جامعة الملك سعود
King Saud University

Specific Abdominal Trauma

Surgery Team
MED 433

MED 433

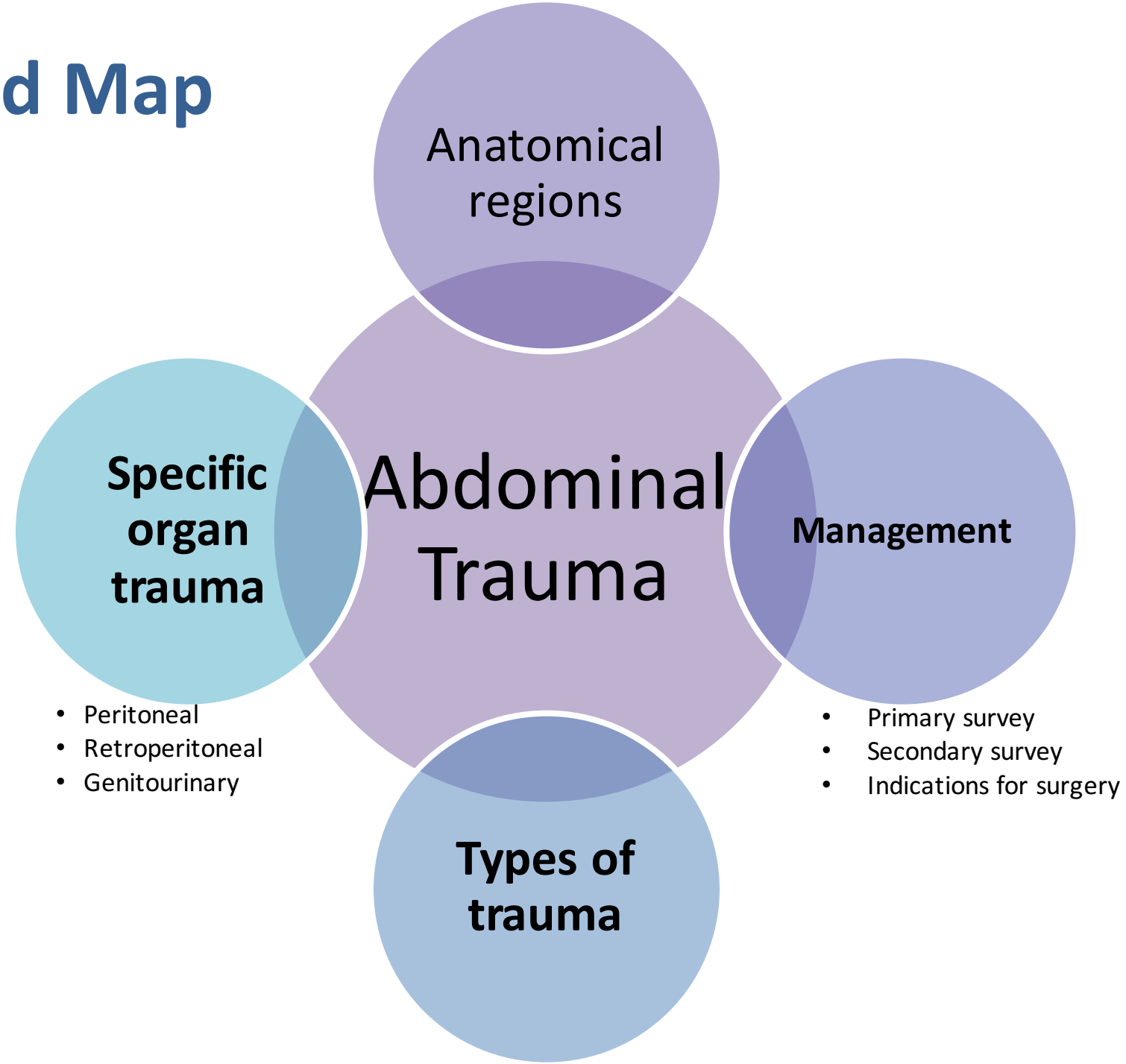
Objectives :

1. To know the types of the abdominal trauma.
2. To know how to evaluate a patient with blunt trauma.
3. To know the commonly solid organs involved the blunt and penetrating trauma.
4. To Describe the anatomical regions of the abdomen.
5. Discuss the difference in injury pattern between blunt and penetrating trauma.
6. Identify the signs suggesting retroperitoneal, intra-peritoneal or pelvic injuries.
7. Outline the diagnostic & therapeutic procedures specific to abdominal trauma.

Color Index: Slides & Raslan's ( ) | Doctor's Notes | Extra Explanation | Additional

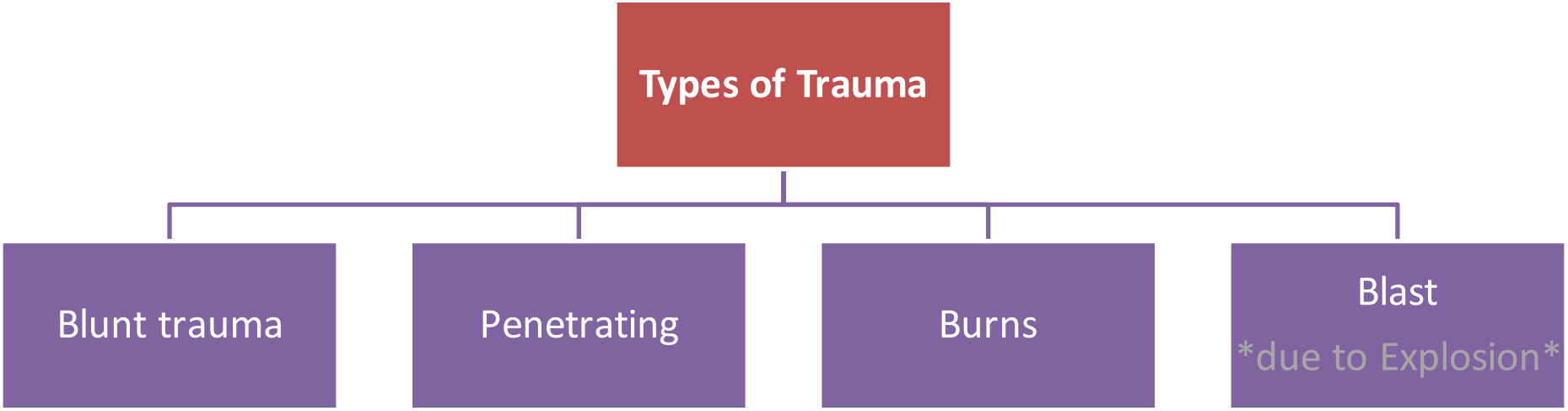
This work is based on doctor's Slides +Notes and Raslan's only (Does not include the book)

Mind Map


Anatomical regions
Abdominal Trauma
Specific organ trauma
Management
Types of trauma
• Peritoneal
• Retroperitoneal
• Genitourinary
• Primary survey
• Secondary survey
• Indications for surgery

Types of Trauma

There are different types of traumas; the types are classified **according to the mechanism of trauma**, and a patient can either get one of these types or a combination of them:



Road Traffic Accidents (RTA):

Road traffic accident (RTA) is one of the good examples of trauma and it is the most common trauma, it is the third leading cause of death after IHD and cancer.

How to reduce trauma due to RTA?

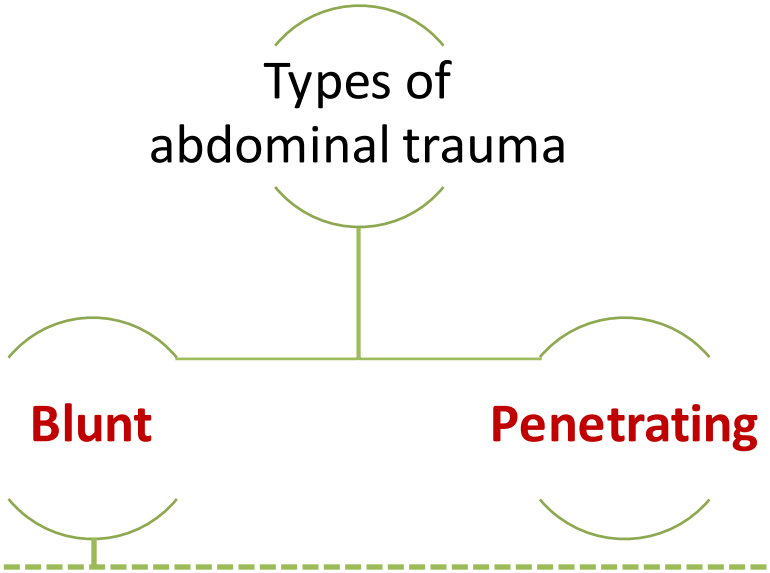
- Roads should be in a good shape.
- Every person should make a complete check up for his car every once in a while, such as: breaks, water the car, wheels... Etc.
- Drivers should follow the rules which include: wearing the seat belt, not to drive while person is drunk or on drugs, follow the road signs, not to exceed the assigned speed and so on.
- Medical care: there should be very good equipment/machines at the ERs with qualified staff.

Notes:

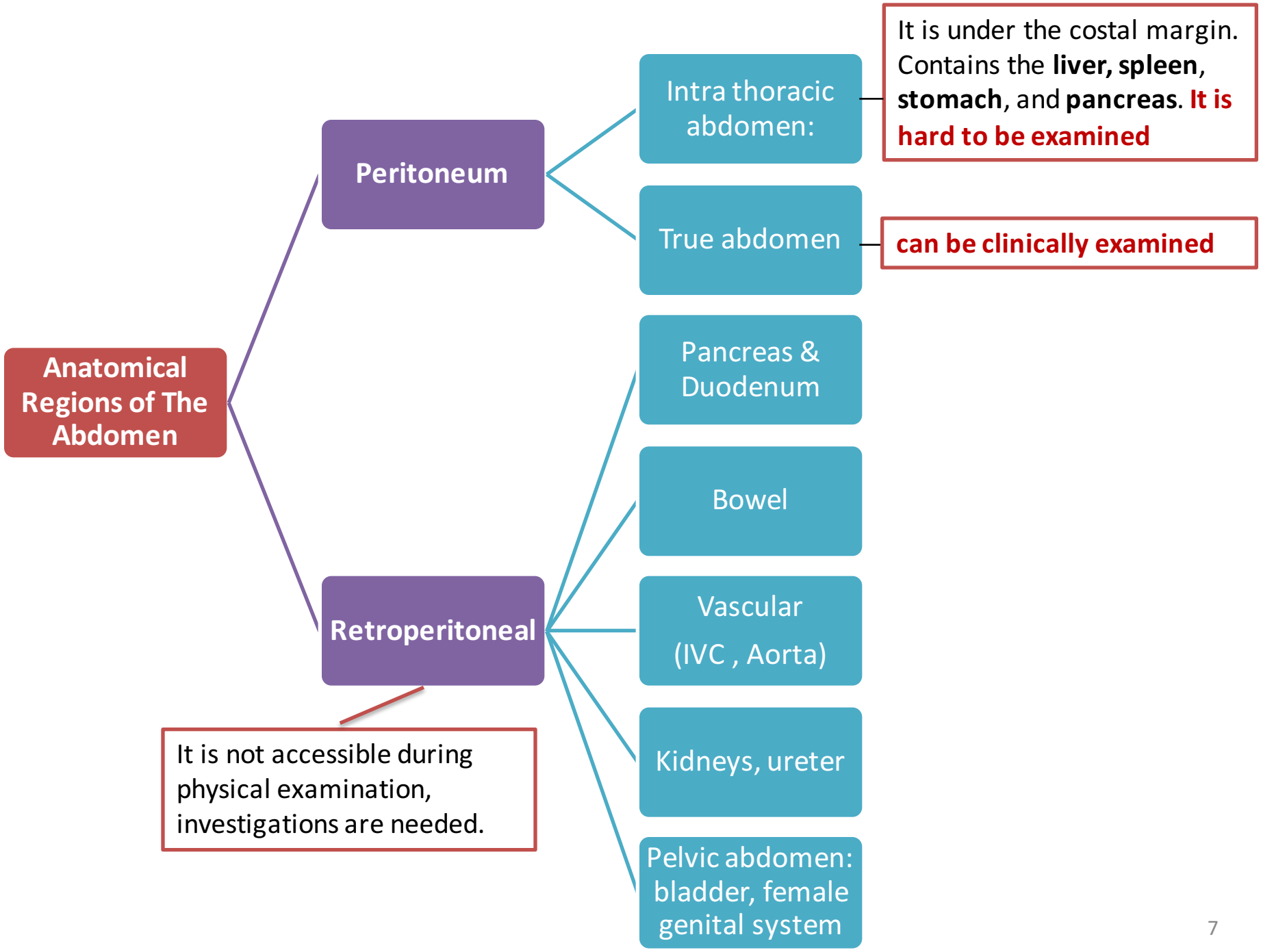
- Blunt trauma: injury incurred when the human body hits or is hit by a large outside object (as a car).
- Blast trauma: injury caused by the explosion of a bomb (especially in enclosed spaces)

ABDOMINAL TRAUMA

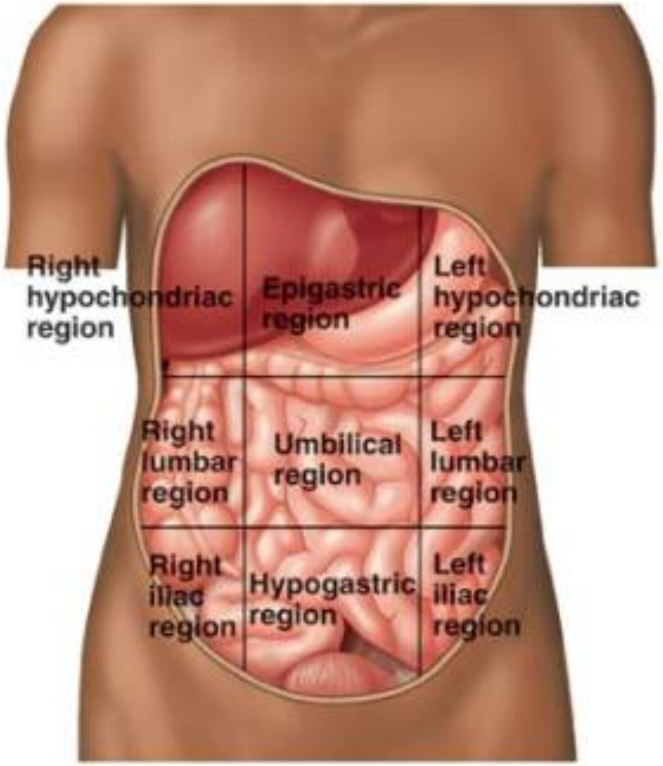
The majority of abdominal injuries are due to blunt abdominal trauma (90%) secondary to high speed automobile accidents.

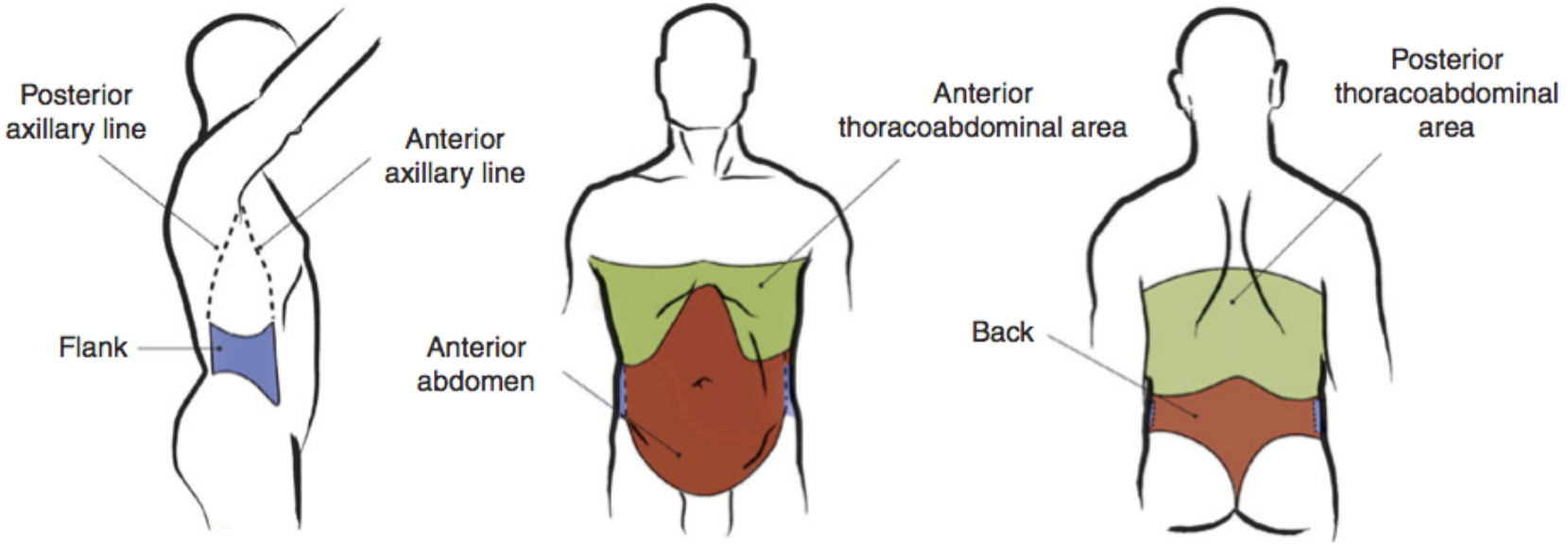


- Sometimes doctors miss such cases because a patient with a blunt abdominal trauma can come walking to the ER.
- Some doctors take superficial history and physical examination and let the patient go home without admitting him.
- **At the mean time, the patient would be bleeding slowly from the inside and in an hour he would collapse.**
- Patients who come to the ER because of trauma should be examined from head to toe whether they came walking and conscious or not.


Anatomical Regions of The Abdomen
Peritoneum
Intra thoracic abdomen:
It is under the costal margin. Contains the liver, spleen, stomach, and pancreas. It is hard to be examined
True abdomen
can be clinically examined
Retroperitoneal
Pancreas & Duodenum
Bowel
Vascular (IVC , Aorta)
Kidneys, ureter
Pelvic abdomen: bladder, female genital system
It is not accessible during physical examination, investigations are needed.

Anatomical Regions of The Abdomen





Management of Trauma Patients

- The primary management of abdominal trauma is determination that an intra abdominal injury exists and operative intervention is required.

- Many deaths would have been preventable if there wasn't a failure in managing the abdominal injuries.
- **Causes of the failure of management includes**:

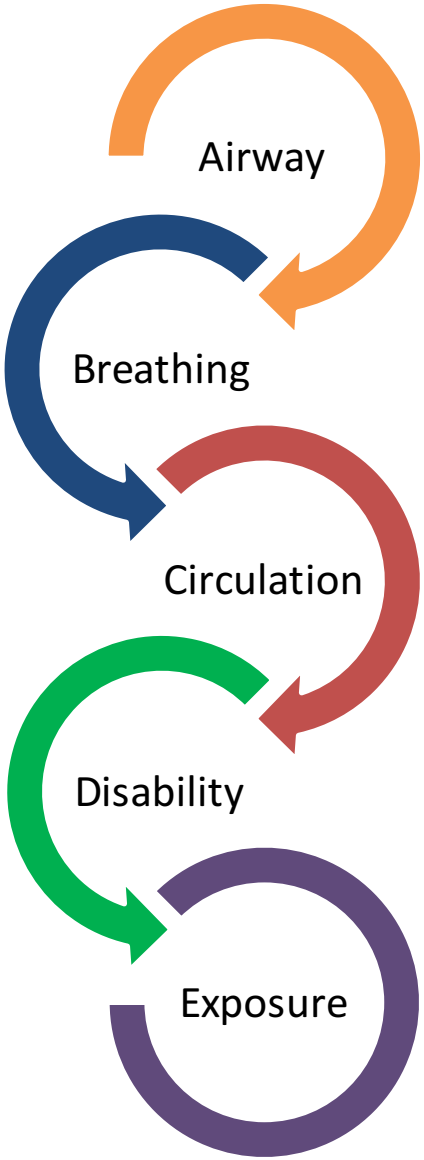
  1- **Delay** in ambulance to arrive, traffic jam, wrong place of hospitals, no good qualified hospital, and non well equipped hospitals.

  2- Many patients die **because doctors don't do ABC**.

- When you receive a trauma case always assume that there is injury even if the patient came walking to you until proven otherwise by history clinical presentation and investigations.

Primary survey

1. **ABCDE of emergencies** (must be done to all trauma patients)



intubation if the airway is damaged

If breath sounds were absent, insert a chest tube immediately. No O2 for 15 minutes will cause a disability

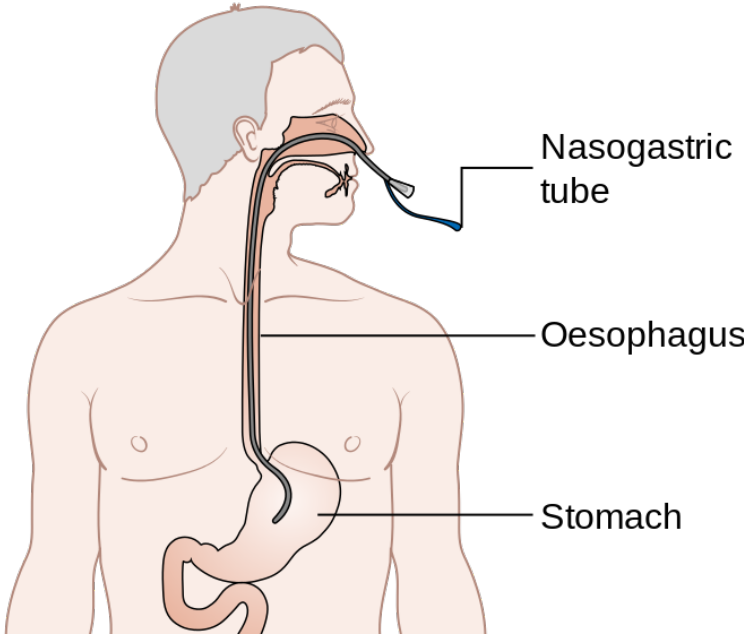
If there was bleeding (hemorrhage), control should be initiated. Give IV fluids (usually crystalloids and normal saline) and control the bleeding.

cut the clothes

Primary survey (cont.)

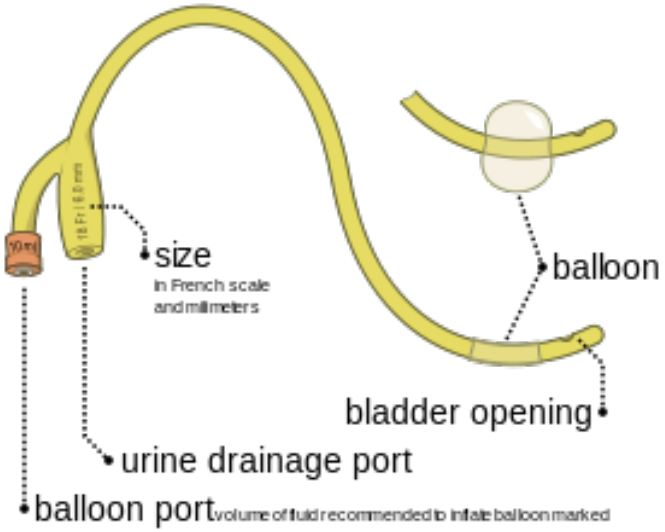
2. Usage of nasogastric tube.

It is contraindicated if there was bleeding from the nose or mouth.



3. Usage of urinary catheter

to monitor the output and input.
It is contraindicated If there was bleeding from the urethra.



Secondary Survey

History

- Taken from the patient himself, if he was conscious, if not it is taken from the person who attended or the paramedic.
  - Blunt trauma
  - Penetrating trauma → immediately to surgery

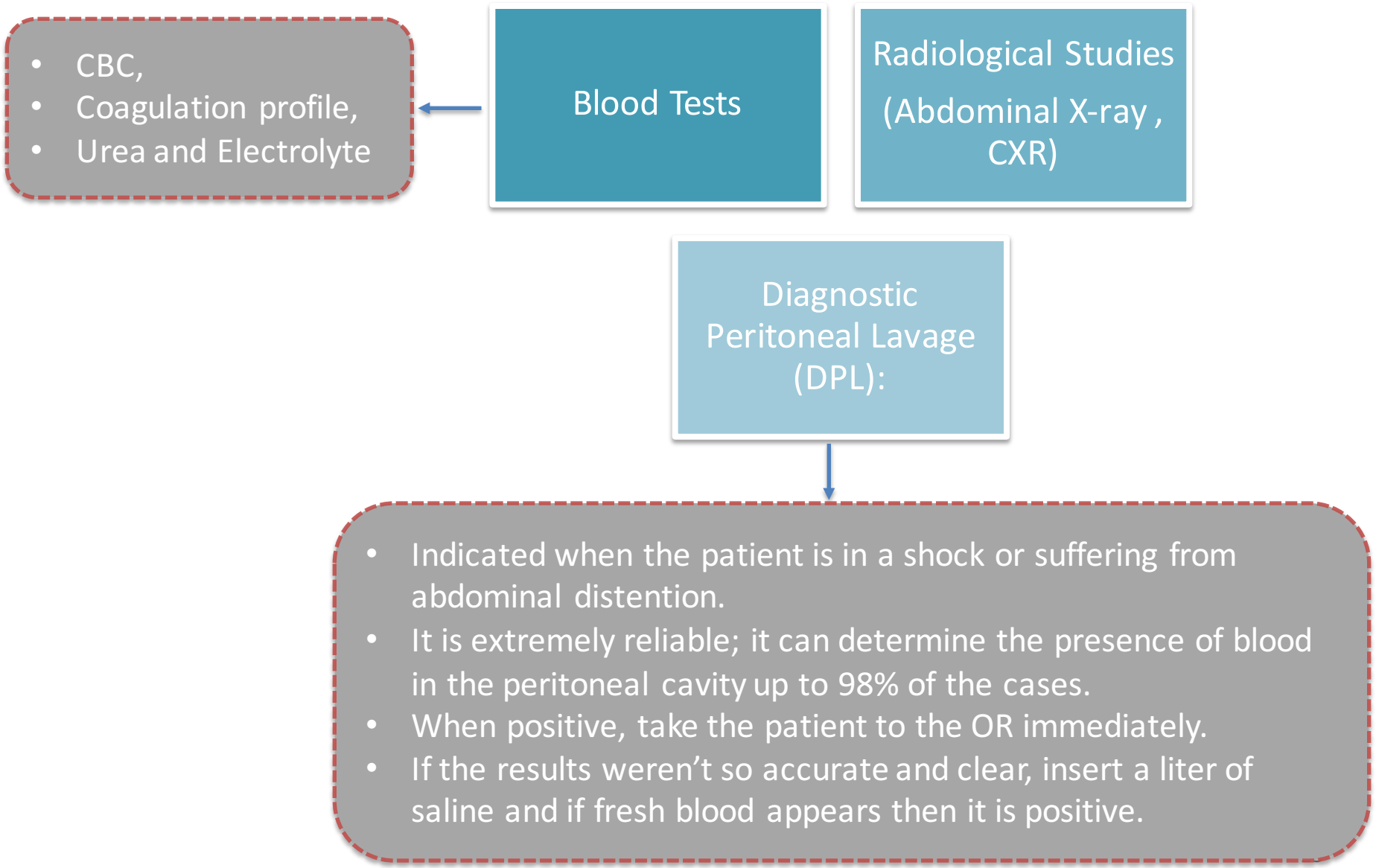
Physical examination

- General and abdominal examination

Abdominal Examination

- **Inspection, Palpation, Percussion, Auscultation.**
- Rectal Examination, and Vaginal Examination.
- Sometimes there is no time for secondary survey.

Investigations:

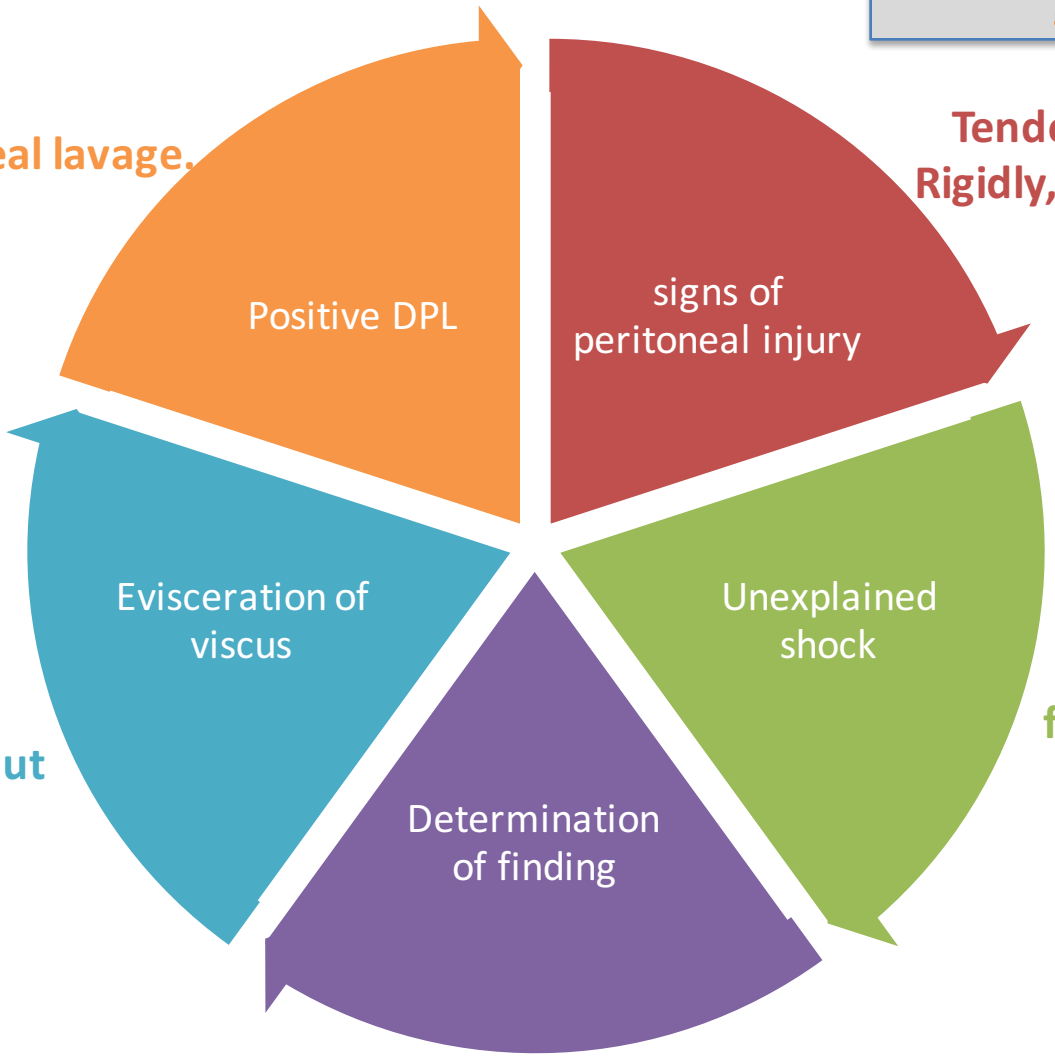


Indication for Surgery – Laparotomy

Laparotomy : is a large incision through the abdominal wall to gain access into the abdominal cavity

Diagnostic peritoneal lavage.

Tenderness, distention, Rigidly, guarding, bruising and so.



If the bowel was out

If you give a lot of fluid but your patient is still in a shock

During routine follow up on investigations.

a) **Sometimes you need to admit the patient for observation or admit them to the ER for 6 hours then signs will start to appear.**
b) **Examination: Patient came conscious with injury for conservative therapy to the ER and got admitted, after 4-6 hours he went into a shock.**

SPECIFIC ORGAN TRAUMA

Peritoneal:

- Liver: protected by ribs.
- Spleen: it is a mobile organ.
- Kidneys: in the retroperitoneal, it is not easy to injure so if it was
- Bowel

Retroperitoneal:

- Pancreas & Duodenum
- Bowel
- Vascular (IVC , aorta)
- Kidneys, ureter

Genito-urinary system:

- Urinary bladder, urethra (it is easy to diagnose if there was a fracture in the pelvis)
- Female reproductive system

Liver Trauma

- Liver is the largest organ in the abdominal cavity "5th intercostal space"

- **Any trauma under the nipple we expect liver; it means the liver is injured.**

- Most commonly injured organ in all patients with abdominal trauma.

- Commonest organ injured in case of penetrating trauma (due to the large space it occupies)

Mechanism of injury in blunt trauma:

- Hepatic injuries result from direct blows compression between the lower ribs on right side and the spine, or shearing at fixed points secondary to deceleration.

- Any penetrating **gunshot, stab or shotgun wound** below the right nipple on right upper quadrant of the abdomen is also likely to cause a hepatic injury.

Clinical manifestations:

- Often made at laparotomy in patients presenting with penetrating injuries requiring immediate Surgery or in shock.

- Blunt Trauma: patients who remain in a shock or present with abdominal rigidity, you do no further investigation and you take him to the OR immediately.

Investigations:

- Diagnostic peritoneal lavage (DPL)

- CT Scan abdomen: **used to diagnose intra peritoneal injuries in stable patients after blunt trauma.**

Management

When the patient comes to ER, the initiate management should be uniform:

1

- regardless what injury you have

ABCDE

2

Non-operative approach

- Not all patients with liver injury need operation**. It is determined by CT scan**
- **Simple hepatic laceration or intra hepatic hematoma.**
- **No evidence of active bleeding.**
- **Intraperitoneal blood loss less than 250 ml.**
- **Absence of other Intra peritoneal injuries " spleen , bladder,.." that requires surgery**

3

Operative approach

- **Persistent hypotension**, despite adequate volume replacement, suggests ongoing blood loss and mandates immediate operative intervention

Next page..

Management (cont.): Operative approach..

Classification: This classification is based on operative findings and management. So hepatic injury is classified into:

Grade 1
- Simple injuries – **non bleeding.**
- **Conservative treatment** if no bleeding or other injuries.

Grade 2
- Simple injuries **managed by superficial suture** alone if you opened the patient.
- **Conservative treatment** if no bleeding or other injuries.

Grade 3
- **Major intra parenchymal with active bleeding** but **not requiring inflow occlusion (Pringle maneuver*) to control hemorrhage.**
- Some of the patients go for **conservative treatment others go for OR.**

Grade 4
- Extensive intra parenchymal injury with major active bleeding **requiring inflow occlusion for haemostatic control.**
- **Needs operation and do Pringle maneuver**.

Grade 5
- **Juxtahepatic venous injury** (injuries to retrohepatic cava or main hepatic veins) portal vein injury.
- **Patients in this grade are less likely to survive**.

* The Pringle maneuver is a surgical maneuver used in some abdominal operations. A large hemostat is used to clamp the hepatoduodenal ligament interrupting the flow of blood through the hepatic artery and the portal vein and thus helping to control bleeding from the liver.

Management (Cont.)

All patients undergoing laparotomy for trauma should be explored through midline incision (from xiphoid precess to pubic around the umbilicus go up or down) because you do not know where is the lesion.

Management according to classification:

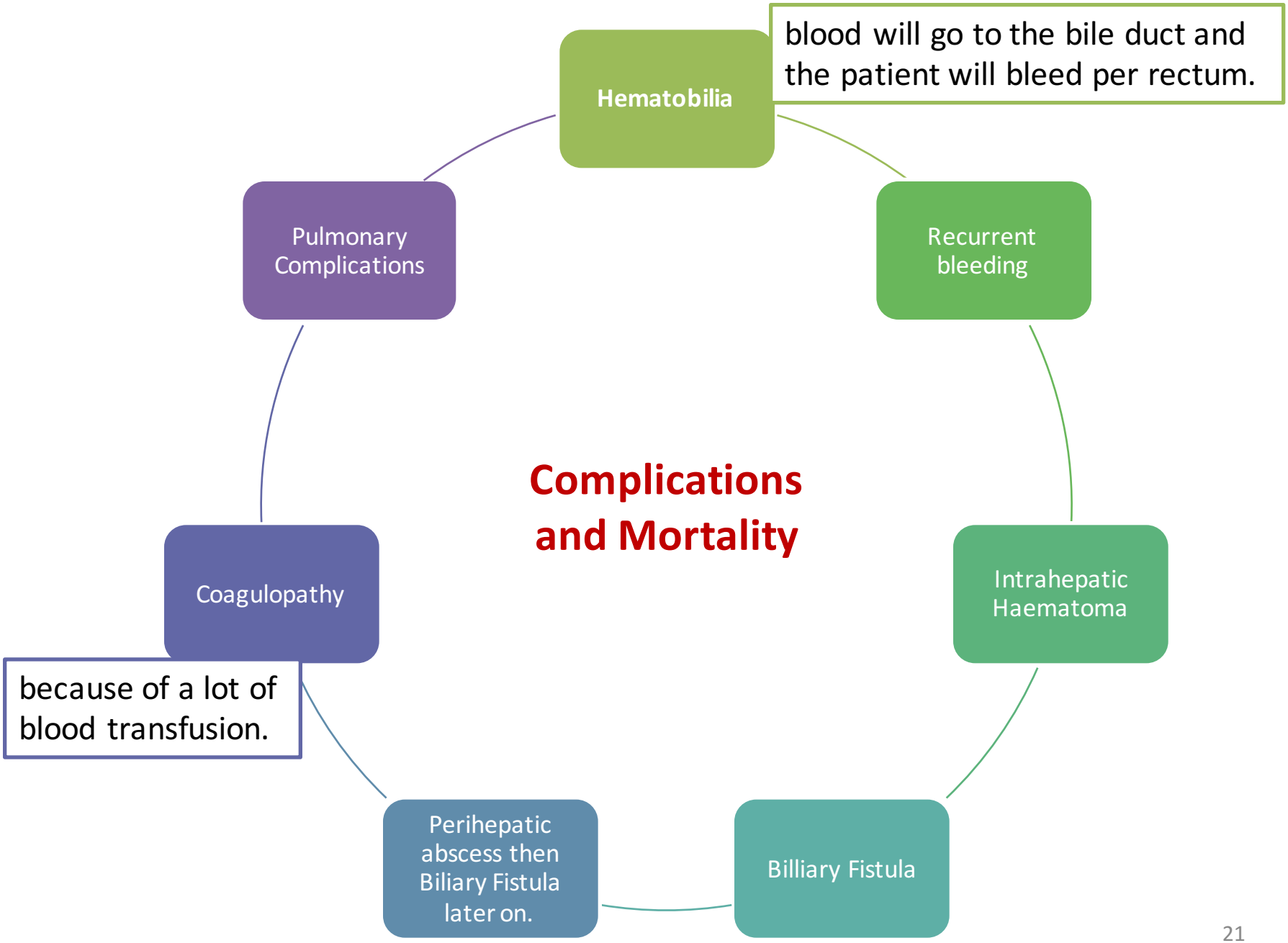
Grades	Management
Grades 1 & 2:	Simple injuries can be managed by any one of variety of methods: if we open it simple suture, electrocautery, topical hemostatic agents, etc. Does not require drainage.
Grade 3	Major intra-parenchymal injuries with active bleeding can be managed best by Finger Fracturing the hepatic parenchyma and ligating or repairing lacerated blood vessels & bile ducts under direct vision.
Grade 4	Extensive intraparenchynal injuries with major rapid blood loss require occlusion of portal trial to control hemorrhage it might need liver resection, lobe resection, and ligation of intrahepatic artery. It is rarely saved

Summary of liver trauma management

- **Simple techniques**: Simple techniques include drainage only of non-bleeding injuries, application of fibrin glue, sutures "hepatorrhaphy" and application of surgical (I & II).
- **Advanced techniques**: Advanced Techniques of Repair (III & IV) all performed with Pringle Maneuver in place

- **Types of repair**:
  1) Extensive hepatorrhaply
  2) Hepatotomy with selective vascular ligation
  3) Omental pack
  4) Resectional debridement with selective vascular ligation
  5) Resection
  6) Selective Hepatic Artery Ligation "remember liver can regenerate"
  7) Peri-hepatic packing: If you can't deal with a patient, just pack the patient and send him to a center where he will be treated.

  Also, if you did what you have to do but the bleeding didn't stop, pack your patient and send him to another hospital.


Hematobilia
blood will go to the bile duct and the patient will bleed per rectum.
Recurrent bleeding
Intrahepatic Haematoma
Billiary Fistula
Perihepatic abscess then Biliary Fistula later on.
Coagulopathy
because of a lot of blood transfusion.
Pulmonary Complications
Complications and Mortality

Spleen trauma

1. Incidence

- The spleen remains the most commonly injured organ in patients who have suffered blunt abdominal trauma and is involved frequently in penetrating wounds of the left lower chest and upper abdomen.
- Management of the injured spleen has changed radically over the past decade.
- Now recognized as an important immunologic factory as well as reticuloendothelial filter (So, reconsider resection because it's important organ)
- The problem is when spleen has a disease :splenomegaly, malaria, portal hypertension makes it more susceptible to be damaged from simple trauma and you will find the patient collapsed.
- Although the risk of over whelming postsplenctomy sepsis (OPSS) is greatest in child less than 2 yrs.
- recognition of OPSS has stimulated efforts to (Conserve spleen) by splenorrhaphy (either by repair or leave according to the grade).

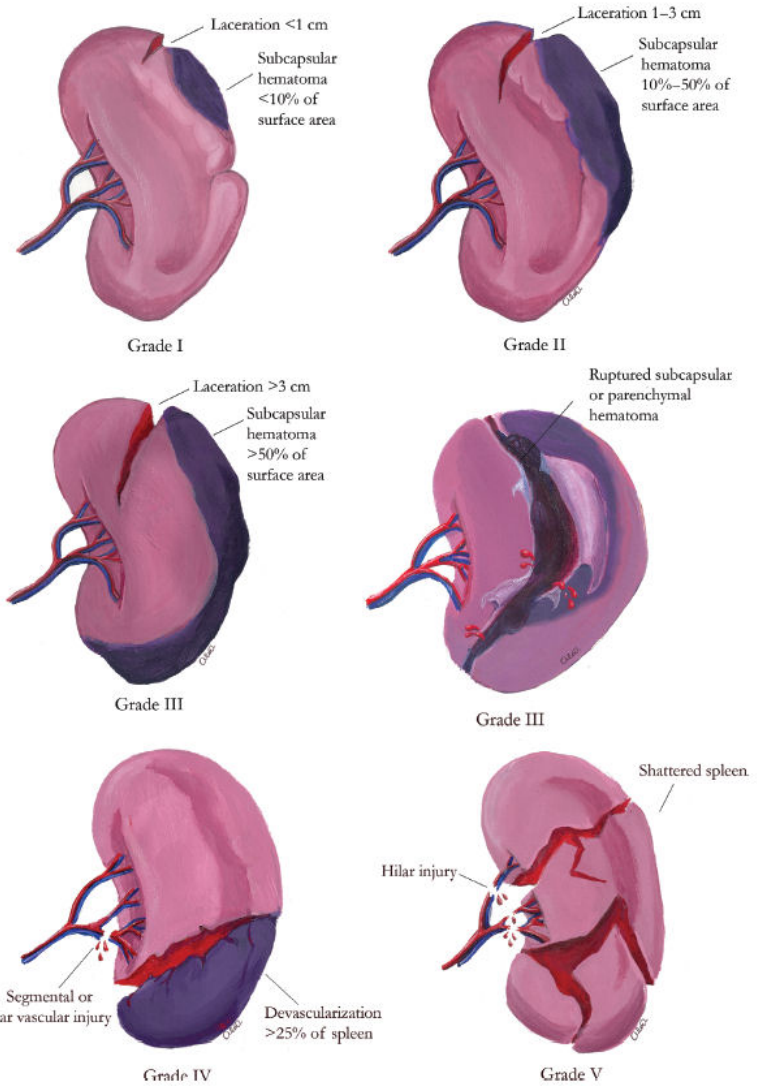
2. Mechanism of injury

- The spleen is commonly injured in patients with blunt abdominal trauma because of its mobility.
- Most civilian stab wounds and gunshot wounds cause simple lacerations or through and through injuries.
- It is of interest 2% of patient who are undergoing surgery LUQ of the abdomen can injure the spleen by the surgeon causing a small injury by any of the surgical equipment being used by the doctor using or the assistant.

3. Classification:

- The Magnitude of splenic disruption depends on the patient's age, injury mechanism and presence of underlying disease.
- **Splenic injury has been classified according to its pathological anatomy into:**

o Grade I: Subcapsular hematoma.
o Grade II: Sub-segmental parenchymal injury.
o Grade III: Segmental devitalization (part of it)
o Grade IV: Polar disruption (complete pole)
o Grade V: Shattered or devascularized organ (autosplenectomy),Patient is in a shock but he can survive because of the blood supply.



4. Diagnosis (Evaluation)

- **Patient History**
- **Physical Examination**
- **Symptoms and signs:**

* 1- LUQ bruising or abrasion
2- Left lower ribs fracture on CXR
3- Kehr's sign : shoulder tip pain (L shoulder)
4- Balance's sign : LUQ mass (hematoma)

* **(if you find any of these, you presume spleen and kidney injury)**

Kehri's sign : is the occurrence of acute pain in the tip of the shoulder due to the presence of blood or other irritants in the peritoneal cavity when a person is lying down and the legs are elevated.

- **Radiological Evaluation**

1- CXR
2- Plain abdominal X-Ray
3- CT (Done if the patient is stable).
4- Angiography (for staging) in stage 4 and 5 when there is extravasation it means a shattered spleen.

5-TREATMENT:

❖ Initial Management ABCDE (Resuscitation)

❖ Non operative approach:

- Widely practiced in pediatric trauma
- **criteria for non-operative approach :**
  1. Haemodynamically stable children / adult (not in a shock).
  2. Those patients who do not have any peritoneal findings at any time (no rigidity, no tenderness, just bruising).
  3. Those who did not need more than two units of blood (more than 2 go to OR)

❖ Operative approach:

- Decision to perform splenctomy or splenorraphy is usually made after assessment & grading the splenic injury

❖ Contraindication for splenic salvage: (So, perform splenectomy):

1. The patient has protracted hypotension (Everything is done but there is no response and the patient is still bleeding).
2. Undue delay is anticipated in attempting repair the spleen (if we put a needle patient will bleed)
3. The patient has other severe injuries (in the liver, bowel, or bladder).

Laceration of the spleen, the patient can go with conservative management.

Stage 2 to 3 and there is hematoma but no extravasation so we can go with conservative management

6- Post splenectomy and splenorraphy complications:

❖ Early complications occur such as:

1. Bleeding.
2. Acute gastric distention.
3. Gastric necrosis (short gastric vessels are close to each other so when you ligate them, it might lead to necrosis.)
4. Recurrent splenic bed bleeding.
5. Pancreatitis (remember the tail of pancreas ends at the pelvis of the spleen)
6. Subpherinic abscess.

❖ Late complications occur such as:

1. Thrombocytosis
2. OPSS (1 – 6 Week)
3. DVT

Renal Trauma

1- GENERAL CONSIDERATIONS:

- The commonest organ prone to injury in urinary system.
- If contusion occur , can be treated by conservative therapy .
- If hematuria present , it means poor indicator of severe renal injury (complete or partial kidney damage).

2- Mechanism of Blunt Renal Injury:

- Sports related injury: Blunt injuries to the kidney from helmets, shoulder pads, and knees are described in football.

3- Diagnosis:

❖ **Symptoms and signs (3 Fs) :**

1- Flank abrasion
2- Fracture of the ribs
3- Fracture vertebral transverse process

❖ **Investigation :**

Intravenous urography (IVU) + CT scan

Extravasation and shattered kidney so we do nephrectomy.

4- Management:

Minor injuries >>

US scan , percutaneous drainage , antibiotic usage

Severe injuries >>

partial nephrectomy or total nephrectomy

Shattered Kidney

Summary

- Trauma is the leading cause of death in people aged between 1-35 years.
- The recognition of the mechanism of the injury whether is penetrating or non-penetrating trauma is a greatest importance for treatment and diagnosis and workup therapy.
- The majority of abdominal injuries are due to **blunt abdominal trauma (90%)** secondary to high speed automobile accidents.
- **The primary management of abdominal trauma is determination that an intra abdominal injury EXISTS and operative intervention is required.**
- **Hospital Care and Diagnosis includes :**

1. Primary survey: (ABCDE)
2. Secondary Survey (HISTORY and PHYSICAL EXAMINATION)

- The liver is The commonest organ injured in case of penetrating trauma .
- The spleen is the most commonly injured organ in patients who have suffered blunt abdominal trauma.
- The kidney is the commonest organ prone to injury in the urinary system and If hematuria is present it is an indicator of severe renal injury.

MCQs

1. In abdominal injuries, the most informative initial investigation is:

A. CT
B. Ultrasound
C. Diagnostic peritoneal lavage
D. Abdominal x-ray

2. Blunt trauma to the abdomen most commonly injures which of the following organs?

A. Liver
B. Kidney
C. Spleen
D. Intestines
E. Pancreas

Explanation: The diagnosis of injuries resulting from blunt abdominal trauma is difficult; injuries are often masked by associated injuries. Thus, trauma to the head or chest, together with fractures, frequently conceals intra-abdominal injury. Apparently trivial injuries may rupture abdominal viscera in spite of the protection offered by the rib cage. The structures most likely to be damaged in blunt abdominal trauma are, in order of frequency, the spleen, kidney, intestine, liver, abdominal wall, mesentery, pancreas, and diaphragm.

Abdominal paracentesis is a rapid, sensitive diagnostic test for patients with suspected intra-abdominal injury and may be extremely helpful in the management of patients with associated head, thoracic, or pelvic trauma in whom signs and symptoms of the abdominal injuries may be masked or overlooked. Abdominal CT scans, which should be done promptly and rapidly, are being used more frequently to evaluate these injuries.

3. Which of the following conditions is most likely to follow a compression- type abdominal injury?

A. Renal vascular injury
B. Superior mesenteric thrombosis
C. Mesenteric vascular injury
D. Avulsion of the splenic pedicle
E. Diaphragmatic hernia

Explanation: In the rapid deceleration injury associated with automobile crashes, the abdominal viscera tend to continue moving anteriorly after the body wall has been stopped. These organs exert great stress upon the structures anchoring them to the retro-peritoneum. Intestinal loops stretch and may tear their mesenteric attachments, injuring and thrombosing the superior mesenteric artery; kidneys and spleen may similarly shear their vascular pedicles. In these injuries, however, ordinarily the intra-abdominal pressure does not rise excessively and diaphragmatic hernia is not likely. Diaphragmatic hernia is primarily associated with compression-type abdominal or thoracic injuries that increase intra-abdominal or intra-thoracic pressure sufficiently to tear the central portion of the diaphragm.

Ans:
1:C
2:C
4:E

Thank You..

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