin
  2. non absorbable suture repair
  3. absorbable mesh wrap (poly galactin)
  4. resectional debridement





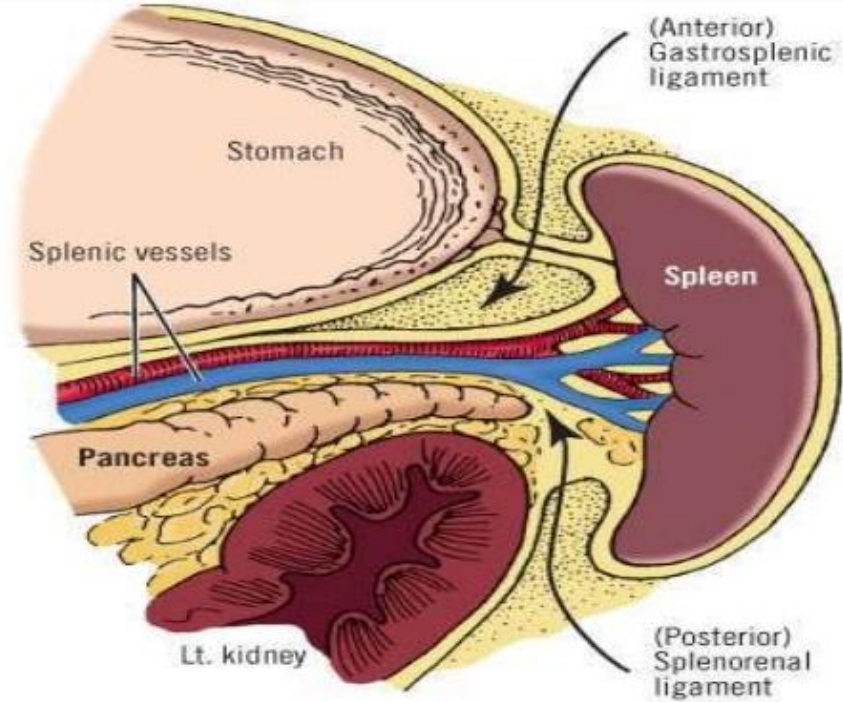
**Fig. 10.** Splenic mesh wrap may be helpful in the management of multiple stellate splenic injuries with loss of the capsule or extension of the laceration into the hilum. This pouch is commercially available or can be constructed from a polyglycolic sheet.



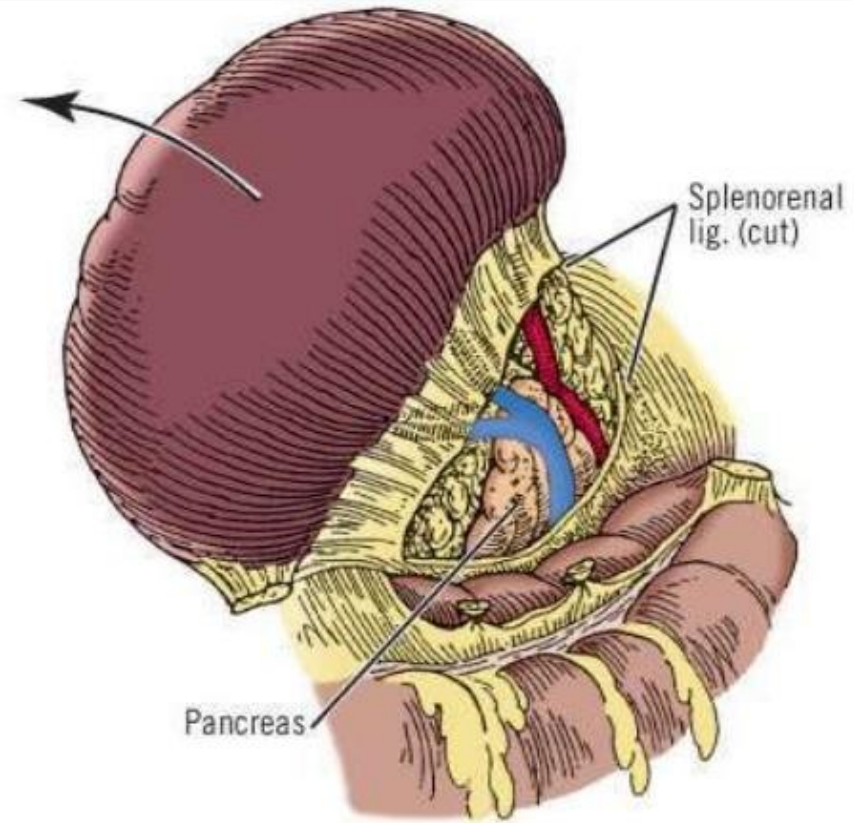
- Incision deepened to access the peritoneal cavity.
- Pack the 4 quadrant of the peritoneal cavity
- Suck out all free blood and clot
- Remove packs starting from least area of bleeding.
- Use your fingers to temporarily secure hemostasis at the hilum(to prevent clamping of the tail of pancreas)
- Place the left hand on the spleen and draw it down to divide the lieno renal ligament lying posteriorly
- Deliver the spleen into the abdominal incision
- Then a non-crushing clamp is applied at the hilum safeguarding the pancreas
- Examine the spleen for grade of injury
- Ligate and divide; the short gastric arteries, left gastroepiploic arteries. Slightly away from the stomach with non absorbable suture

## Approaches:

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## *Complications:*

### **INTRAOPERATIVE**

- Haemorrhage
- Pancreatic injury
- Bowel injury(stomach & colon)
- Diaphragmatic injury

## *Complications*

### **EARLY POST OP**

- Hematoma/seroma
- Wound infection
- Subphrenic abscess
- Atelectasis
- Pneumonia
- Pleural effusion
- Portal vein thrombosis
- DVT
- Paralytic ileus

## Complications

### **LATE**

- OPSI
- splenosis

## OPSI

- A rapidly fatal infection following removal of spleen
- Incidence: 0.23-0.42% per year
- Most Occur 1<sup>st</sup> 2 years after splenectomy
- Lifetime risk <1-5%,
- Common organisms
- 1.S.pneumonia-50-90%
- 2.H.influenza
- 3.N.meningitis
  
- Mortality rate : 50-80%

## Prevention:

### **Immunoprophylaxis:**

- Vaccines against Streptococcus Pneumoniae [PPV23], H. Infl [H influenzae type B], Meningococcus
- Elective: At least 2 wks prior
- Emergency: PPV 23 immediate post op & Other two 2 wks after surgery.
- [All 3 delayed for at least 2wks; because transient immune suppression post op]

### **Antibody titre:**

- No correlation between ab titre & clinical immunity
- Only in about 50% cases protective levels abs formed against pneumococci
- Revaccination: CDC [United States Communicable Disease Control & Prevention] to be revaccinated ppv 23-6 yrs after splenectomy.



**Antibiotic prophylaxis:**

- Children: Until 5 yrs of age or at least 5 yrs after surgery
- Penicillin, Amox, amoxyclav
- Adults: scanty evidence. Provided with antibiotics to be taken at the sign of infection.

### *Unanswered questions:???*

1. Frequency of Hb measurements
2. Frequency of abdominal examinations
3. Intensity and duration of monitoring
4. Is there a transfusion trigger after which operative or angiographic intervention should be considered?
5. Time to reinitiating oral intake
6. The duration and intensity of restricted activity (both in hospital and after discharge)
7. Optimum length of stay for both the intensive care unit (ICU) and hospital
8. Necessity of repeated imaging
9. Timing of initiating chemical deep venous thrombosis (DVT) prophylaxis after a splenic injury
10. Should patients with severe injuries/or embolized injuries receive postsplenectomy vaccines?
11. Is there an immunologic deficiency after splenic embolization?

### Conclusion:

- Spleen is important organ, try to conserve it.
- Clinical examination has vital role in diagnosing and treating splenic injuries.
- Activate the team as soon as splenic injury is suspected.
- CECT is the investigation of choice.
- Hemodynamically unstable patient : Directly to OR
- Keep adequate blood ready before opening the abdomen.
- Splenic artery embolisation has got definitive role.