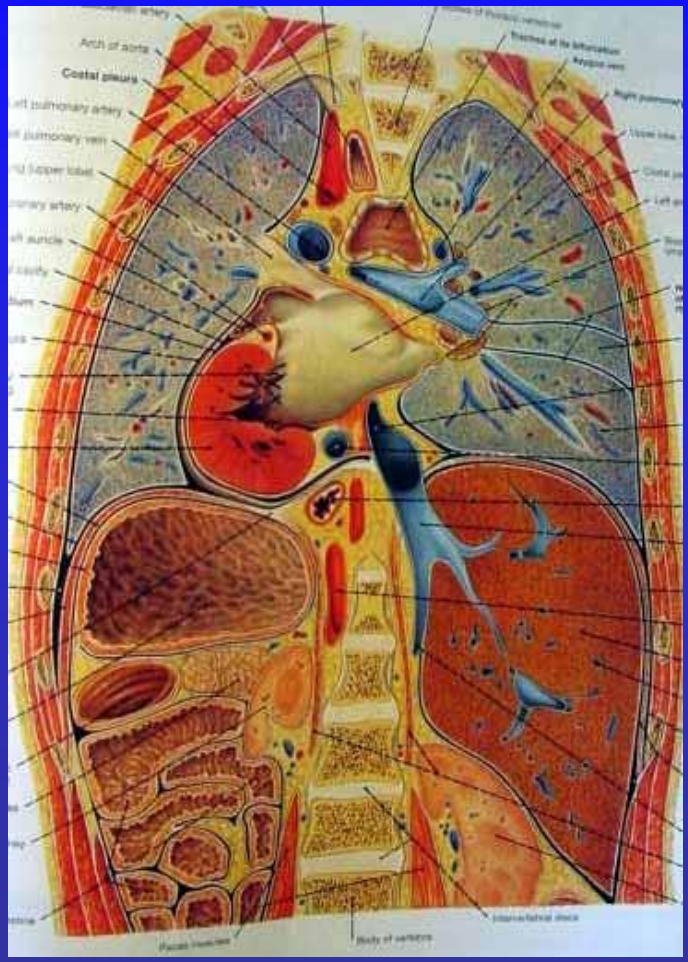
Abdominal Trauma

William Schecter, MD

Torso Trauma

- Both the spleen and the liver are located within the thoracic cage
- Lower rib fractures are frequently associated with liver and spleen injuries
- The diaphragm changes its position during the respiratory cycle.
- Penetrating chest injuries below the 5th intercostal space may traverse the diaphragm and enter the peritoneal cavity



Injury to Abdomen or Chest?

http://www.trauma.org/imagebank/imagebank.html

Initial Approach to the Abdominal Patient

- Primary Survey
  - A,B,C,D,E –
- Stage of Resuscitation
  - Re-evaluation of ABC –
  - Monitors –
  - Gastric tube and Foley Catheter –
  - X-Rays: Chest, Pelvis (blunt trauma), –
  - C/Spine (blunt trauma, ?) –

Careful Abdominal Exam takes place in the Secondary Survey

Secondary Survey of the Abdomen

- Inspection
- Palpation
- Percussion
- Auscultation

Inspection

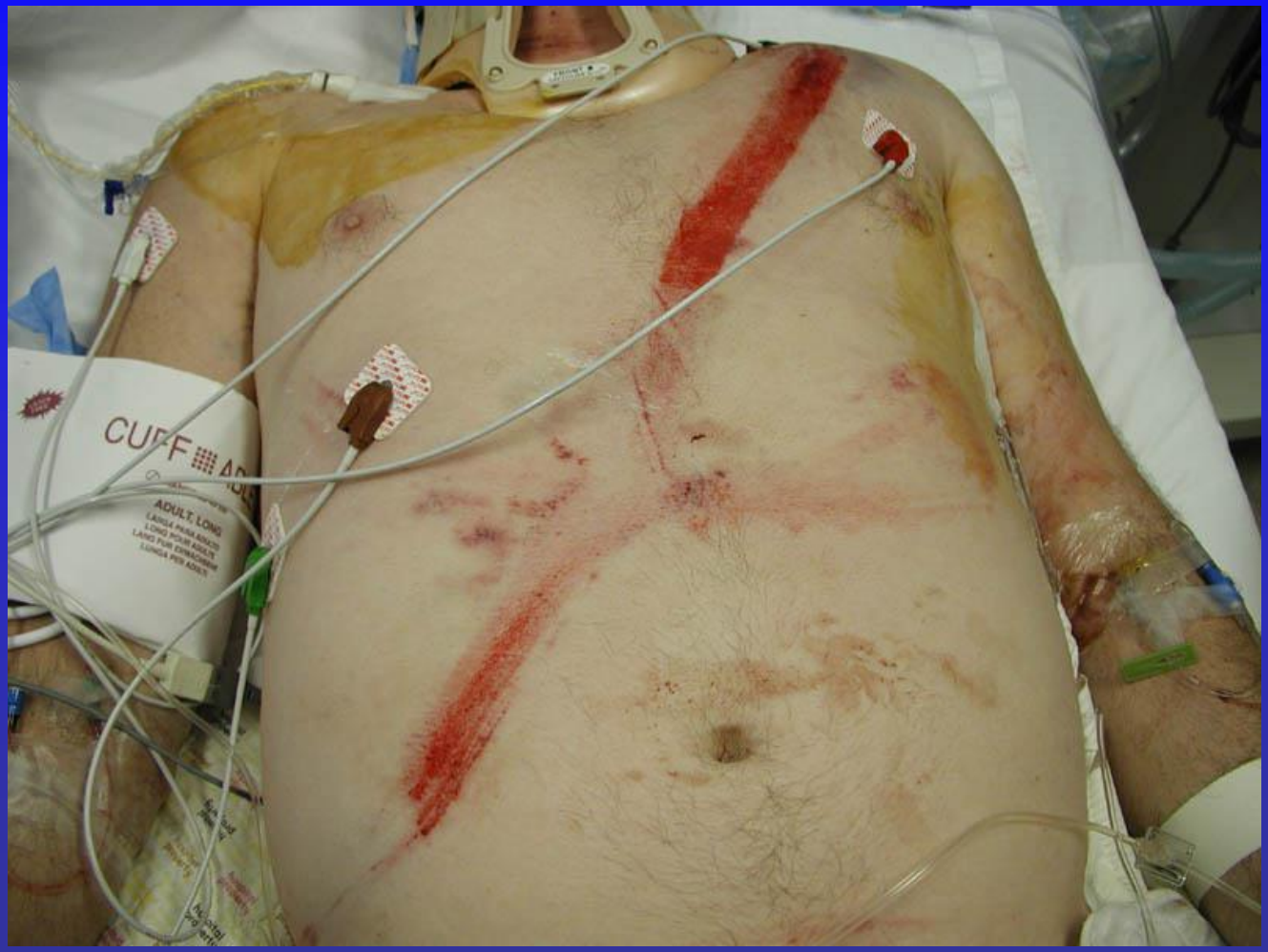
- Is the Abdomen distended or flat?
- Are there external signs of trauma?
- Are there any wounds in the back or perineum?

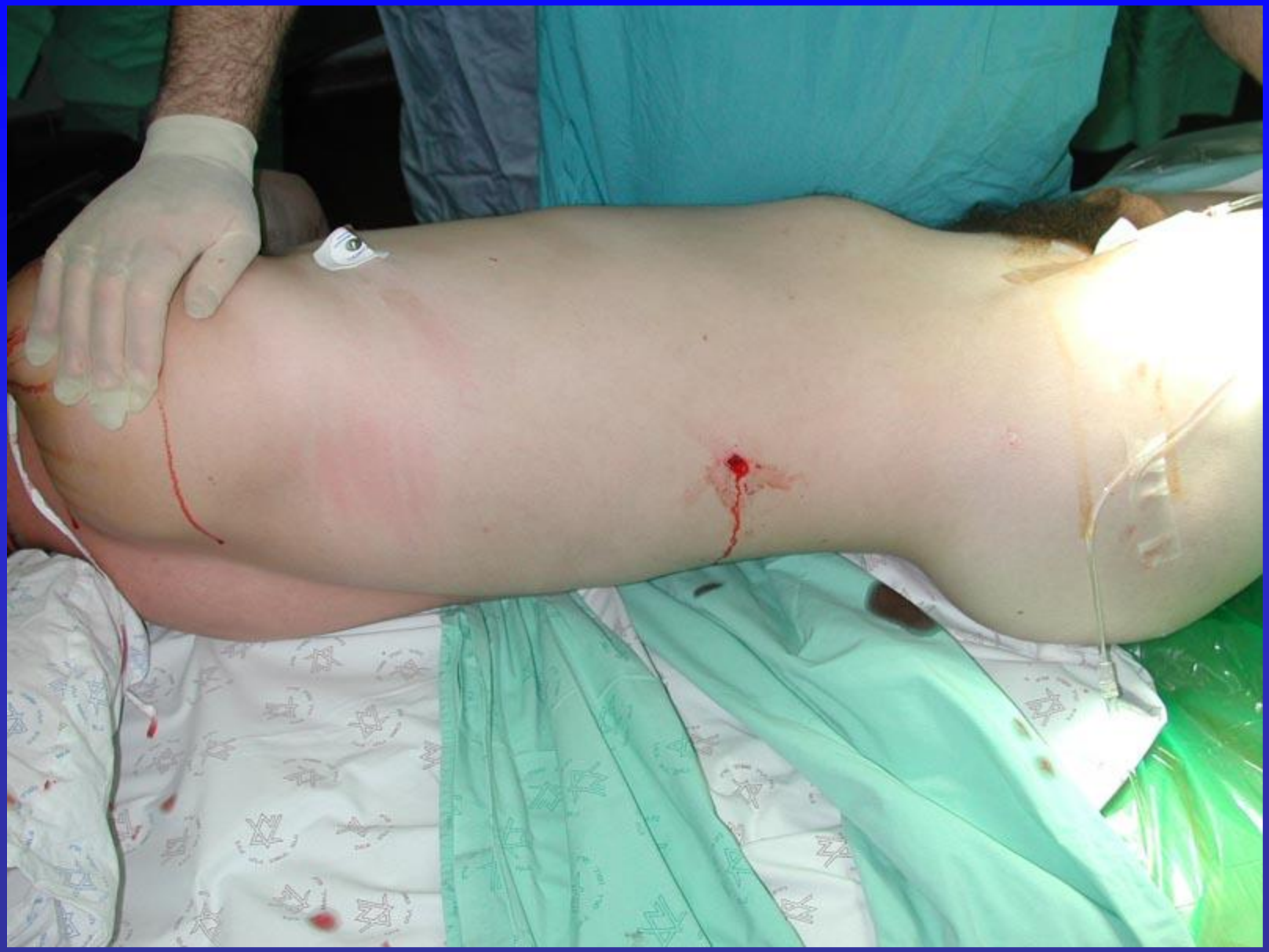
Evaluation of the Injured Abdomen

Inspection

http://www.trauma.org/abdo/pat.html

Seat Belt Sign





http://www.trauma.org/imagebank/imagebank.html

Palpation

- Cough tenderness?
- Pain to light tapping over an umbilical or ventral hernia?
- Gentle touch
- Palpation
- Search for rebound tenderness

Percussion

- Provides a graded stimulus which is useful in peritoneal stimulation
- Can be used to detect tympany
- Useful to detect an enlarged liver or a distended bladder

Auscultation

- Not particularly helpful in the trauma room
- May be useful to detect bowel obstruction (high pitched sounds and “rushes”)
- A “quiet” abdomen may suggest peritonitis but this finding is unreliable.

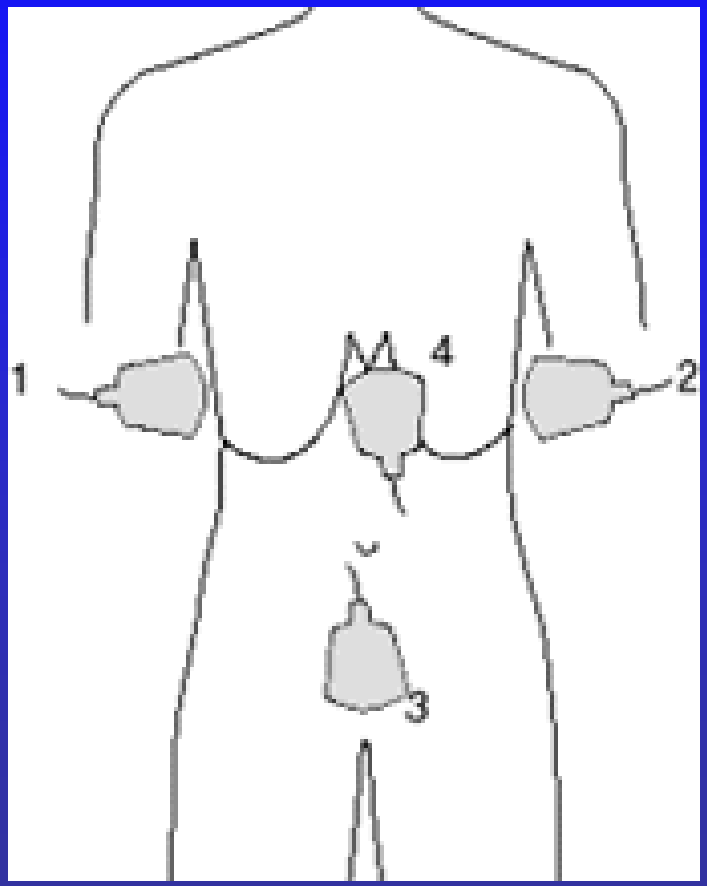
Questions re: the Abdomen in the Secondary Survey

- Is there blood in the peritoneal cavity
- Is there blood in the retroperitoneum
- Are there intestinal contents in the peritoneal cavity
- Is there a hole in a retroperitoneal hollow viscus
- Is there a solid organ injury?
- Is there an injury to the genitourinary tract?

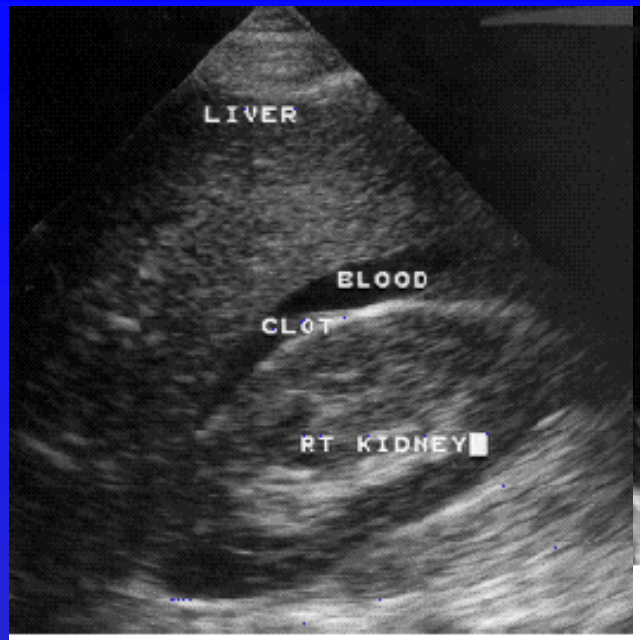
Is there blood in the peritoneal cavity?

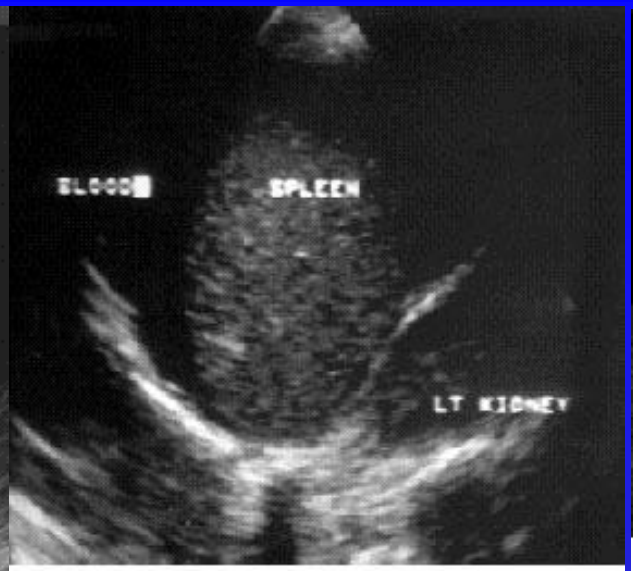
- FAST
- DPL (Diagnostic Peritoneal Lavage)
- Abdominal CT Scan

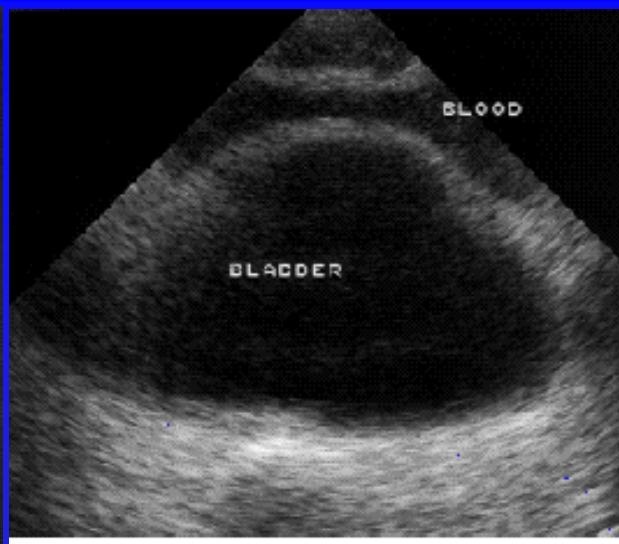
Focused Abdominal Sonography for Trauma (FAST)

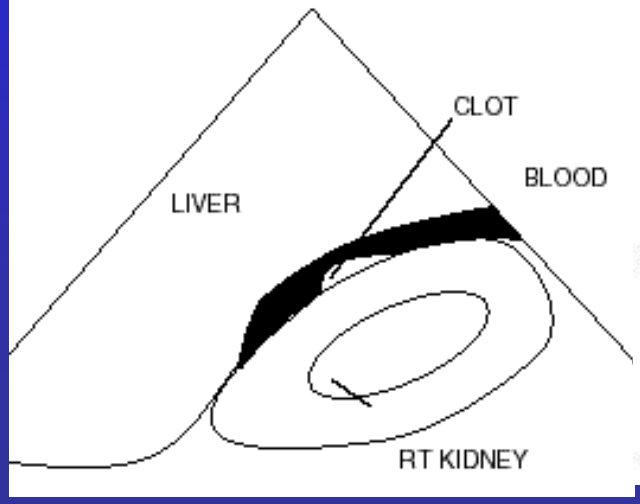


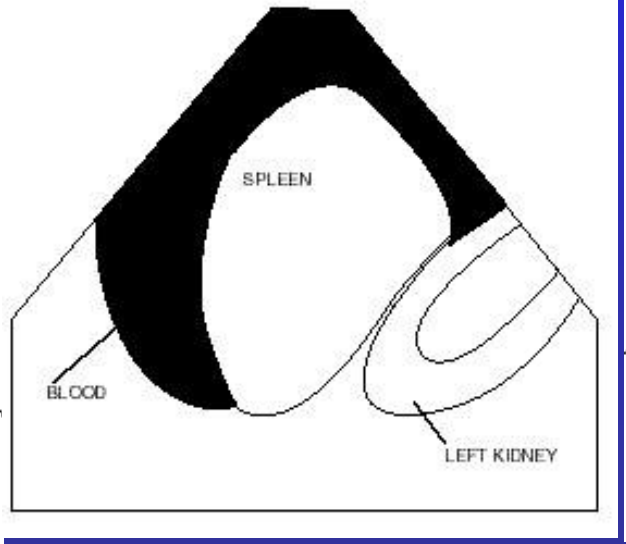
http://www.eastbaytrauma.org/Protocols/ER%20protocol%20pages/FAST-files/FAST-pelvis-1.htm

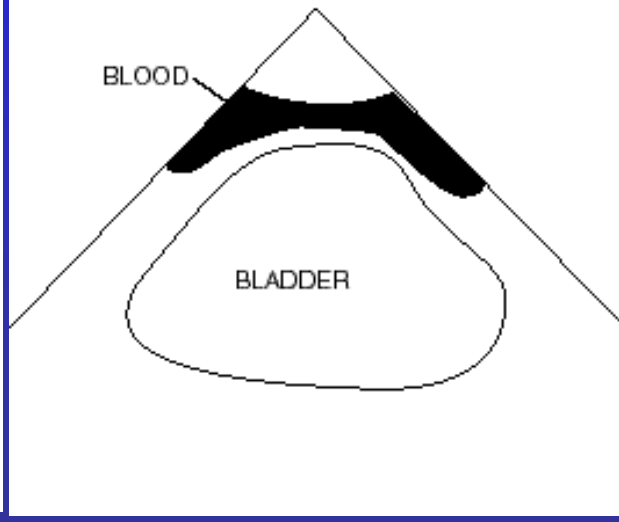










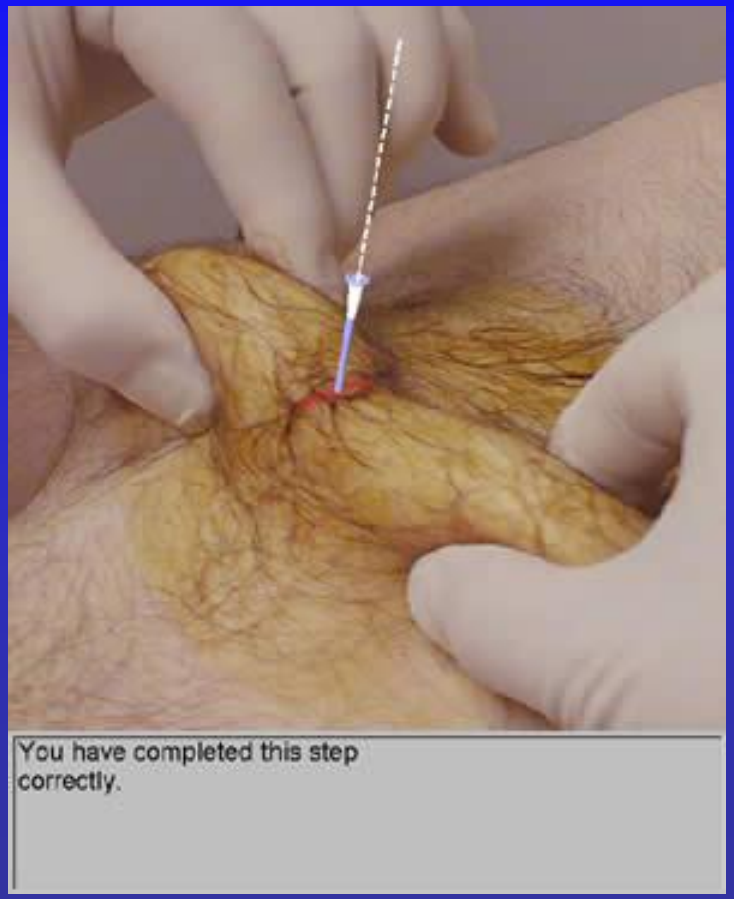


RUQ

LUQ

Pelvis

Diagnostic Peritoneal Lavage



http://www.simcen.org/surgery/projects/dpl/

What is a positive diagnostic peritoneal lavage?

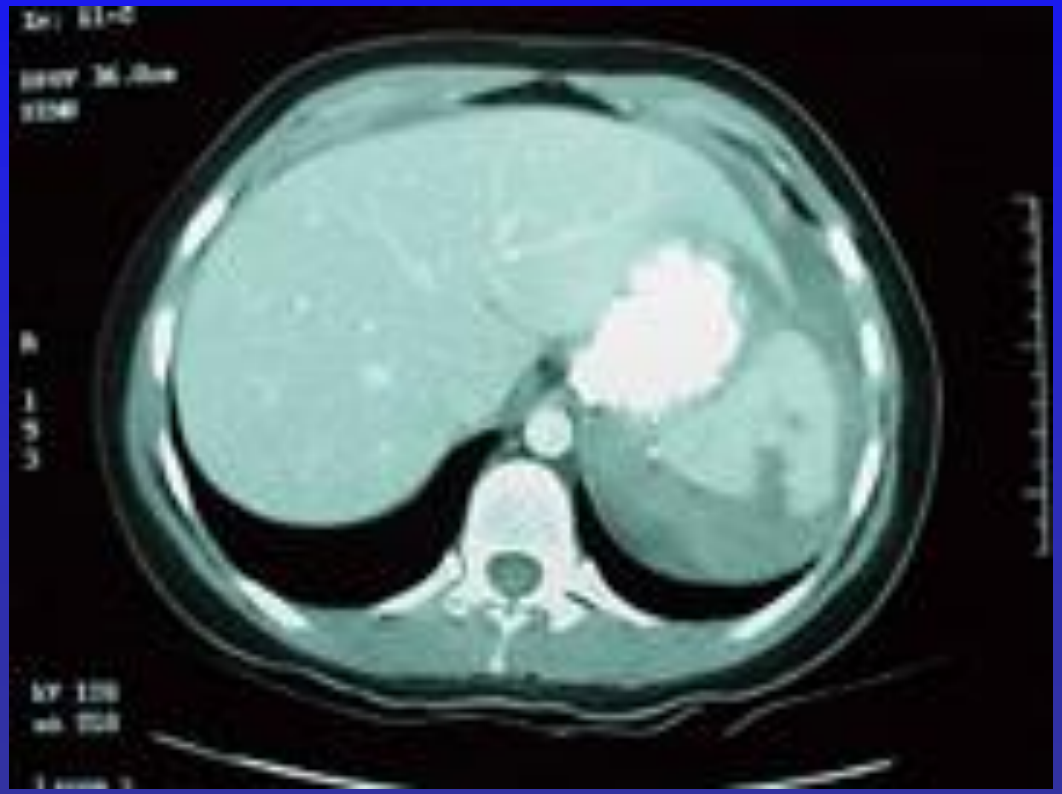
- Gross blood?
- 100,000 RBC/mm^3
- 175 units of amylase/mm^3
- Intestinal Contents

As we accept lower cell counts, the sensitivity increases but the clinical accuracy decreases

Is the DPL positive???

1 cc of blood injected into 1 liter of saline

CT Scan-Blood in Peritoneal Cavity due to Ruptured Spleen



Is there blood in the Retroperitoneum

- AP Pelvis
- CT Scan

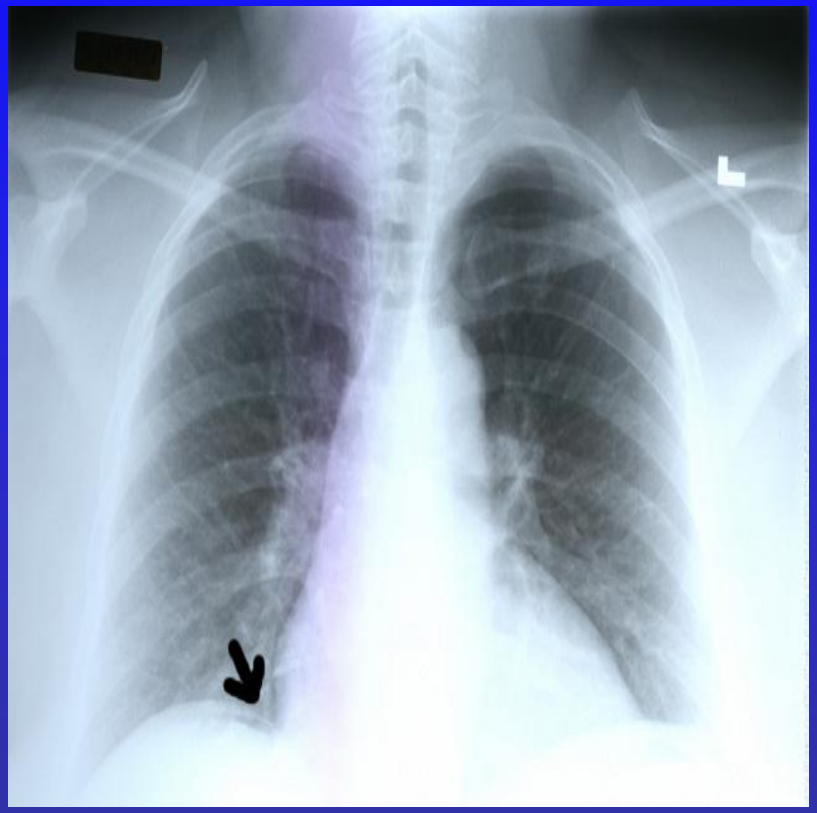
Are there intestinal contents in the peritoneal cavity

- Physical Exam
  - Unreliable in the unconscious, elderly, paraplegic or sedated patient
- Upright Chest X-ray
  - free air under diapghragm?
- CT Scan
  - Fluid in the peritoneal cavity?
- DPL
  - Elevated wbc, amylase, presence of bile or intestinal contents
- Exploratory Laparotomy

Physical Exam

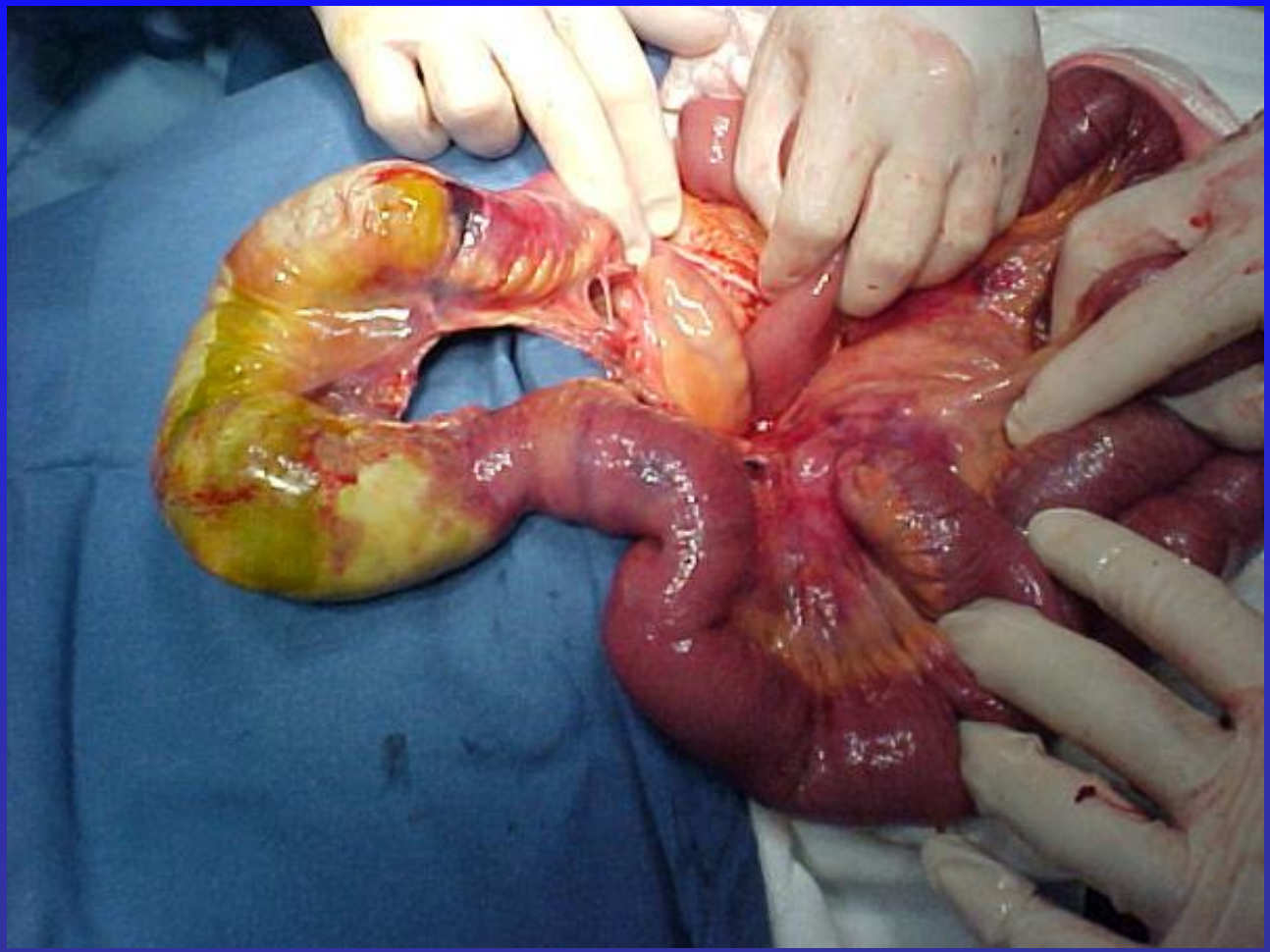
- Abdominal Distention
- Guarding
- Rebound Tenderness

Free Air under Diaphragm



http://www9.uchc.edu/curriculum_pub/swp/mirna/AirdiaphragmDream.html

Ischemic Bowel due to late diagnosis of mesenteric laceration

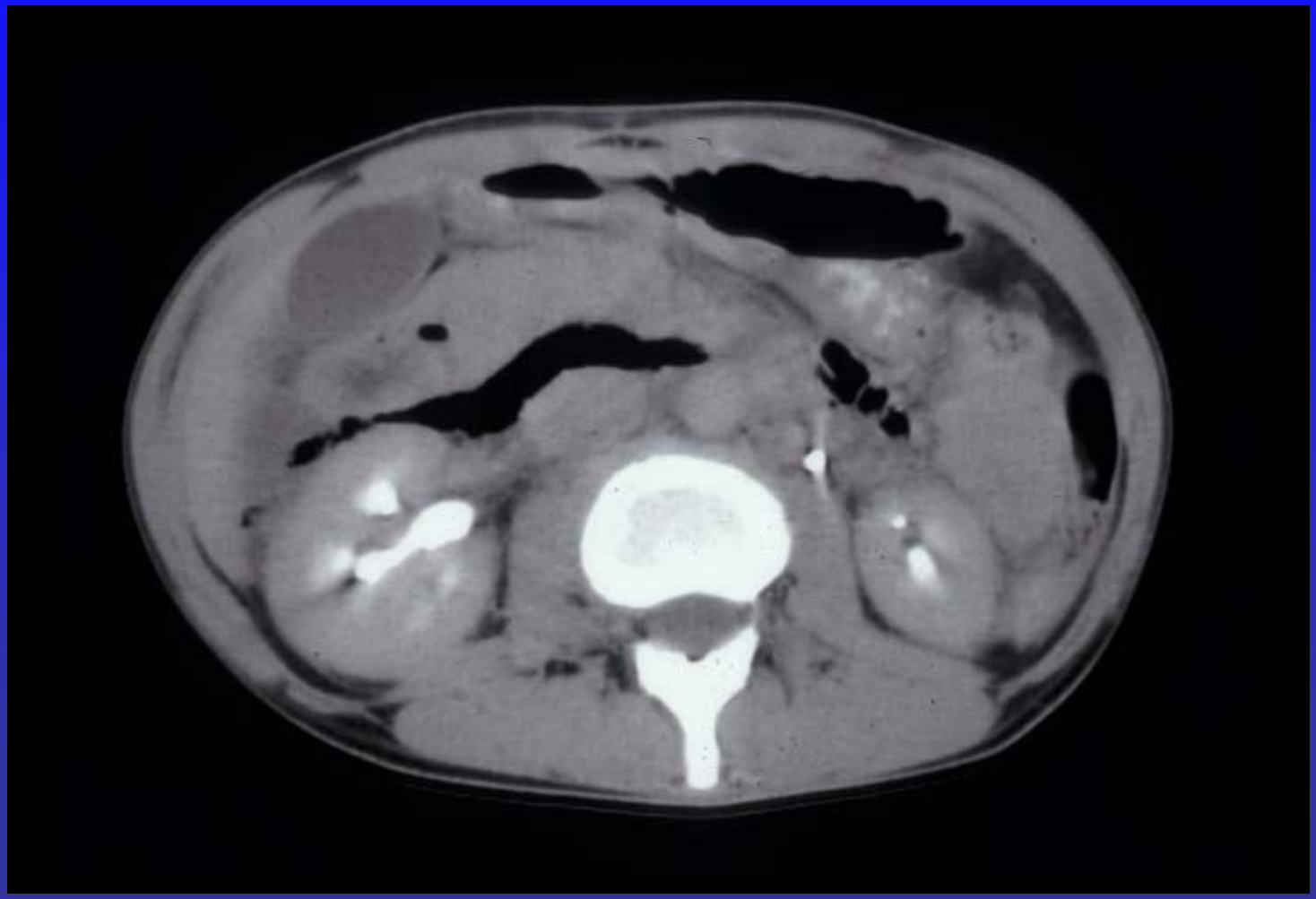


http://www.trauma.org/imagebank/imagebank.html

Is there a hole in a retroperitoneal hollow viscus

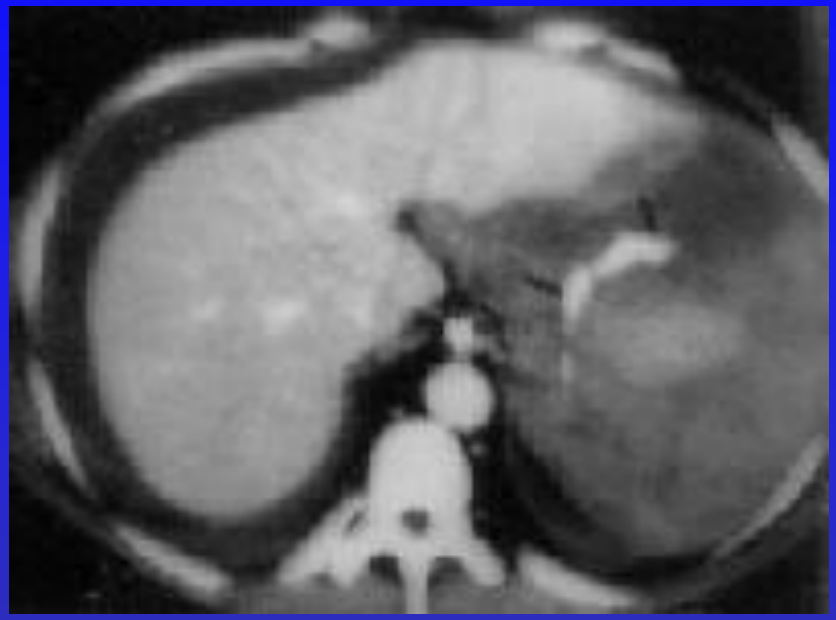
- Duodenum, colon, rectum
- High index of suspicion
- Plain film of abdomen
- CT Scan
- Proctoscopy
- Exploratory Laparotomy

Retroperitoneal Air to due blunt injury to duodenum



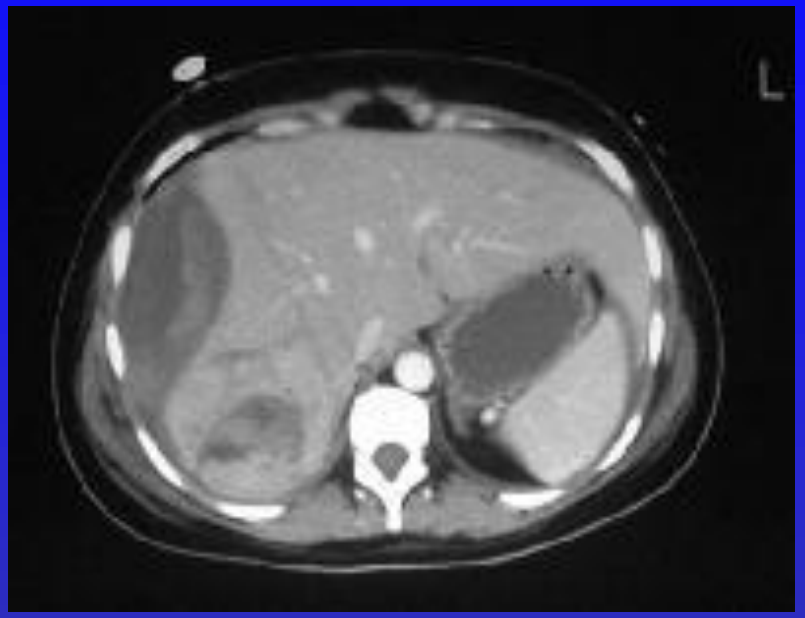
Is there a solid organ injury?

- Spleen
  - CT excellent
  - Ultrasound +/-
- Liver
  - CT excellent
  - Ultrasound +/-
- Pancreas
- CT +/-
  - ERCP excellent
  - Ultrasound useless except for pseudocyst (a late finding)



http://www.emedicine.com/radio/topic645.htm

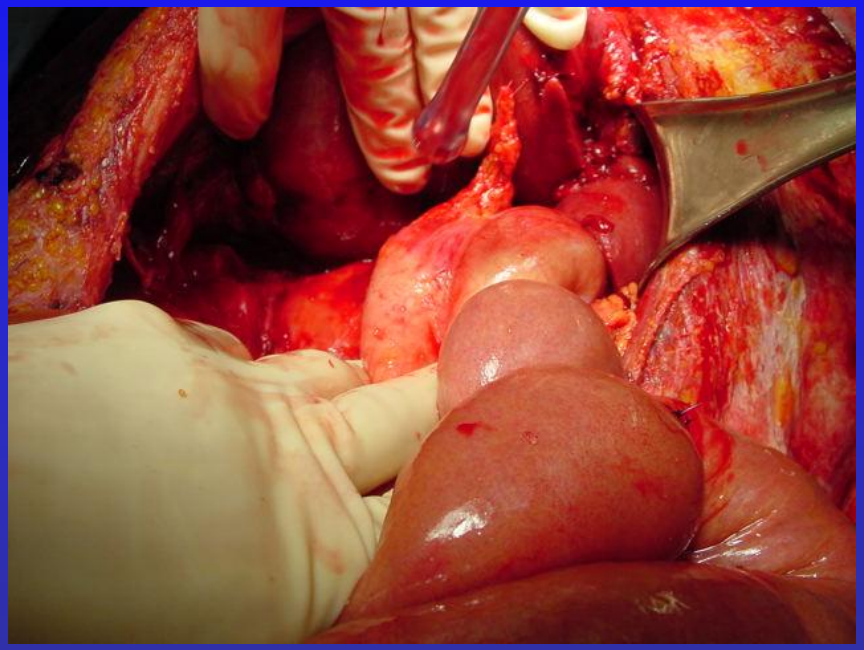
Splenic Injury

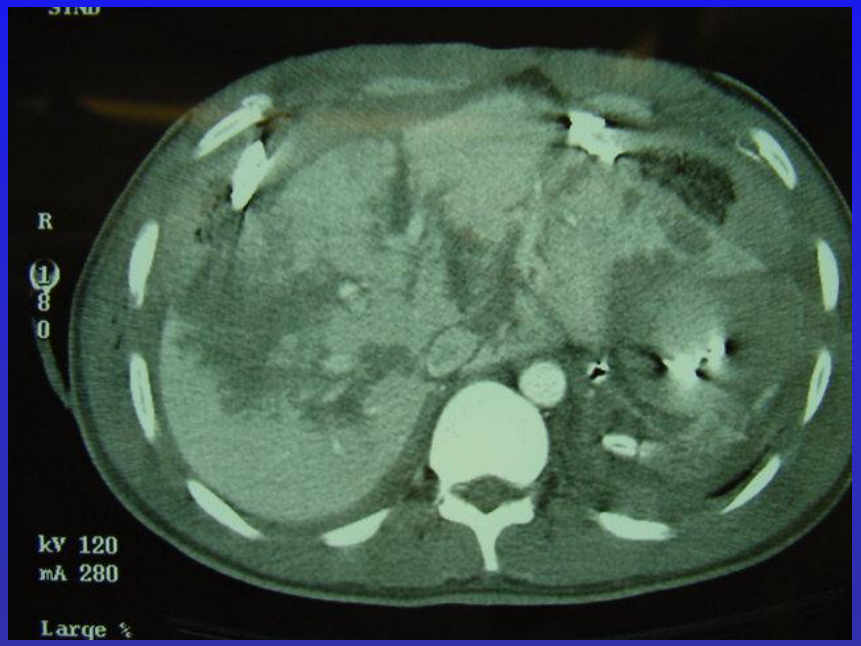


http://www.emedicine.com/radio/topic397.htm

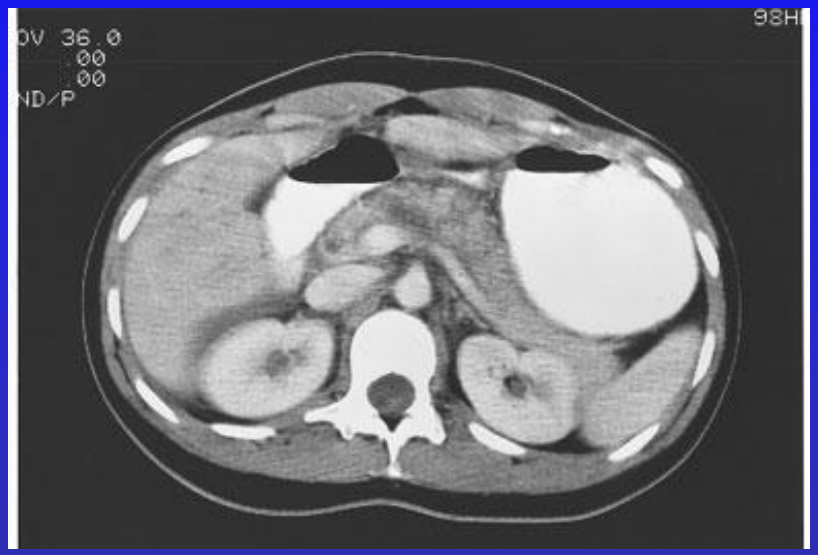
Liver Injury

Liver Injury: Clinical vs CT Findings

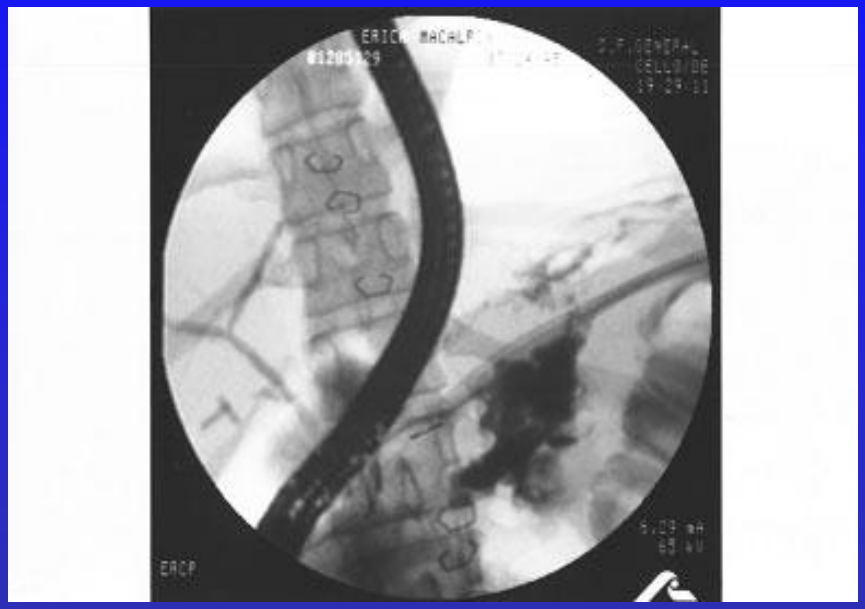




Pancreatic Injury due to blunt trauma



Mild edema of body of pancreas



Extensive extravasation
Rx- distal pancreatectomy

Distal Pancreatectomy

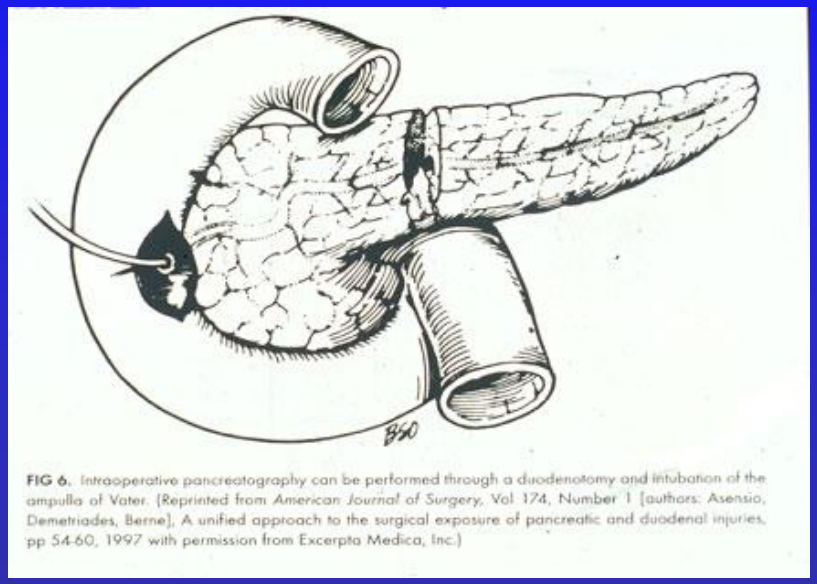
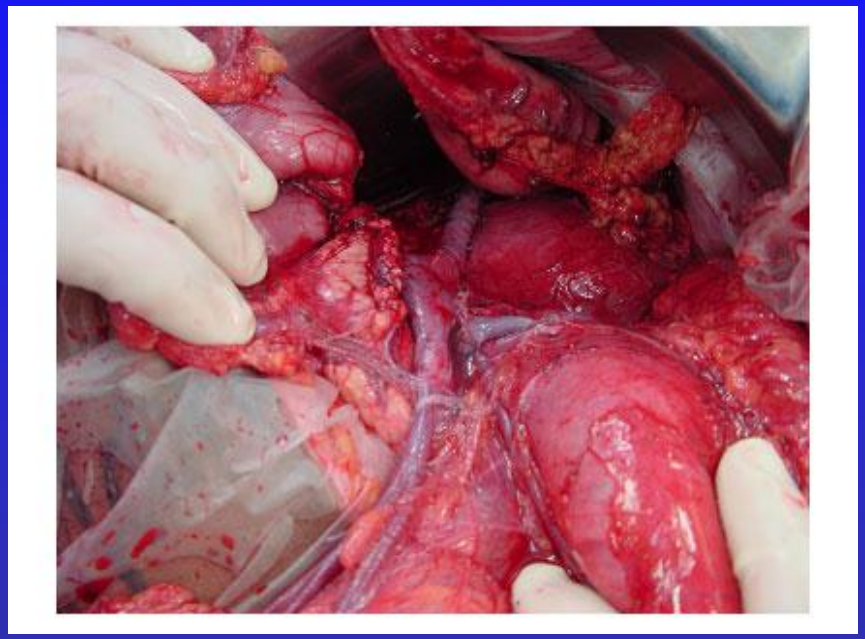


FIG 6. Intraoperative pancreatography can be performed through a duodenotomy and intubation of the ampulla of Vater. (Reprinted from *American Journal of Surgery*, Vol 174, Number 1 [authors: Asensio, Demetriades, Berne], A unified approach to the surgical exposure of pancreatic and duodenal injuries, pp 54-60, 1997 with permission from Excerpta Medica, Inc.)

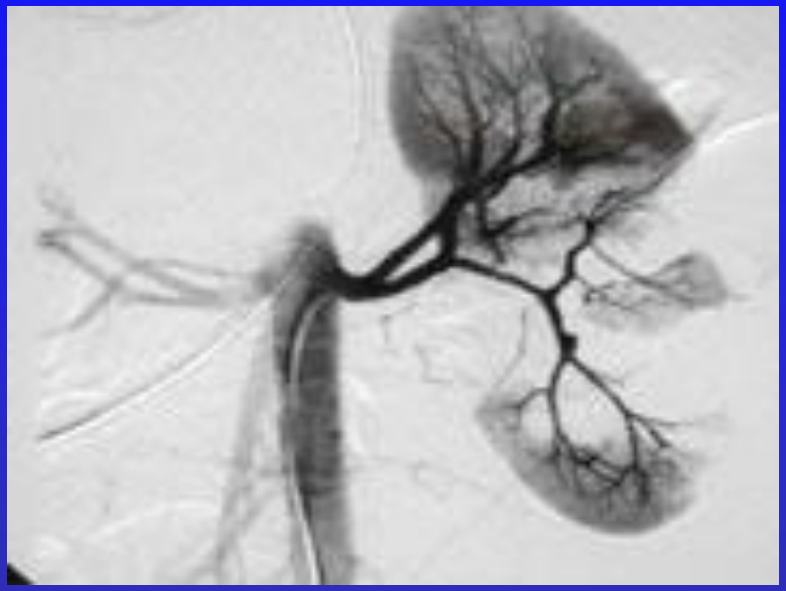


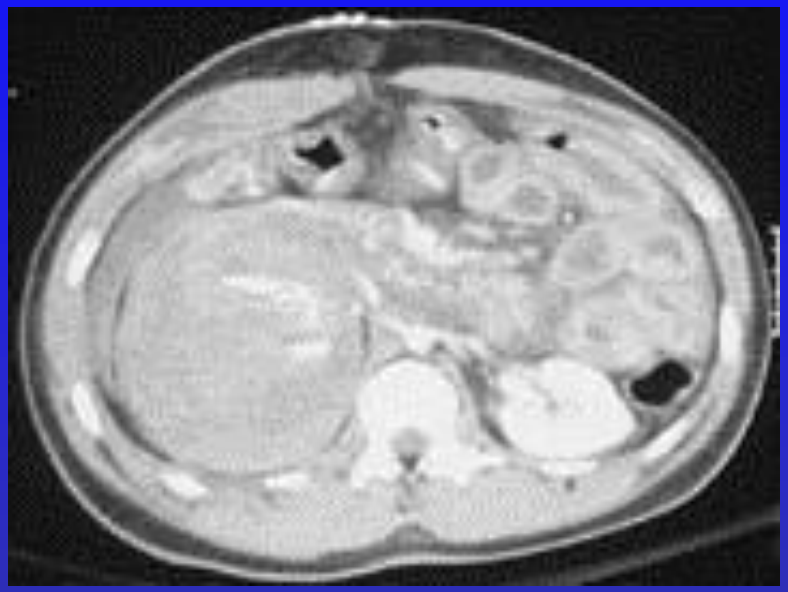
Distal Pancreatectomy with Preservation of the Spleen

Is there an injury to the Genitourinary tract?

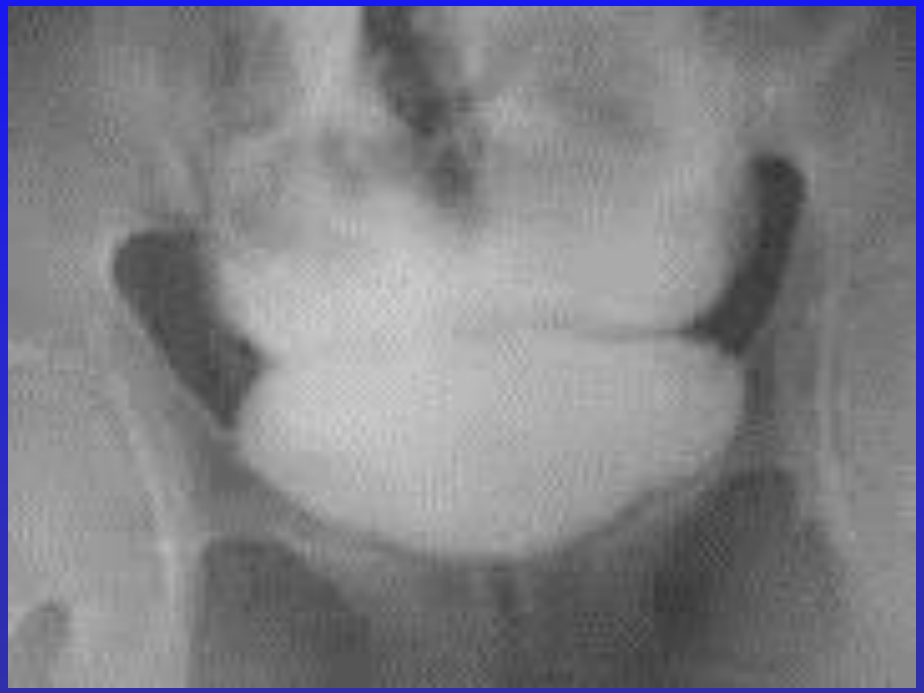
- CT with iv contrast excellent for kidney and ureter but NOT bladder—Patient must have a retrograde cystogram (CT retrograde cystogram ok)
- Retrograde urethrogram if
  - Blood at the urethral meatus
  - High riding prostate on rectal exam
  - Edema in perineum

Renal Trauma



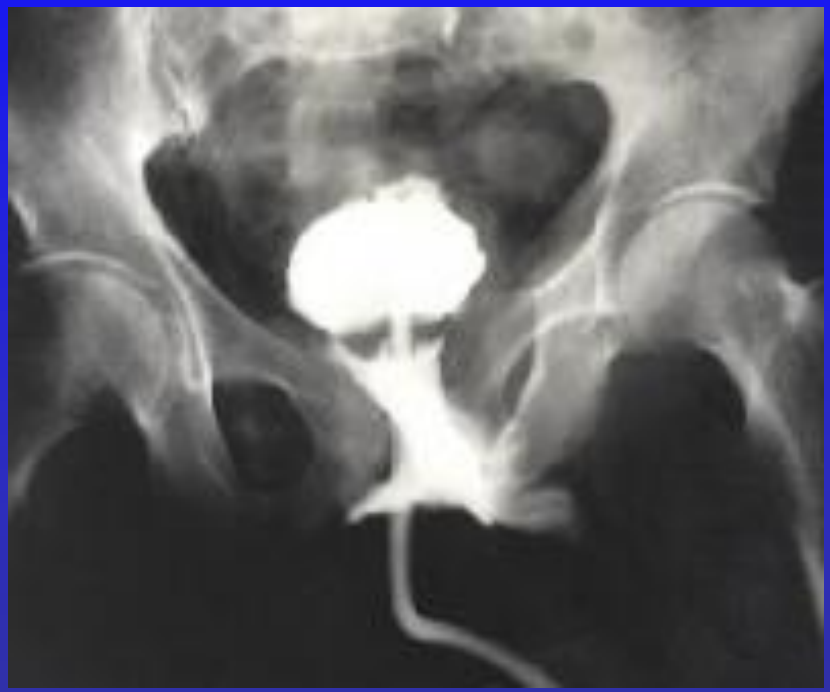


http://www.trauma.org/imagebank/imagebank.html



Ruptured Bladder

http://www.trauma.org/imagebank/imagebank.html



Ruptured Urethra

http://www.emedicine.com/MED/topic3082.htm

Why do a Single Shot IVP

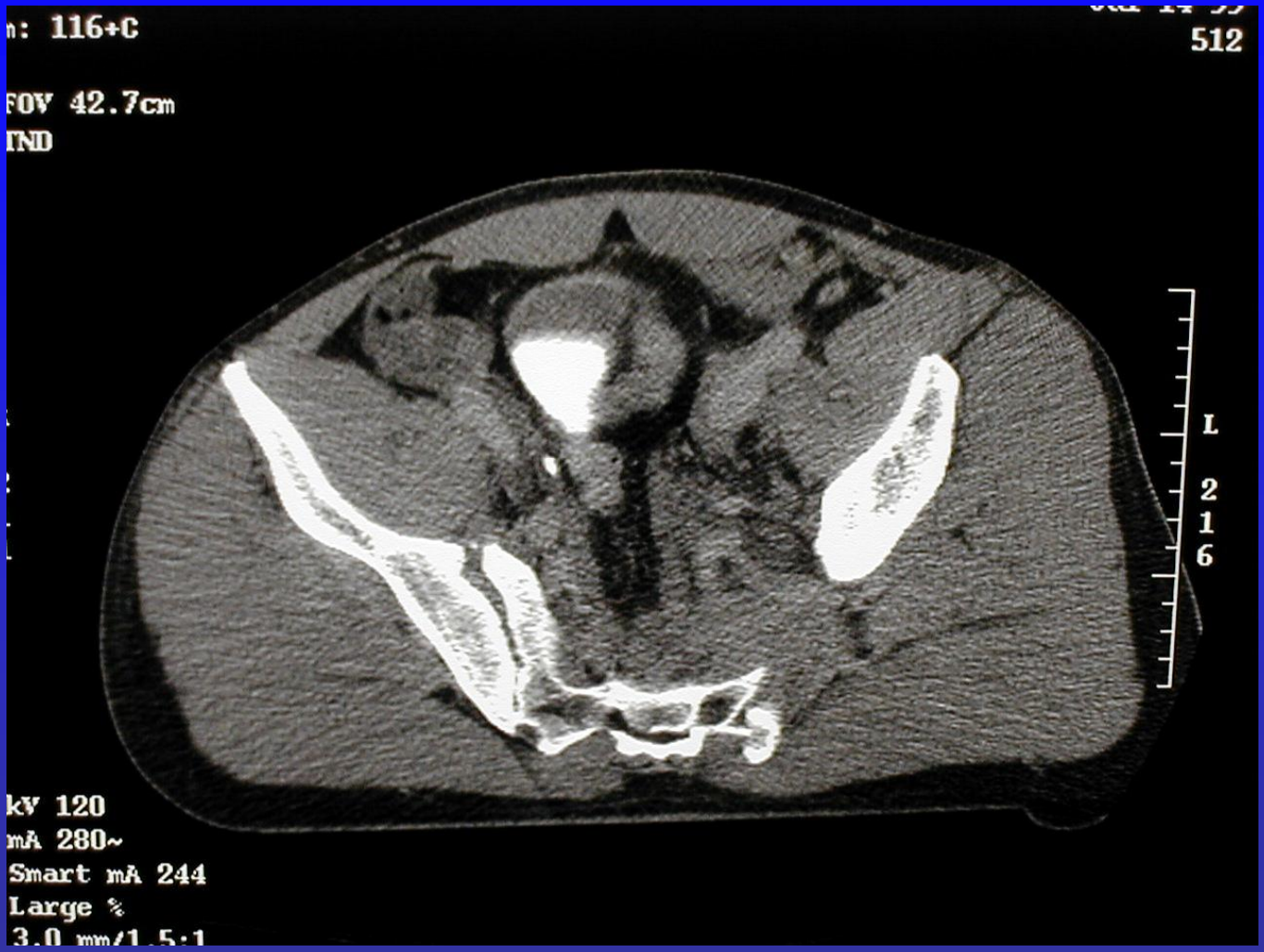
- Patient in shock with penetrating wound to abdomen going straight to OR
- Question: If a nephrectomy is necessary on one side, does the patient have a functioning contralateral kidney?
- Answer: Single shot IVP with 150 cc of contrast (in an adult), Flat plate of the abdomen 10 minutes later. If bilateral nephrograms are present, patient has 2 functioning kidneys.

Most Common Clinical Dilemma

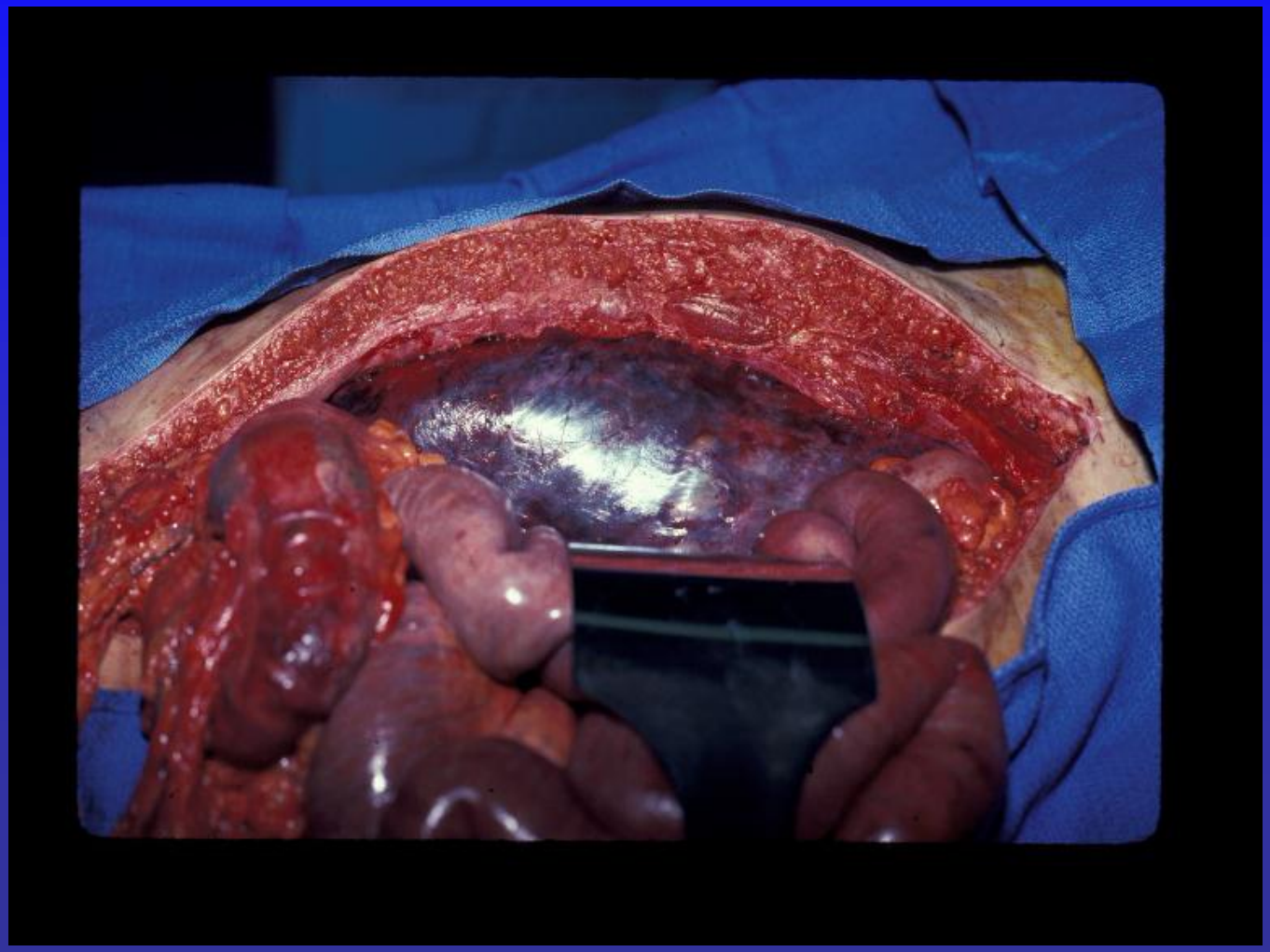
- Patient in shock
- Multiple Trauma
- Severe pelvic fracture
- Question: Is the source of hemorrhage intraperitoneal or retroperitoneal?
- Question: OR or Angiography??

Diagnostic Options

- FAST Exam (Ultrasound exam of abdomen)
- CT Scan of Abdomen
- DPL (Diagnostic peritoneal lavage)
- Angiography
- Laparotomy (based on “surgical intuition”)

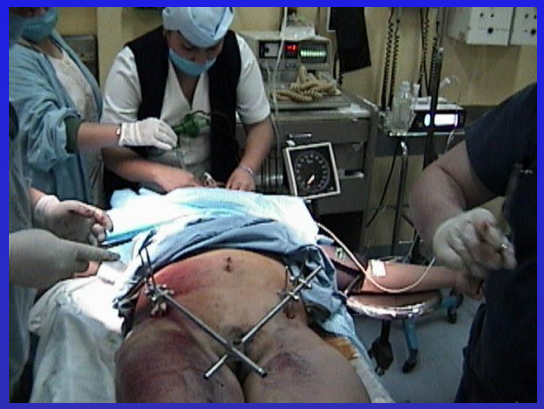

n: 116+C
512
FOV 42.7cm
IND
L
2
1
6
kV 120
mA 280~
Smart mA 244
Large %
3.0 mm/1.5:1

Supraumbilical DPL if Pelvic Fracture is present

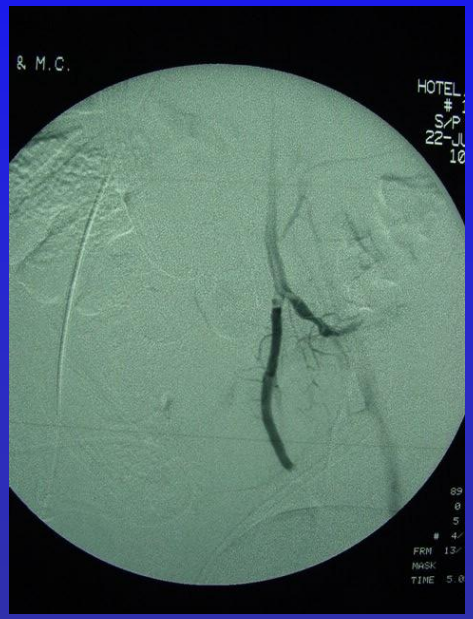


Controversy: Control Pelvic Fracture bleeding by :

Pelvic Binder



External Fixator



Embolization

http://www.trauma.org/imagebank/imagebank.html

21 year old man involved in bar brawl at approximately 04:00 on 22-6-03
Beaten and run over by his assailants
Patient dragged under auto 3-4 city blocks
GCS in field 3

Emergency Room

- BP=0, P=0, Breathing spontaneously, GCS=6, EKG=Sinus tachycardia
- Traumatic amputation left arm
- Near amputation right leg
- Open left pelvic fracture
- Subcutaneous air right chest
- 3rd degree road burn anterior abdomen

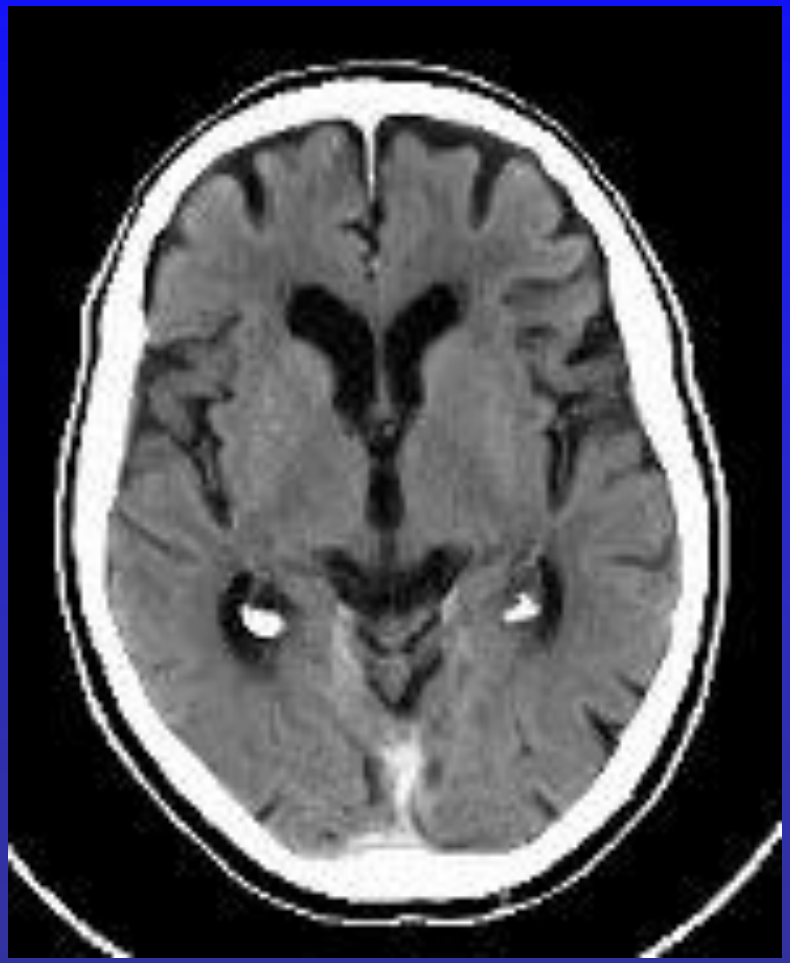
Operating Room

- Intubated
- Right tube thoracostomy
- Ligation of bleeding vessels left upper arm stump
- Laparotomy: splenectomy, packing of liver, (abdomen left open)
- ICP bolt insertion: ICP=11
- Washout open left iliac fracture, left femur fracture (grade 2) and left tibia fracture (3B)

Operating Room

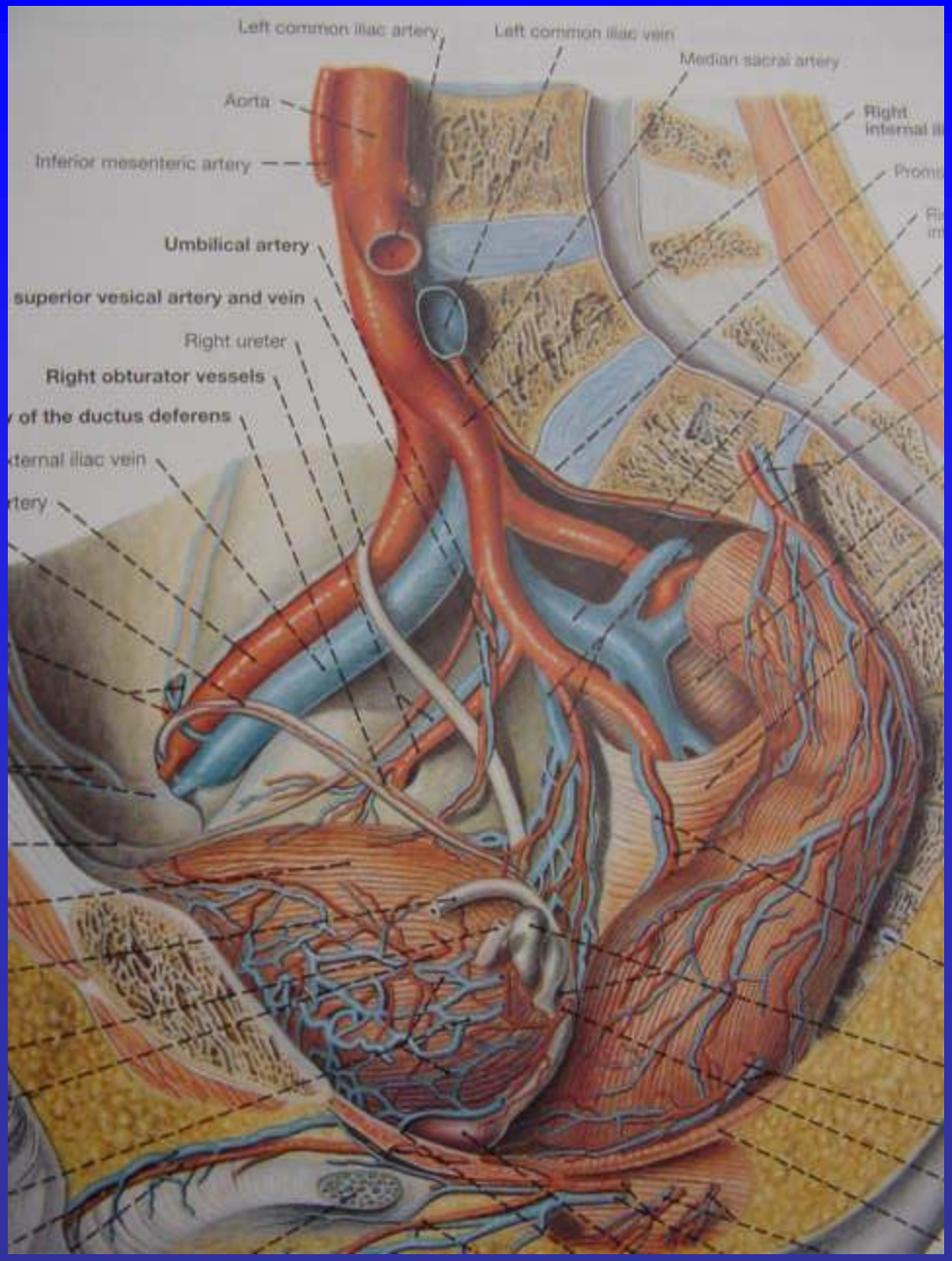
- External fixators applied to femur and tibia
- Eschar debrided from anterior abdominal wall
- QUESTION: Where do we go from here?
  - ICU?
  - CT?
  - Angiography?

Head CT

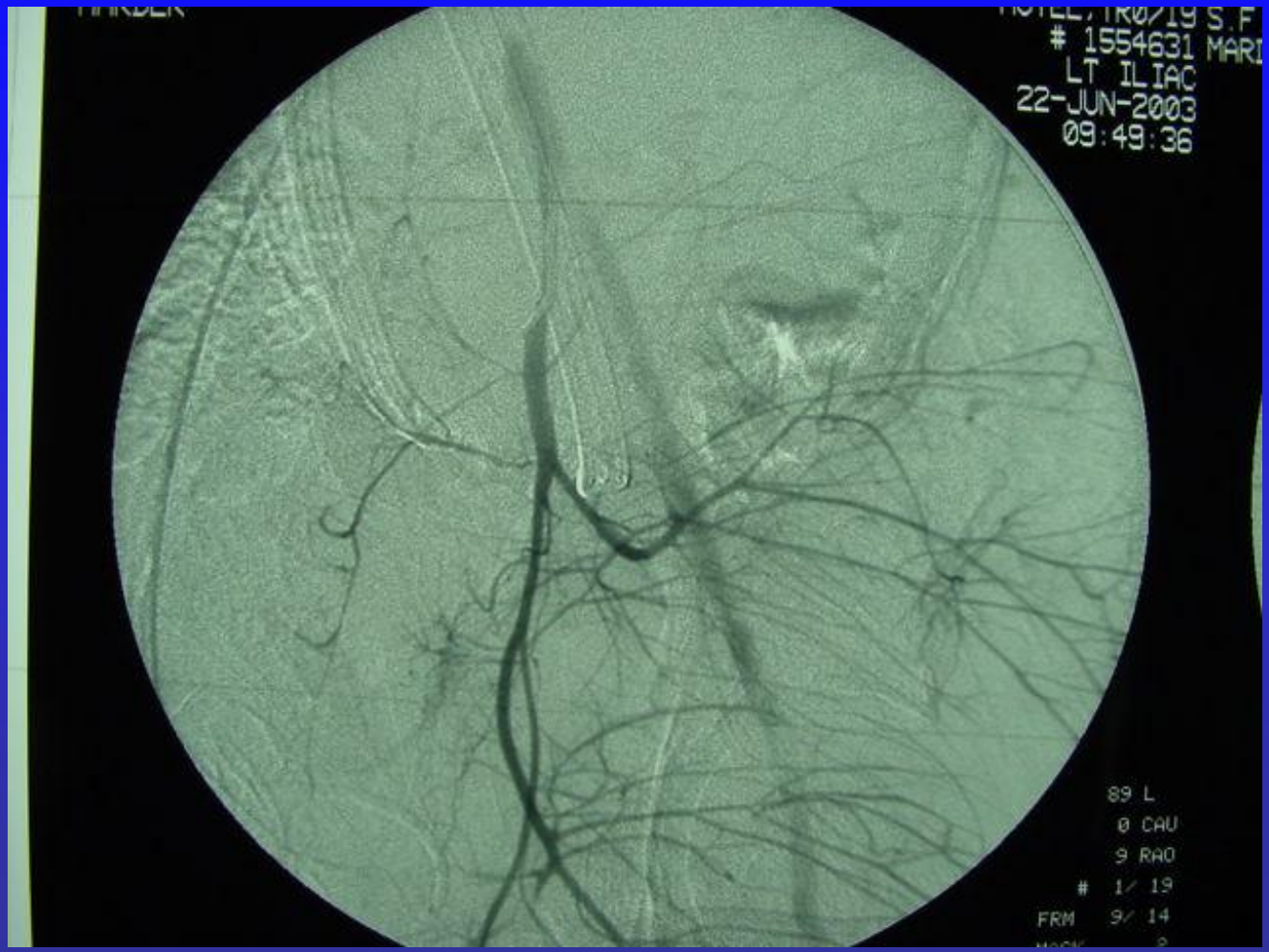


- Normal
- ***Rationale for Head CT****: Bleeding relatively controlled-If unsurvivable head injury: withhold further diagnostic and therapeutic procedures*

http://www.imaginis.com/ct-scan/history.asp

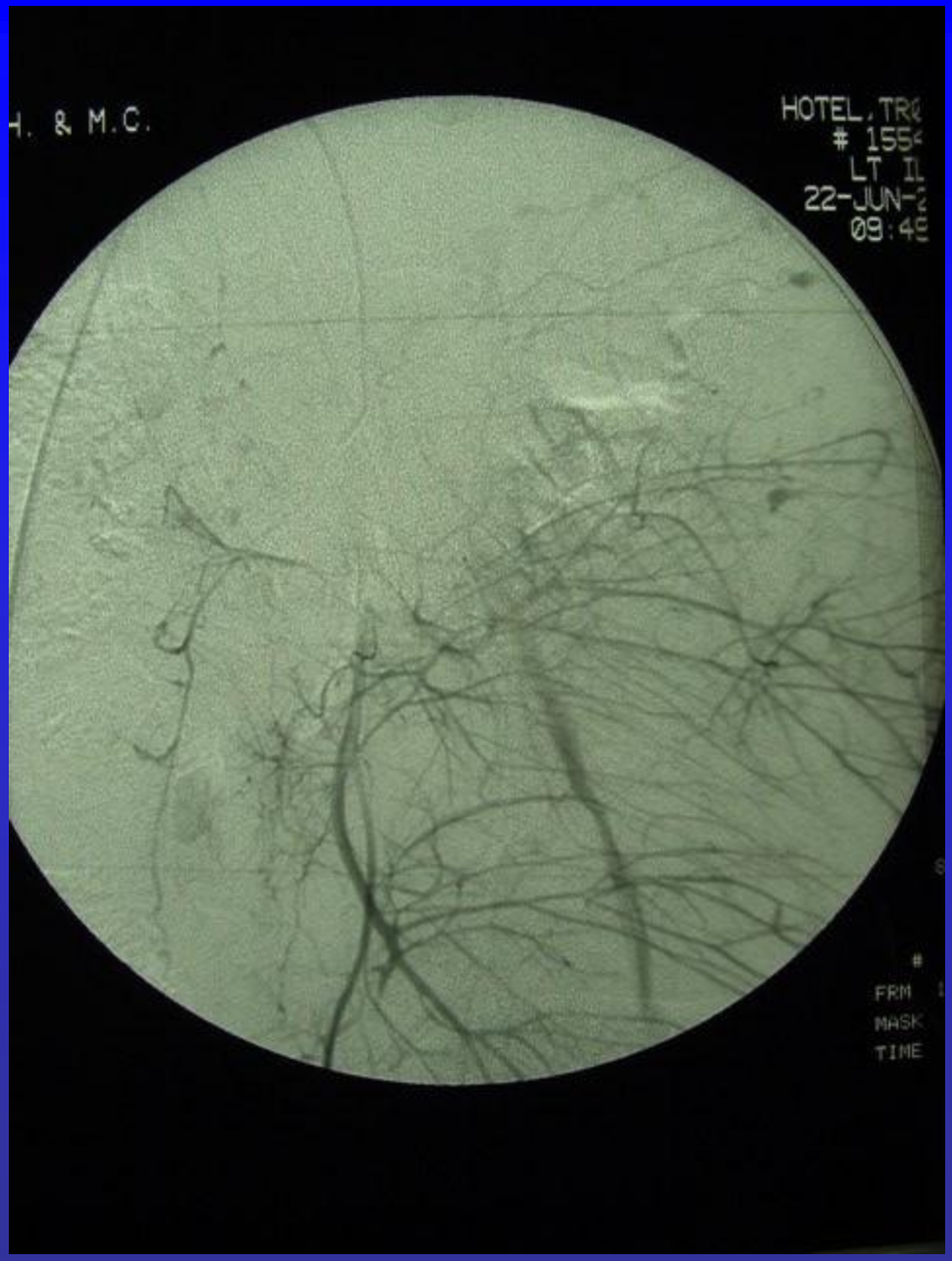

Left common iliac artery
Left common iliac vein
Median sacral artery
Aorta
Inferior mesenteric artery
Umbilical artery
superior vesical artery and vein
Right ureter
Right obturator vessels
of the ductus deferens

Pelvic Angiogram

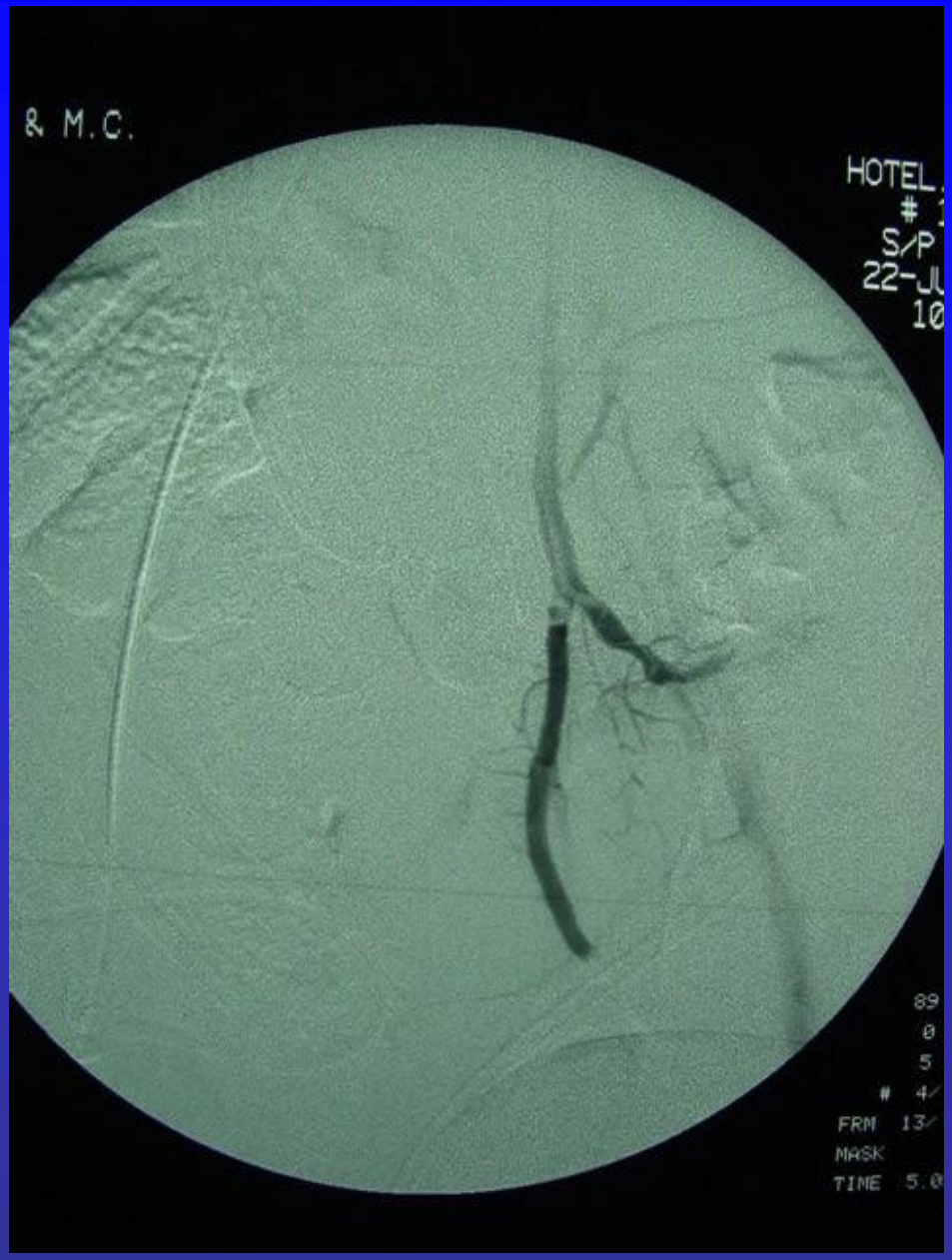


External and internal iliac arteries

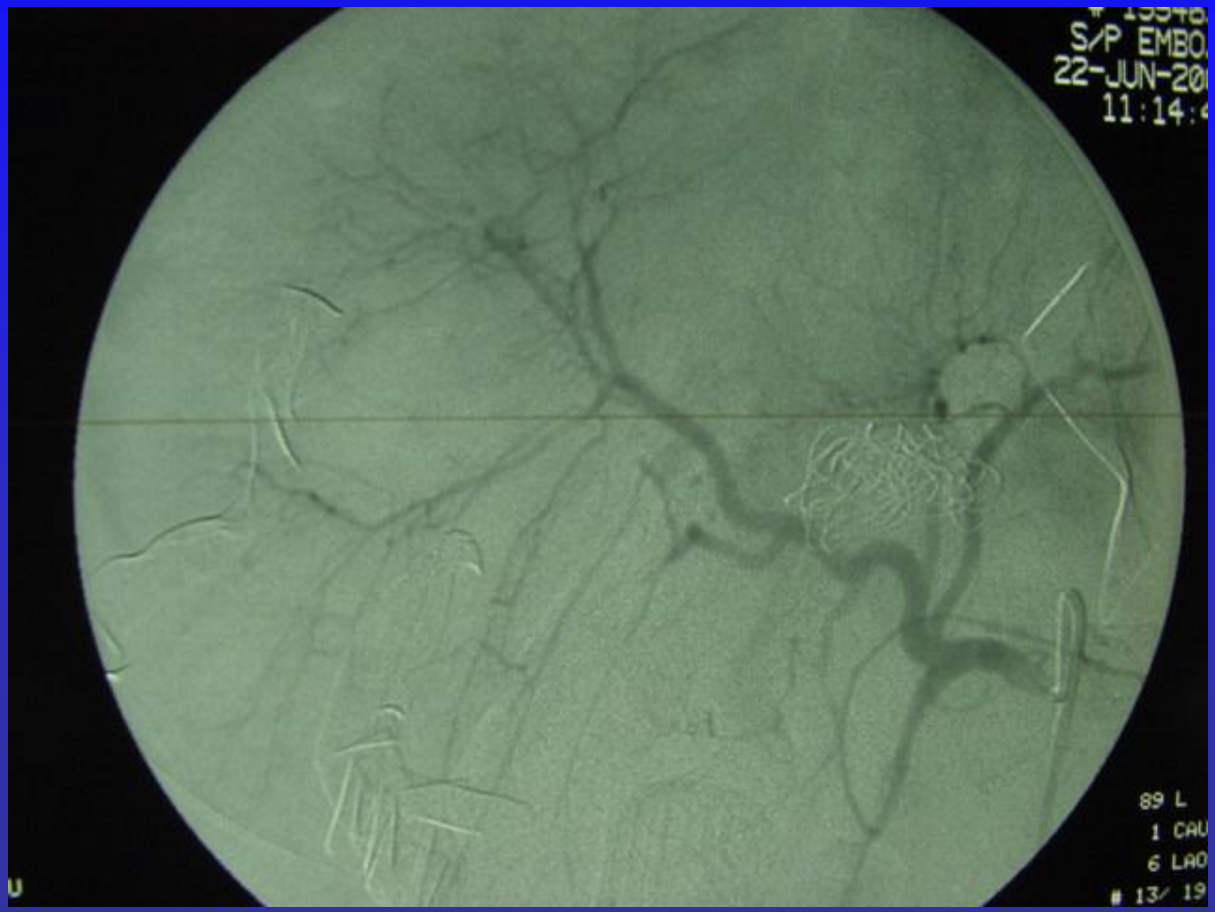
Multiple areas of Extravasation

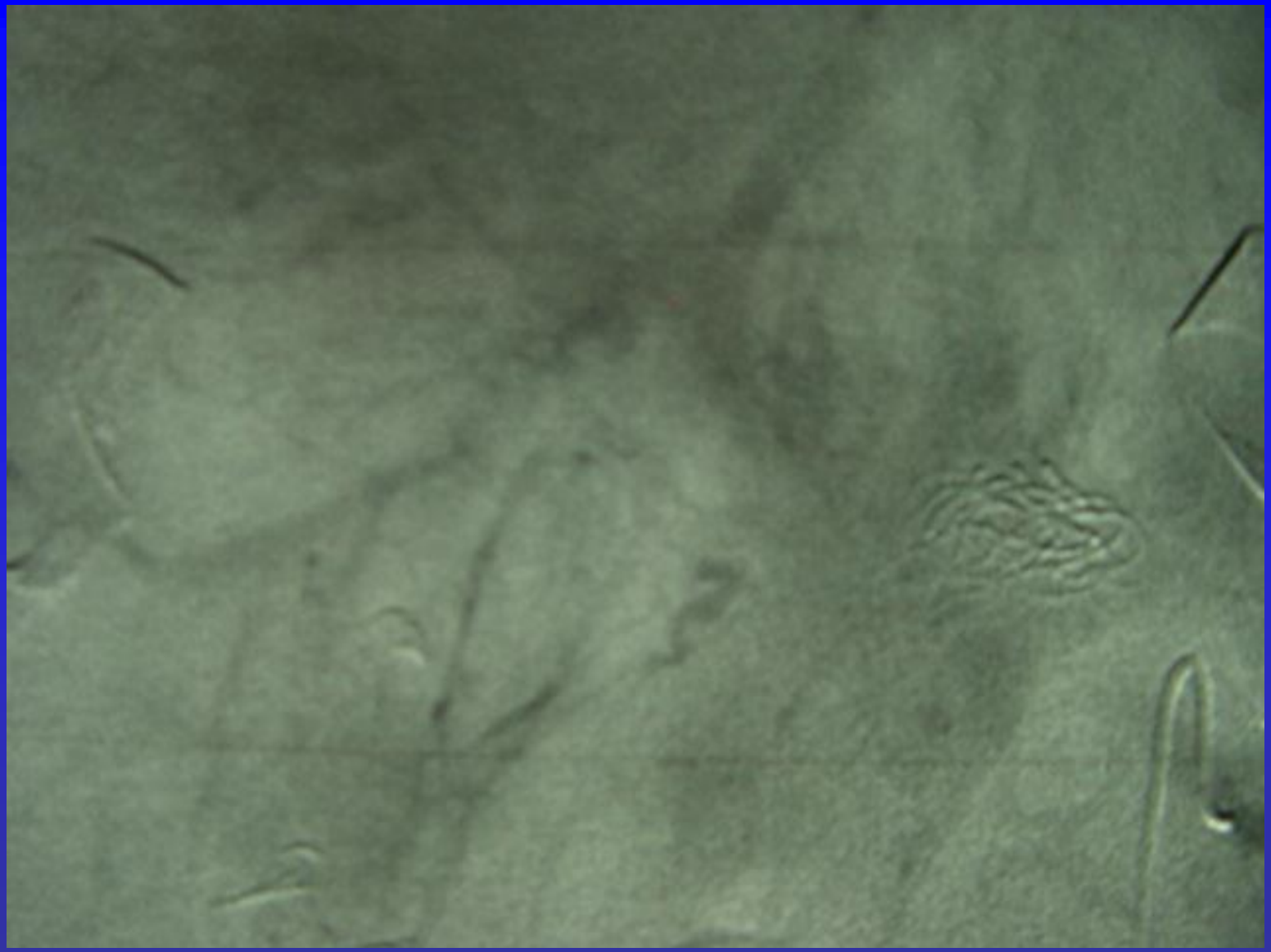


Post embolizaton

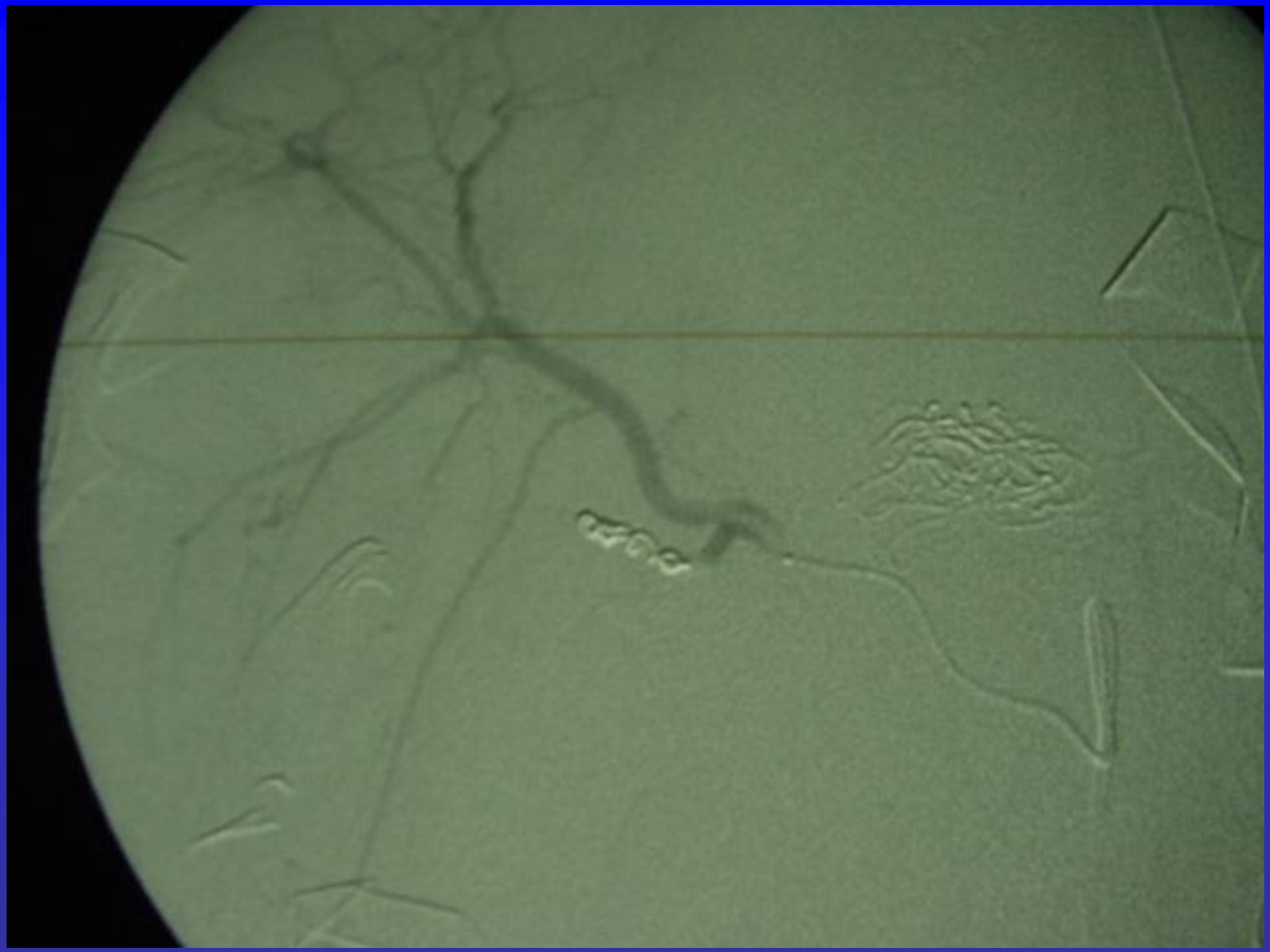


Hepatic Arteriogram

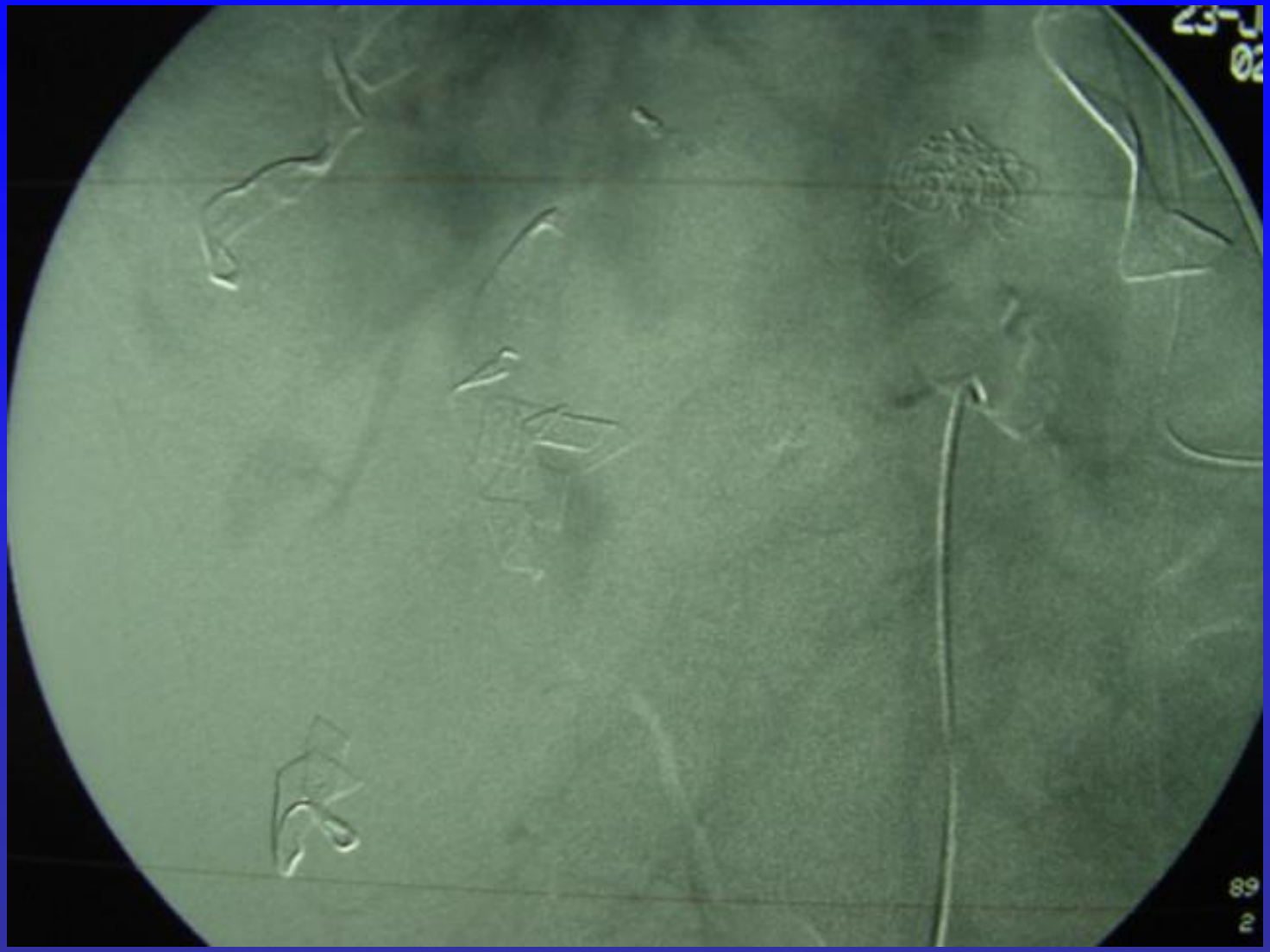




Extravasation from branch of hepatic artery

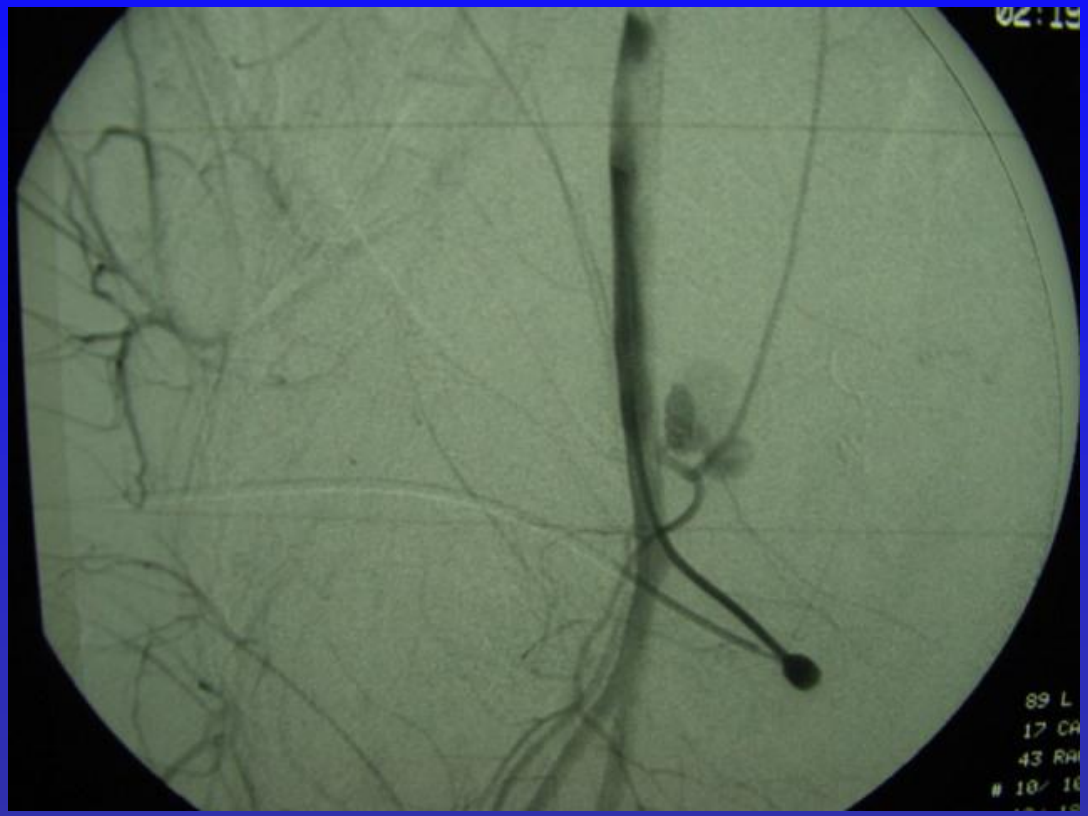


Post hepatic artery embolization



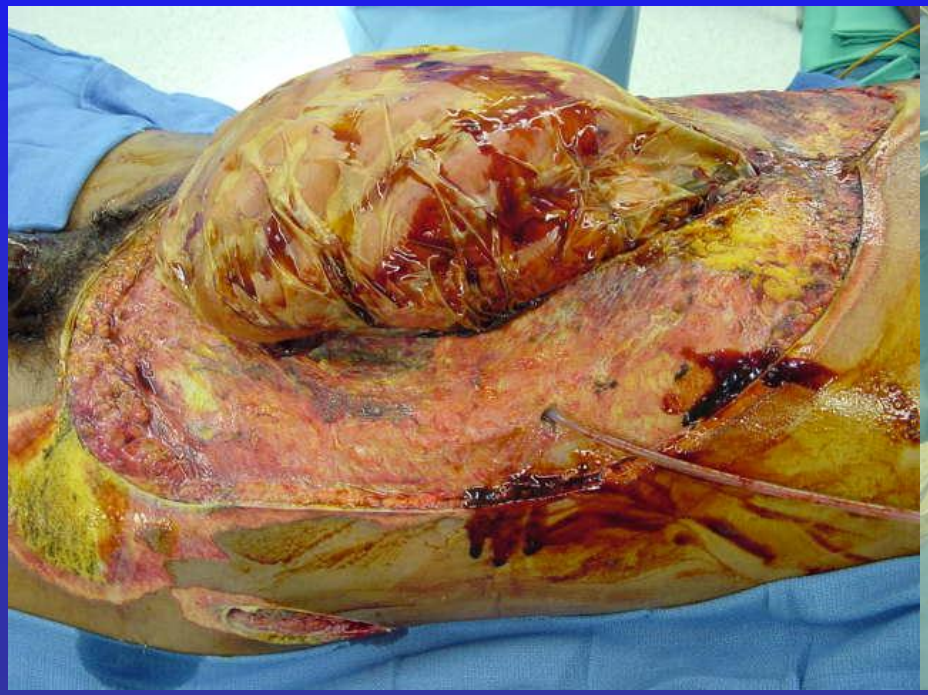
Portal vein extravasation

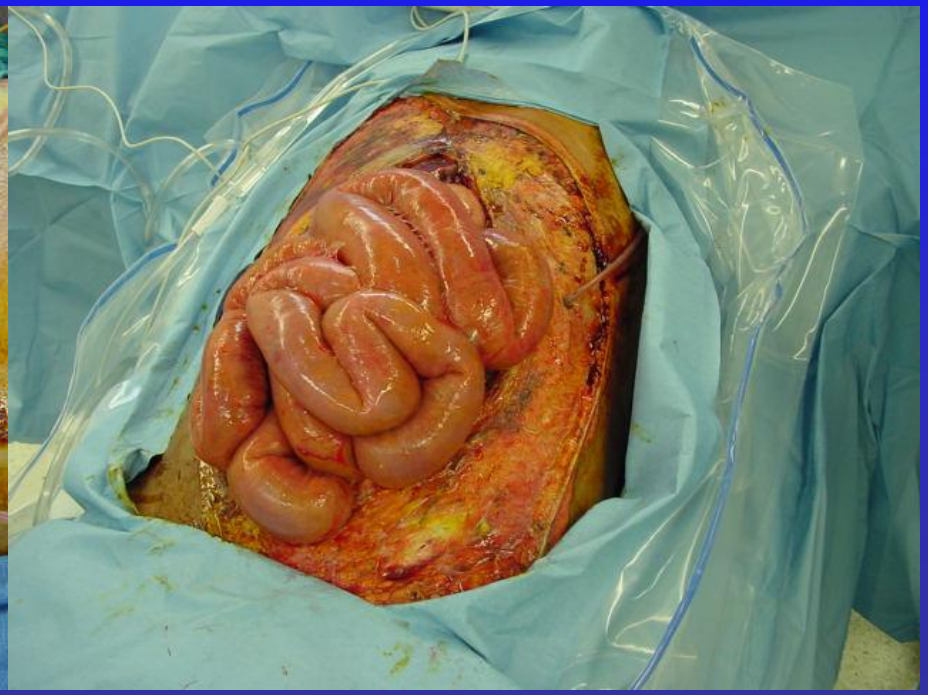
Complication

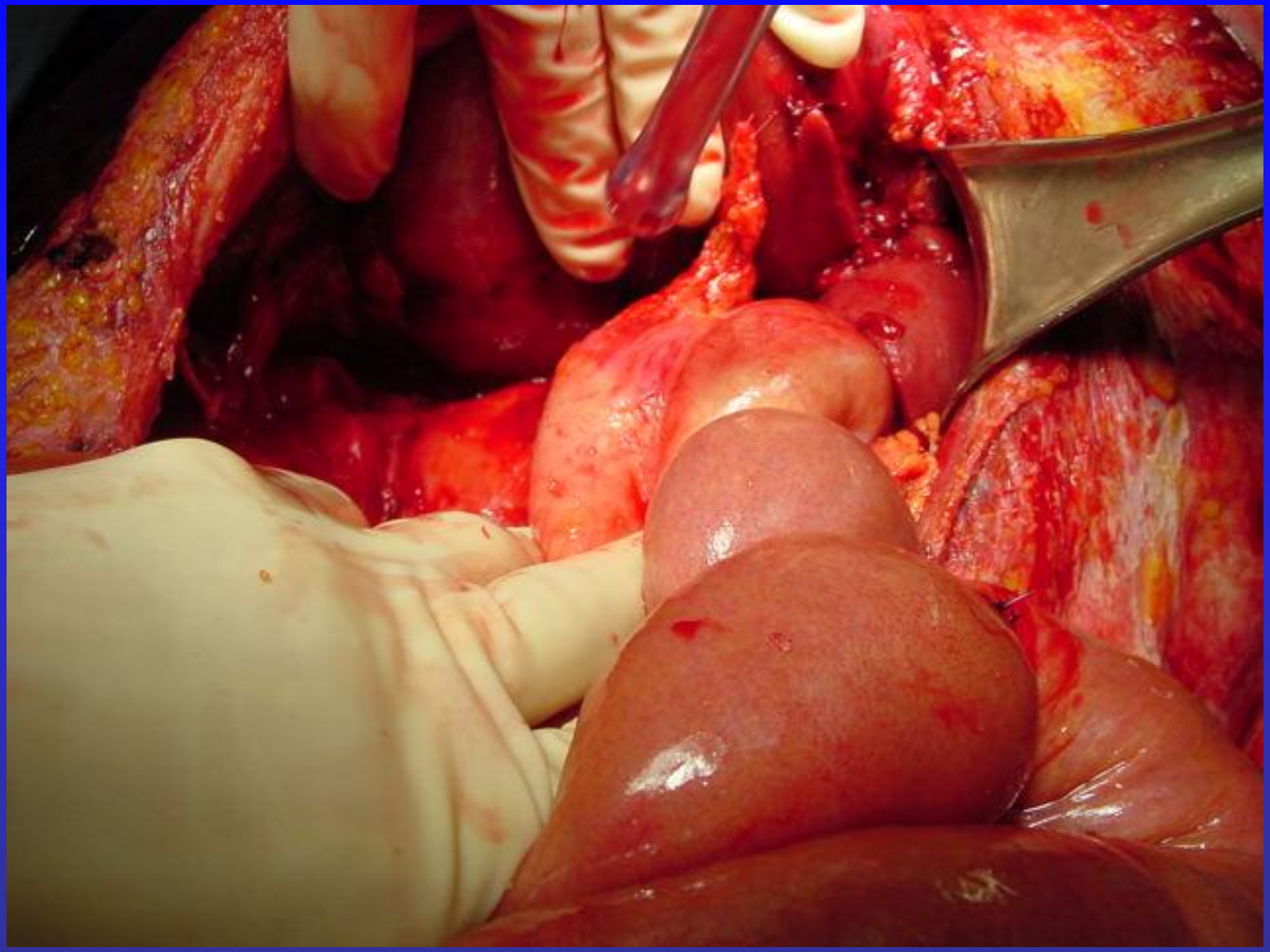


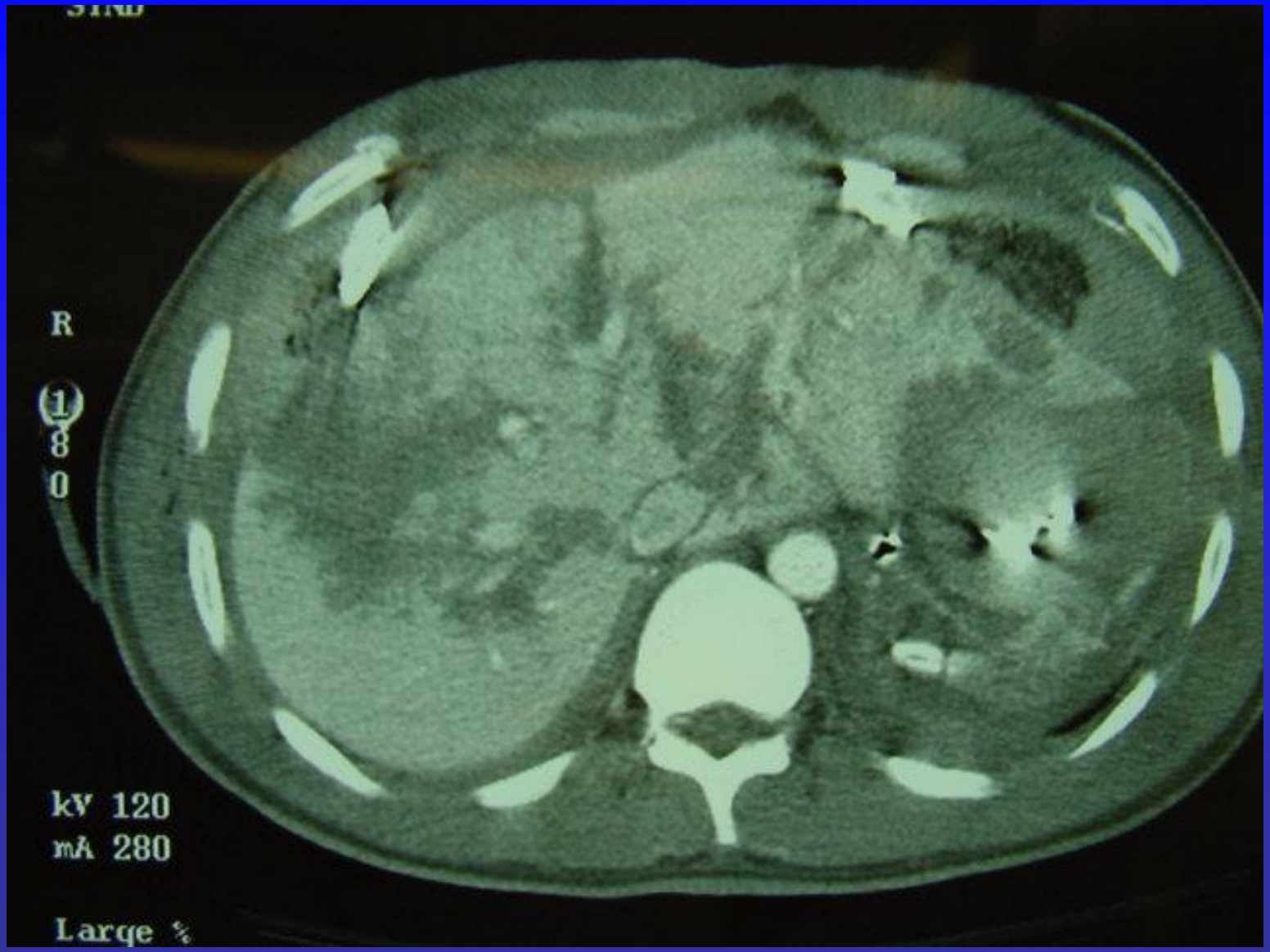
Femoral artery pseudoaneurysm due to Cordis catheter arterial placement in ER

June 24, 2003 – 2nd look lap





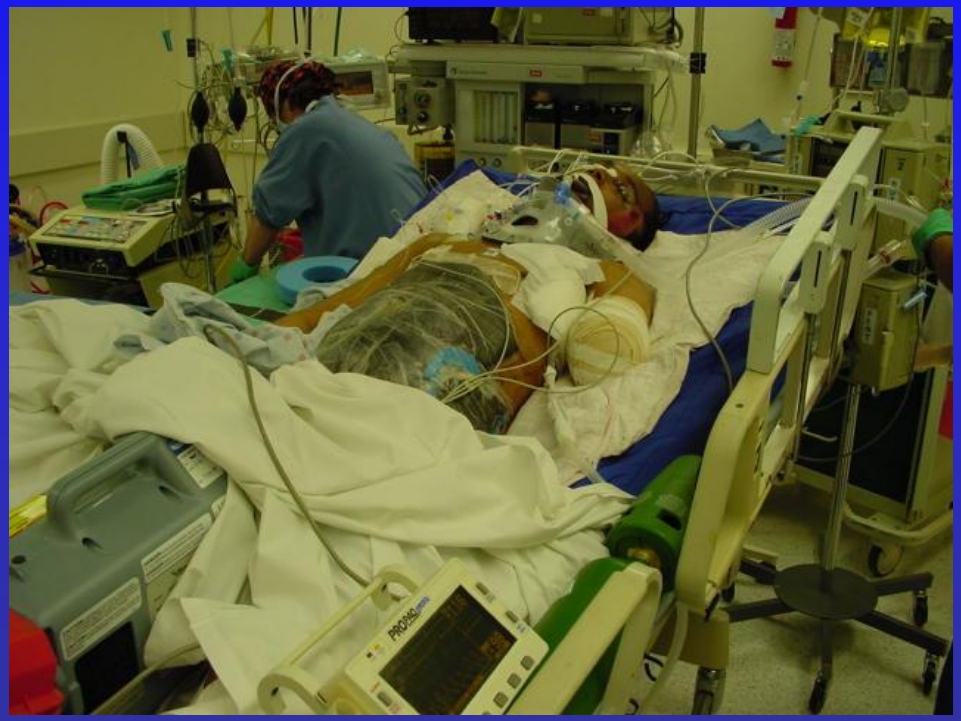




Post op CT of Liver

Outcome

- Patient expired on post injury day 10 of multiple organ failure



Abdominal Trauma