Abdominal Trauma

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Abdominal Trauma Lecture Objectives

- Recognize signs of intrabdominal trauma
- Prioritize treatment of abdominal trauma in the multiple – injury patient
- Familiarity with diagnostic procedures for abdominal trauma:
  - Laboratory studies
  - Plain radiographs
  - Peritoneal lavage
  - Computed tomography
  - Contrast radiographs

Abdominal Trauma Incidence and Mortality

- Incidence
  - motor vehicle crashes 7-20%
  - Falls from heights 5-15%
  - Vietnam military experience 7-14%
- Mortality
  - Major blunt trauma 4-30%
  - Gunshot wounds 5-15 %
  - Stab wounds 1-2%

Abdominal Trauma – Effect of Time to Definitive Treatment on Mortality

	Hours from injury to definitive treatment	Percent overall mortality	Percent mortality associated with abdominal wounds
World War I	12 to 18	8.5	53.5
World War II	8 to 12	3.3	21.0
Korean War	2 to 4	2.4	12.0
Vietnam War	1 to 4	1.8	4.5

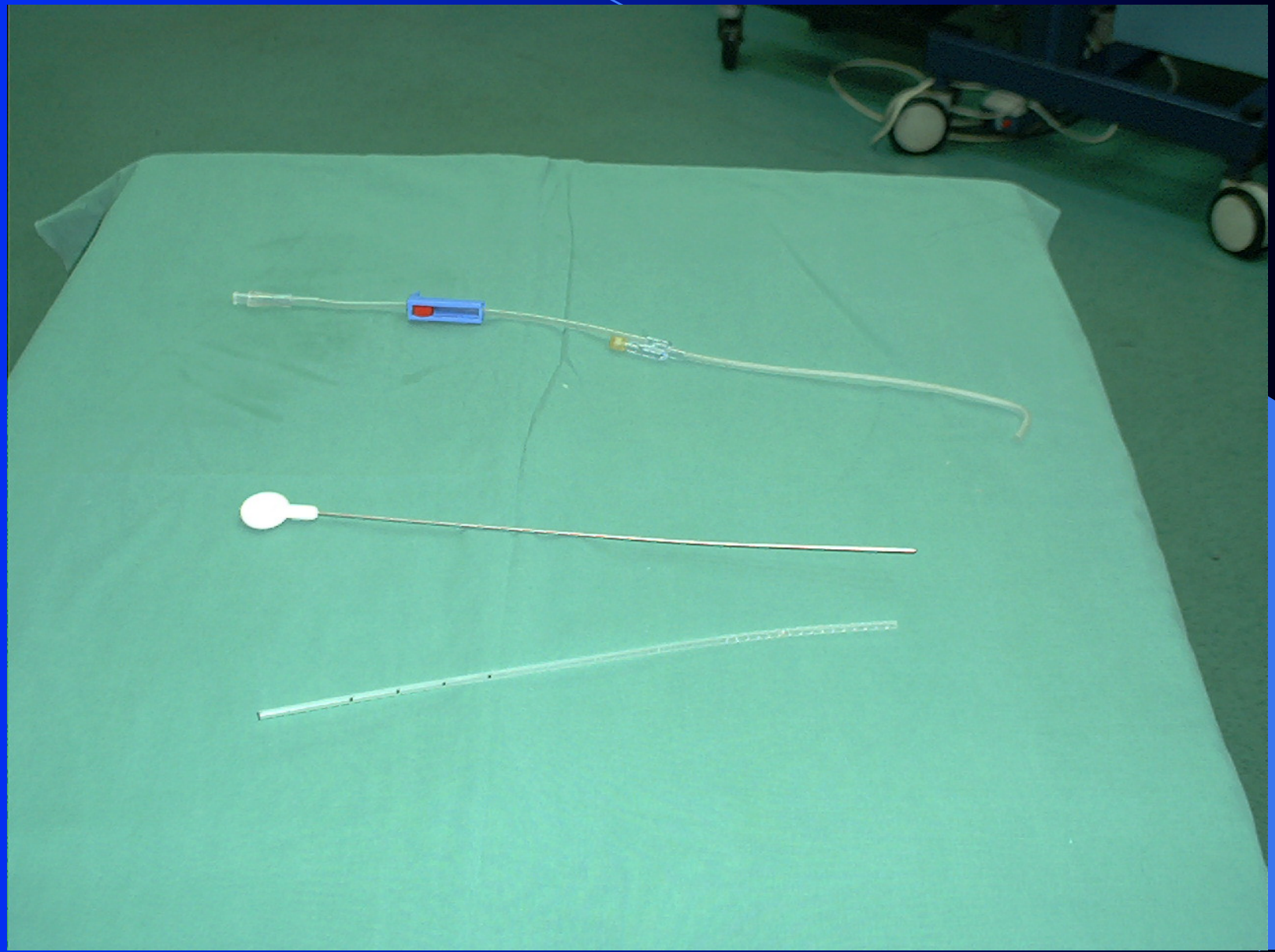
Abdominal Trauma Diagnosis & Treatment Priorities

- First: recognize presence of shock or intraabdominal bleeding
- Second: start resuscitative measures for shock / bleeding
- Third: determine if abdomen is source for shock or bleeding
- Fourth: determine if emergency laparotomy is needed
- Fifth: complete secondary survey, lab, and radiographic studies to determine if “occult” abdominal injury is present
- Sixth: conduct frequent reassessments

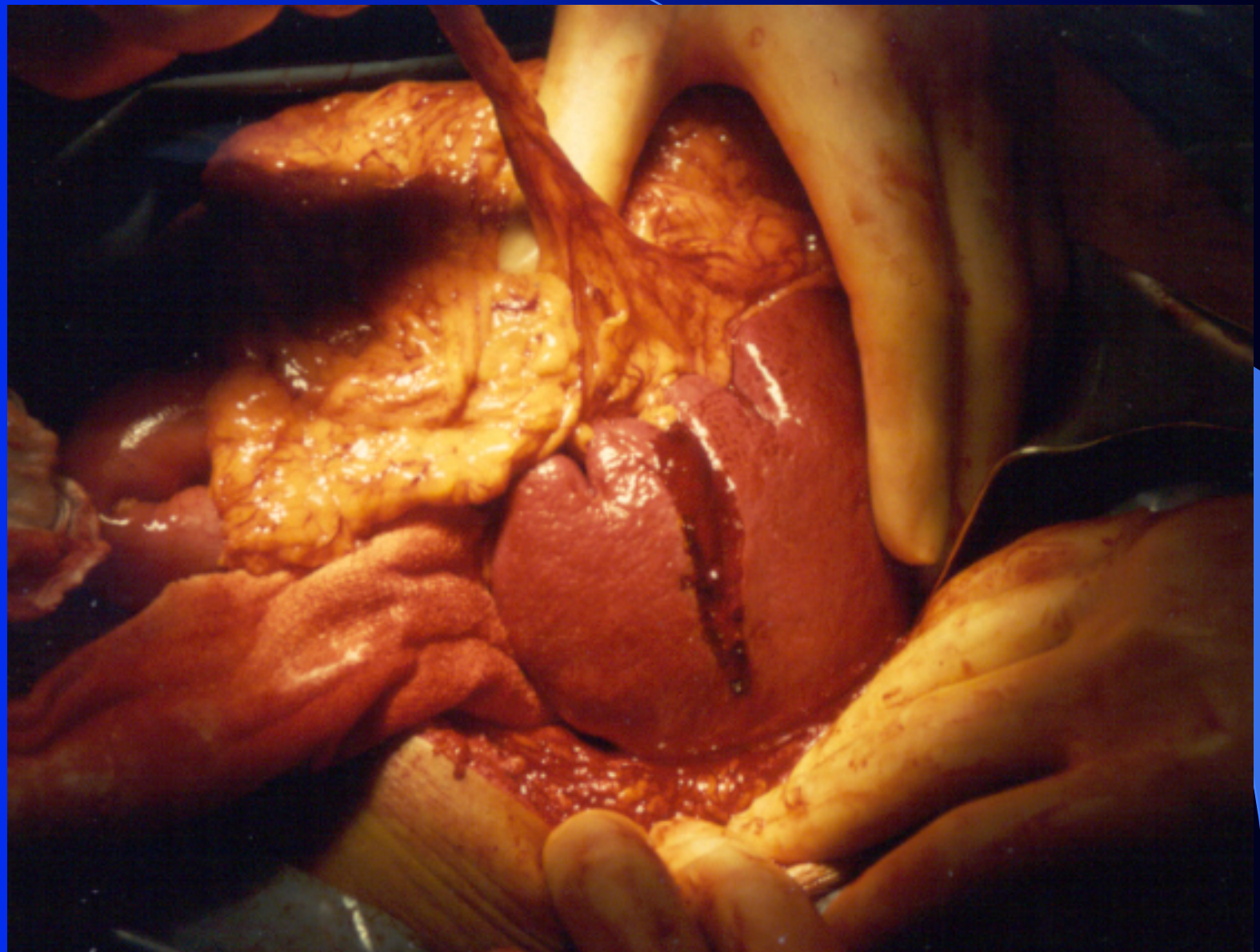
Abdominal Trauma
Decision Scheme for Emergent Laparotomy

- Emergent laparotomy indicated for:
  - hypotension / shock with:
    - Penetrating injury & external bleeding
    - Positive peritoneal lavage
    - Secondary deterioration
    - Rapid abdominal distension

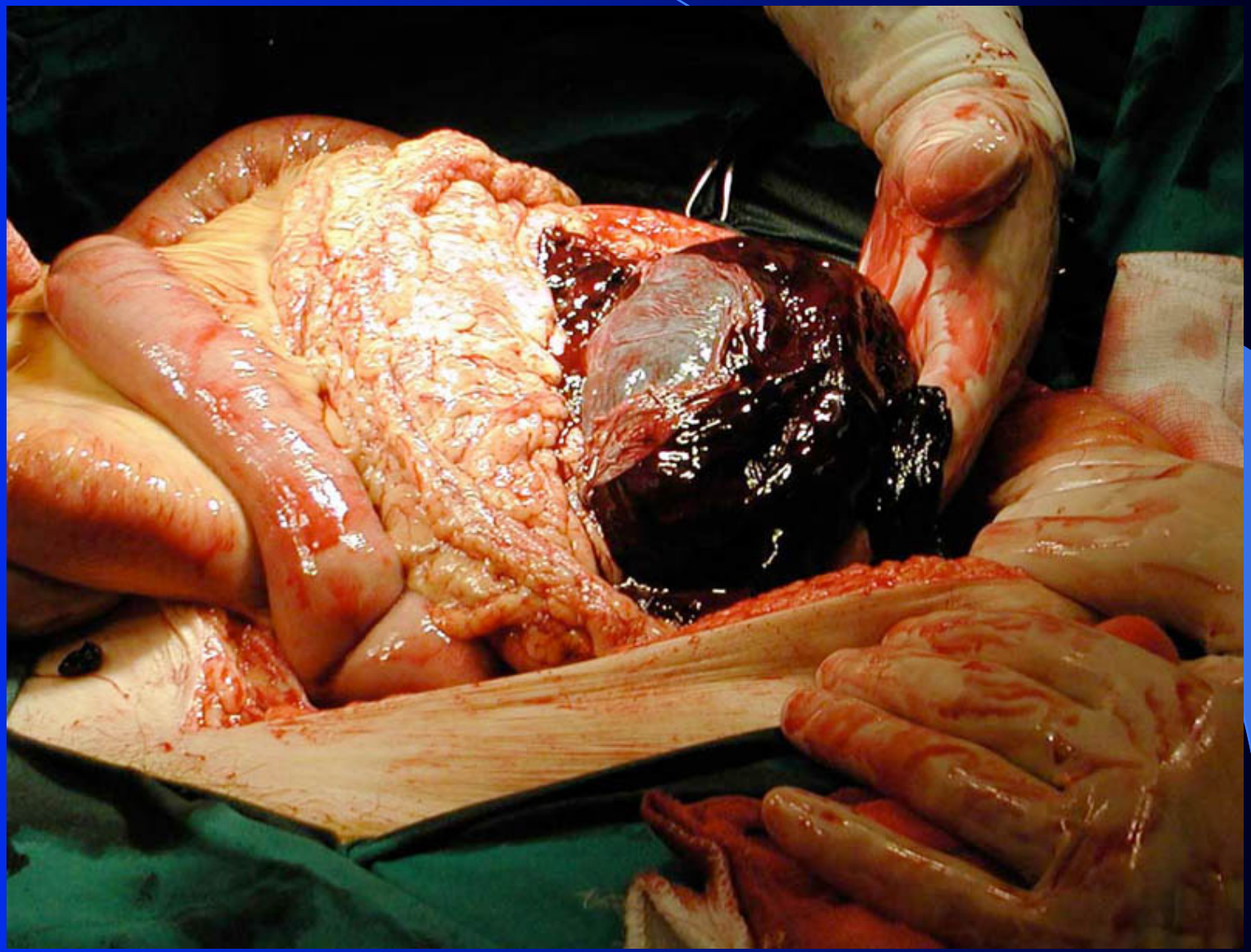
Trusă de lavaj peritoneal



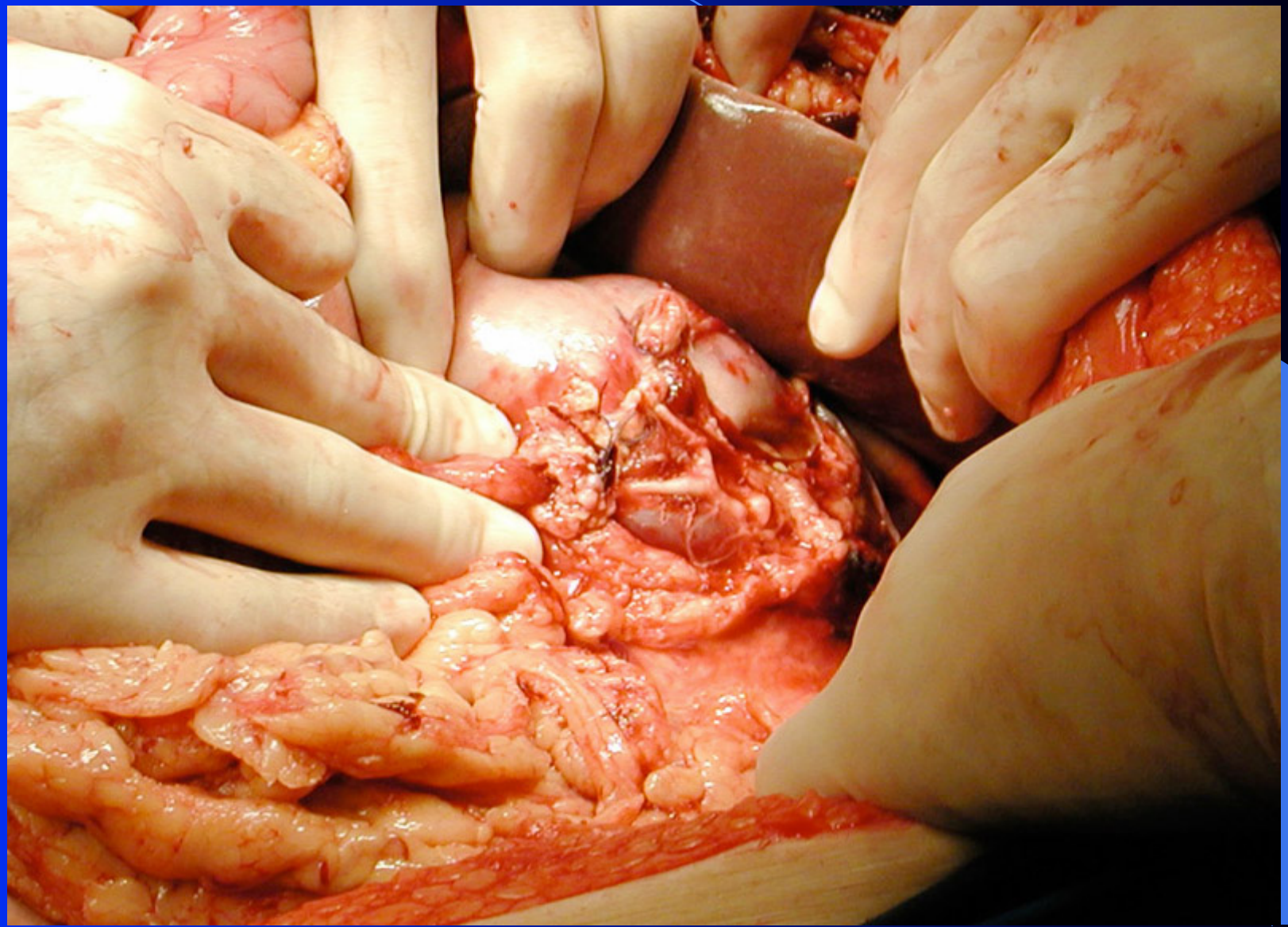
Traumatism abdominal închis
Ruptură de splină



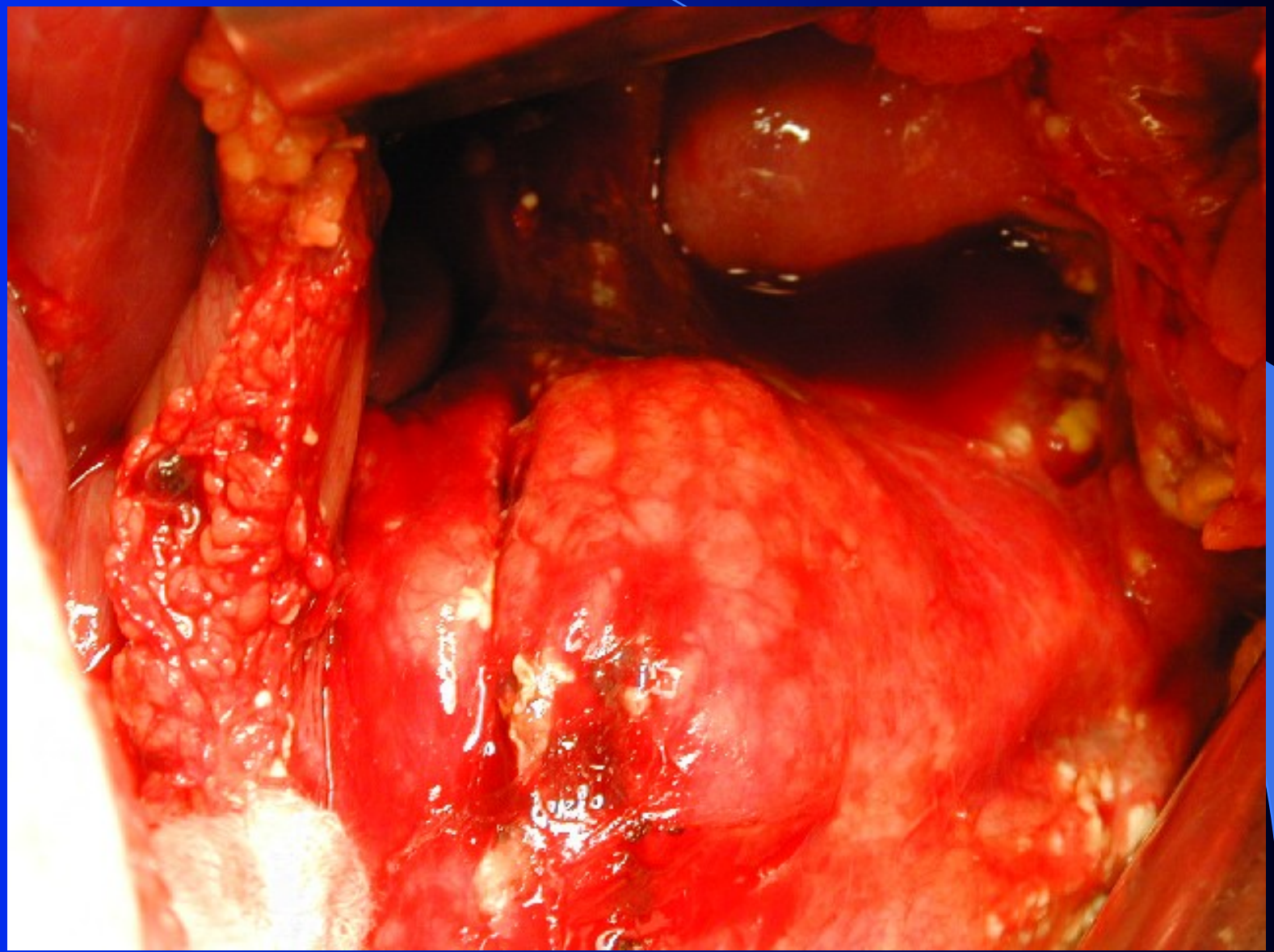
Traumatism abdominal închis
Hematom subcapsular splenic rupt



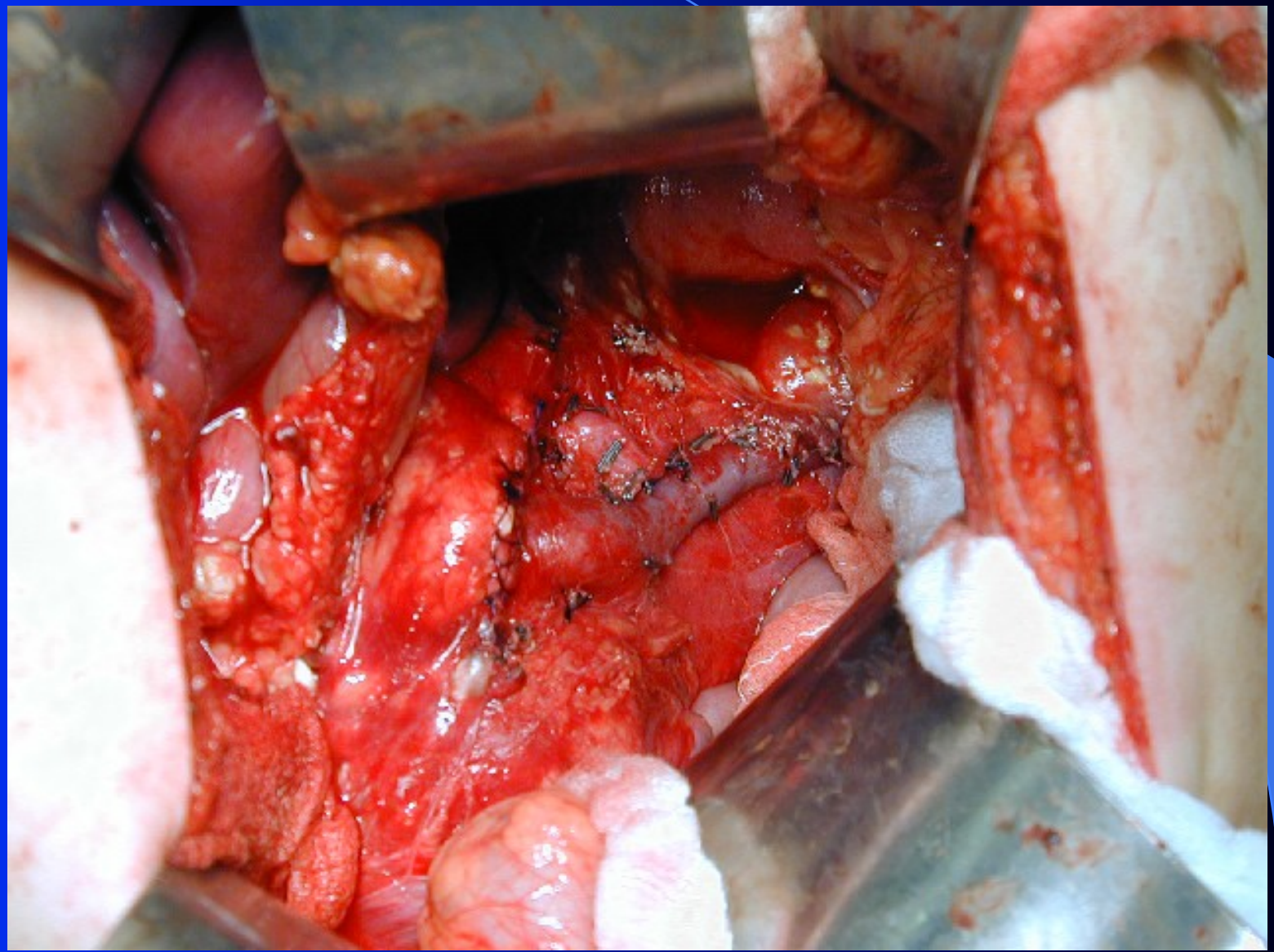
Traumatism abdominal închis
Aspect postsplenectomie



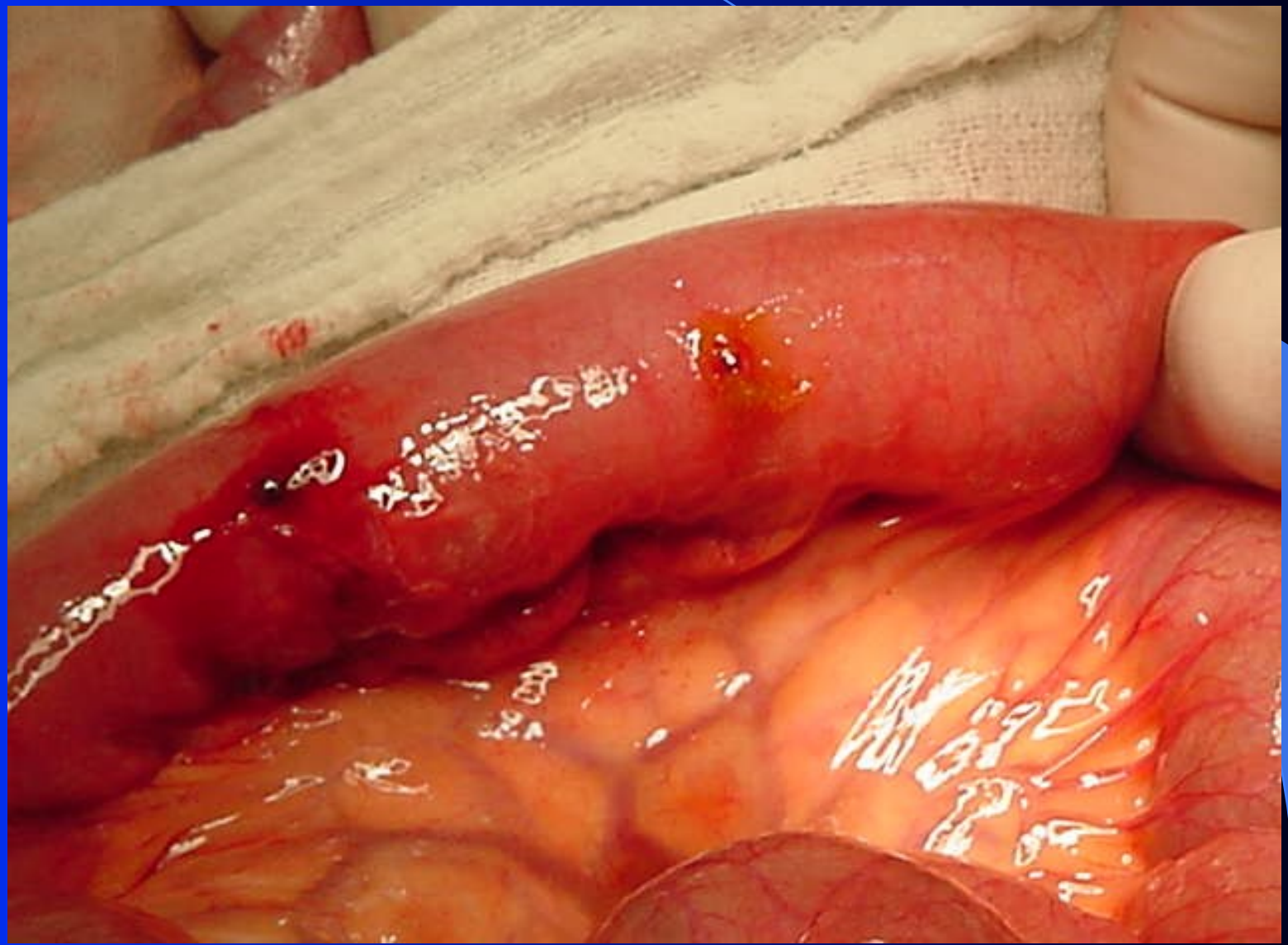
Traumatism abdominal închis
Leziune de pancreas



Traumatism abdominal închis
Aspect după pancreatectomie distală



Traumatism abdominal închis
Leziune de intestin subţire

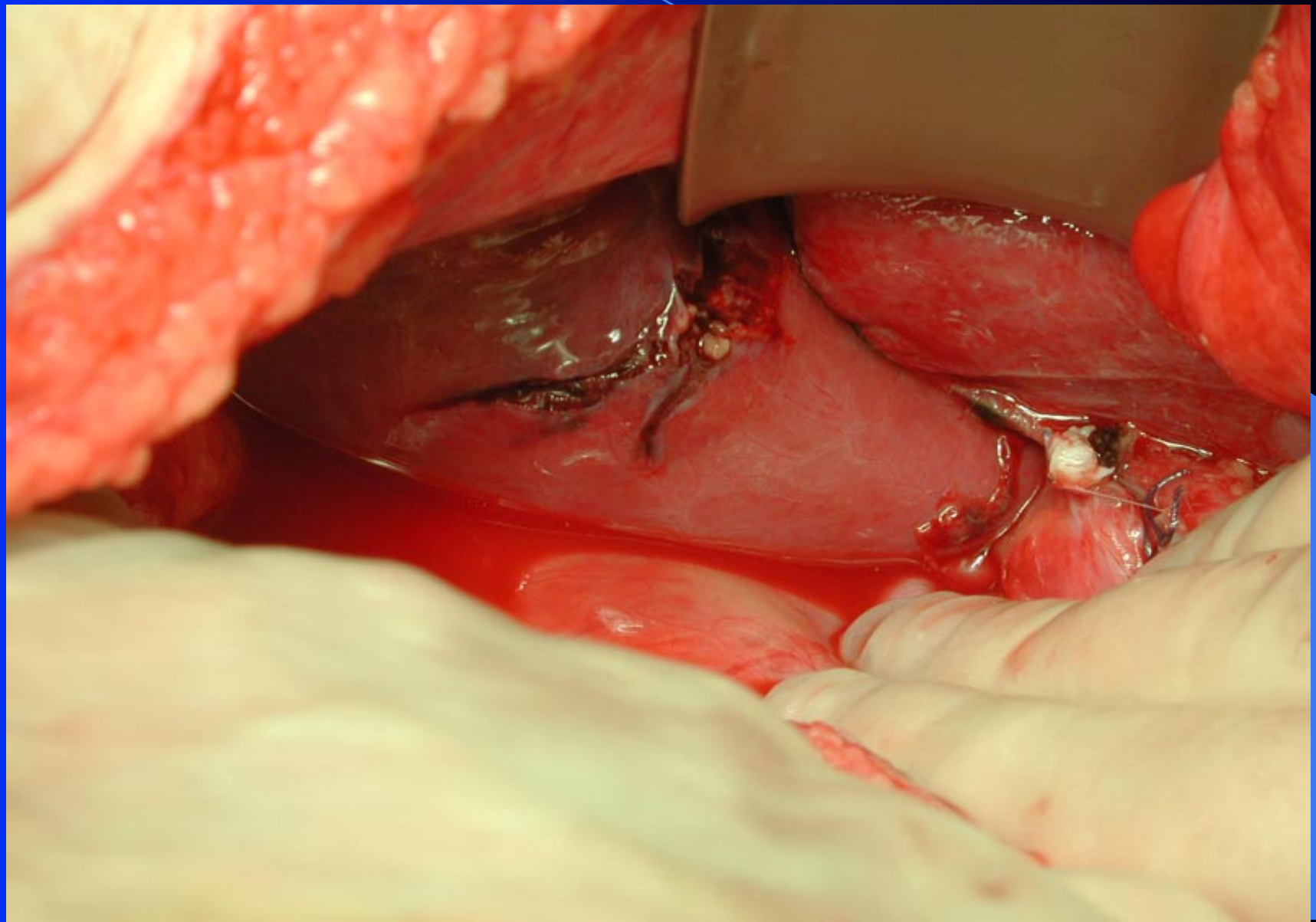


Abdominal Trauma Decision Scheme for Emergent Laparotomy

- Urgent laparotomy indicated for:
  - Gunshot wounds
  - deeply impaled foreign object
  - Evisceration
  - Signs of peritoneal irritation (peritonitis)
  - Blood in rectum
  - Blood in stomach (NG tube)

Plagă împuşcată abdominală
Orificiu de intrare

Leziune de lob drept hepatic prin împuşcare



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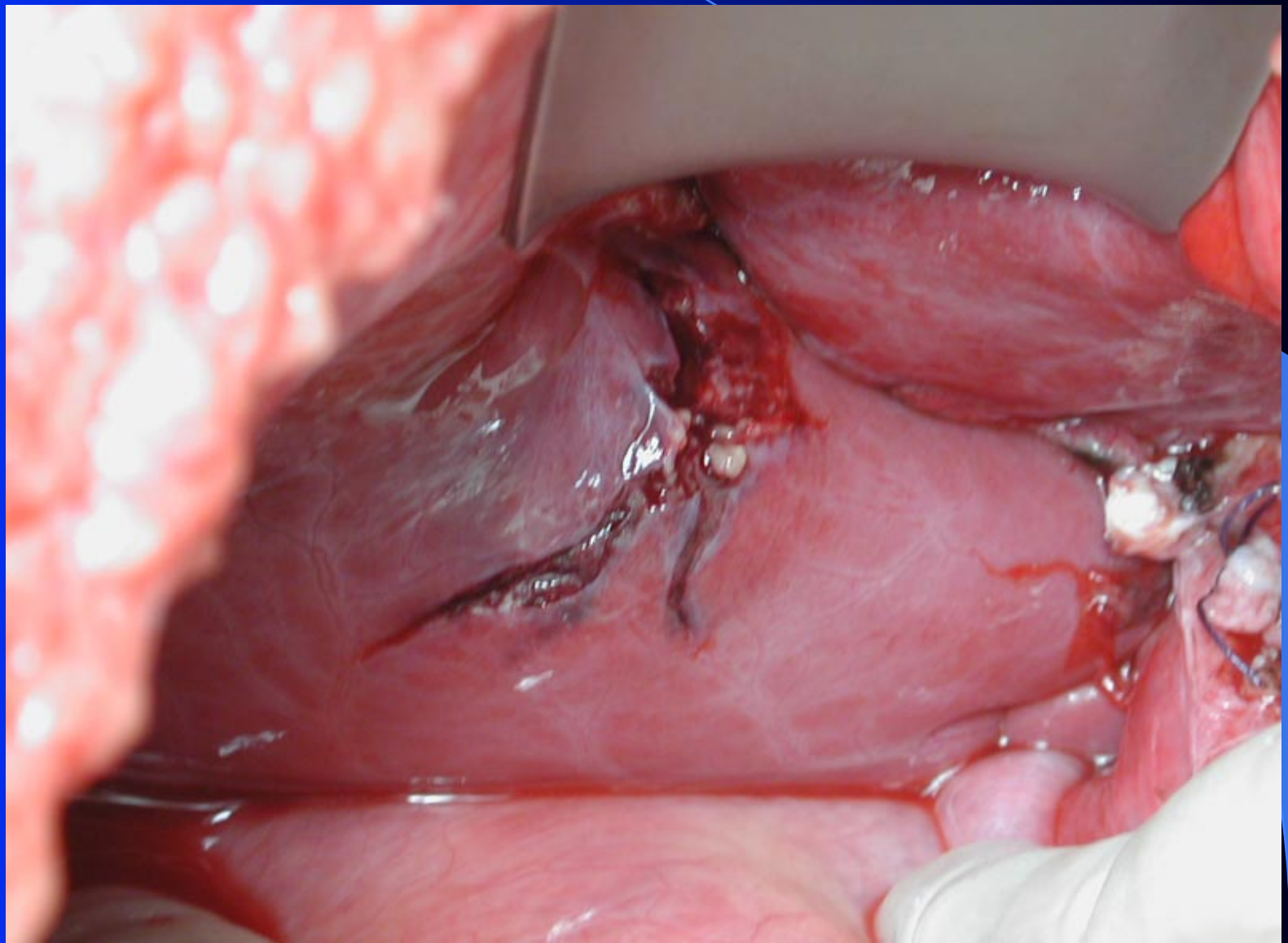
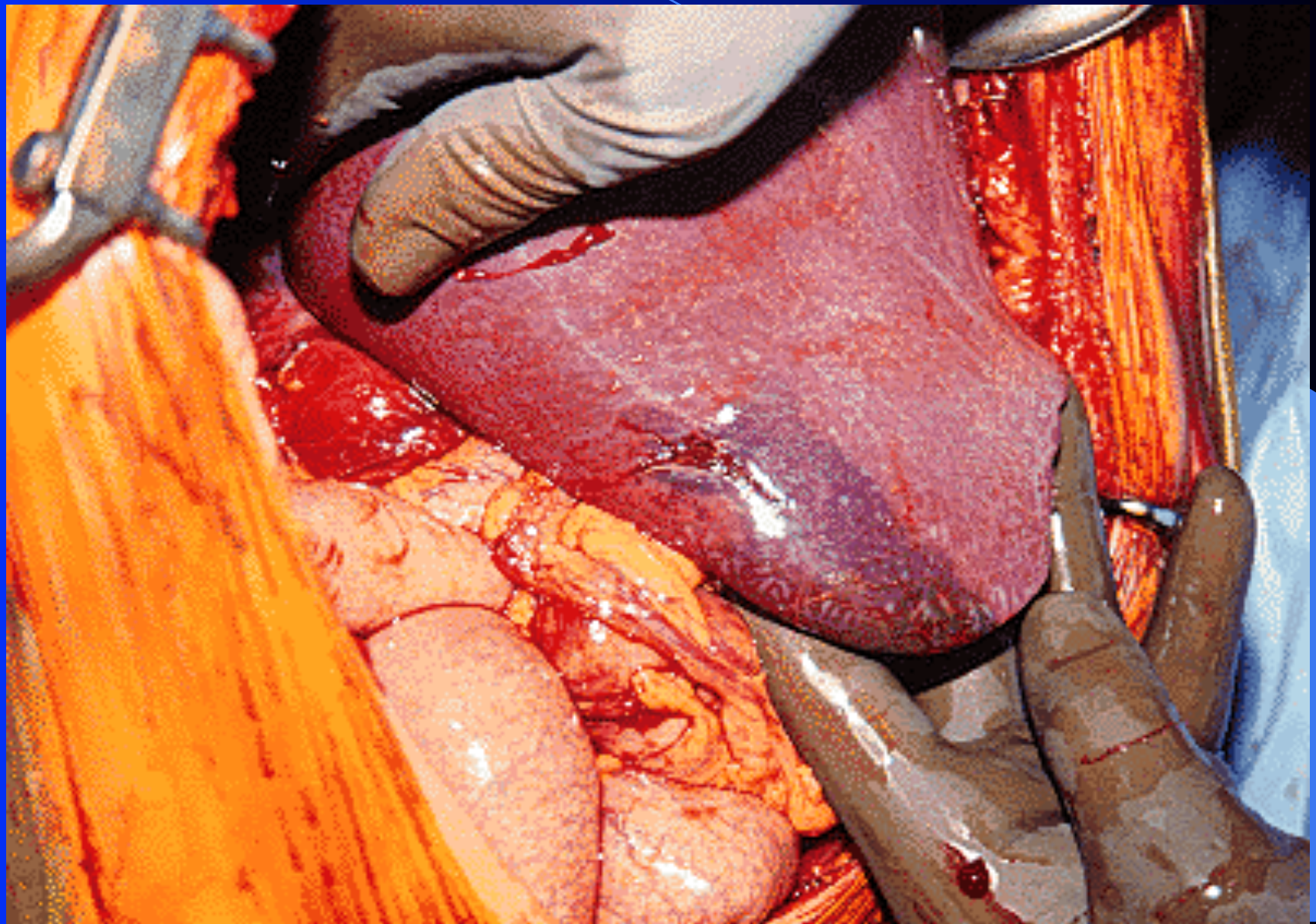
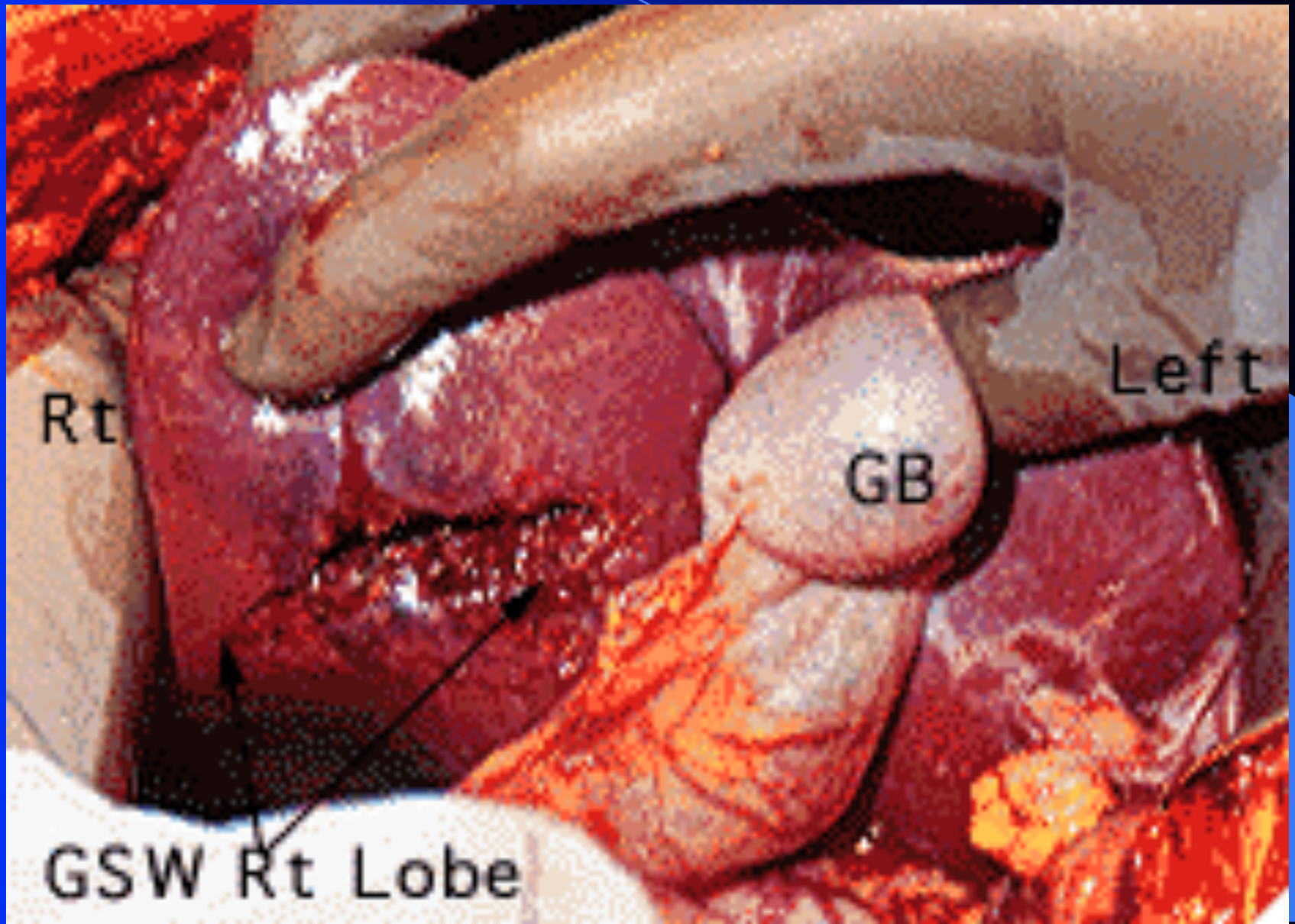


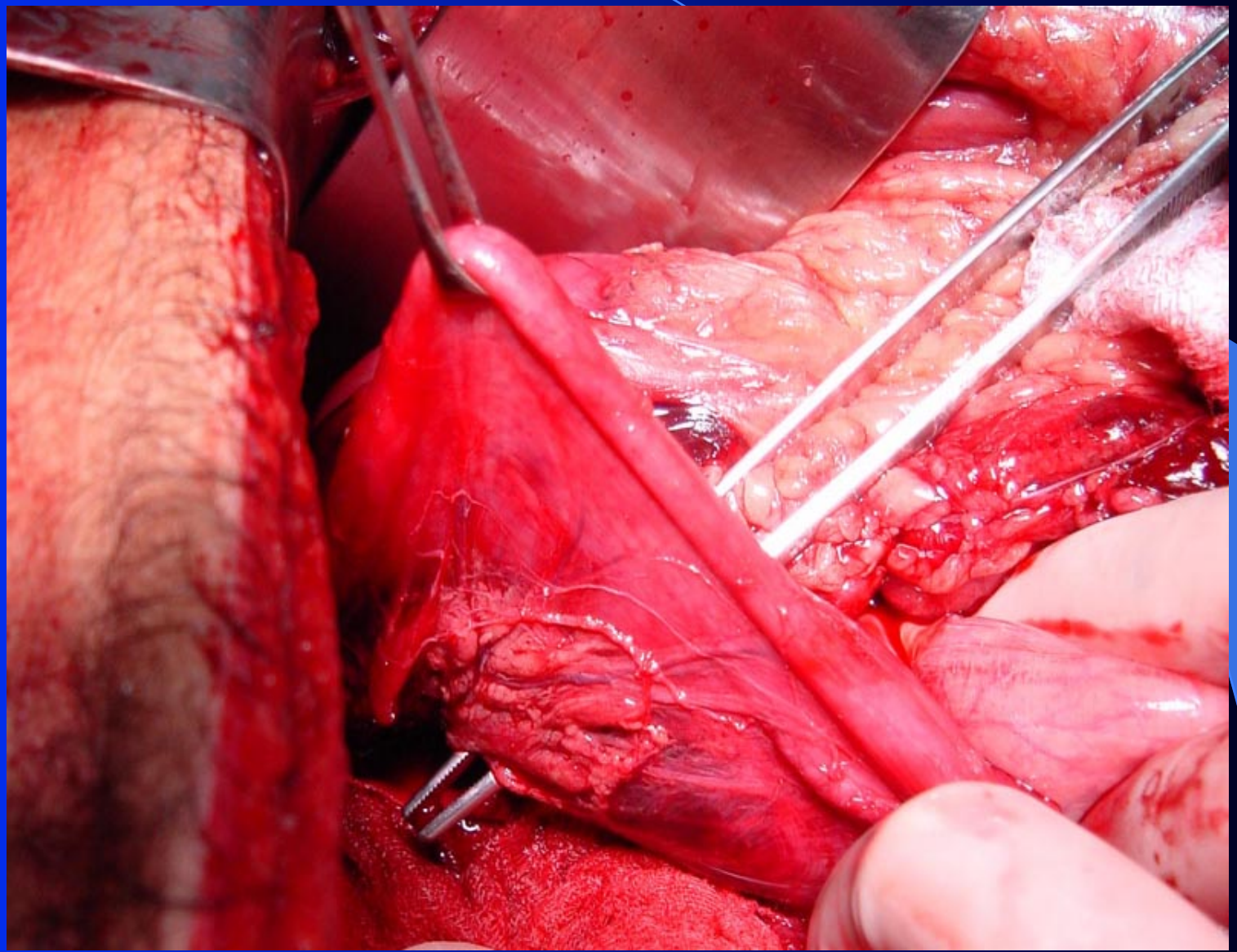
Leziune hepatică prin împuşcare
Orificiu de intrare



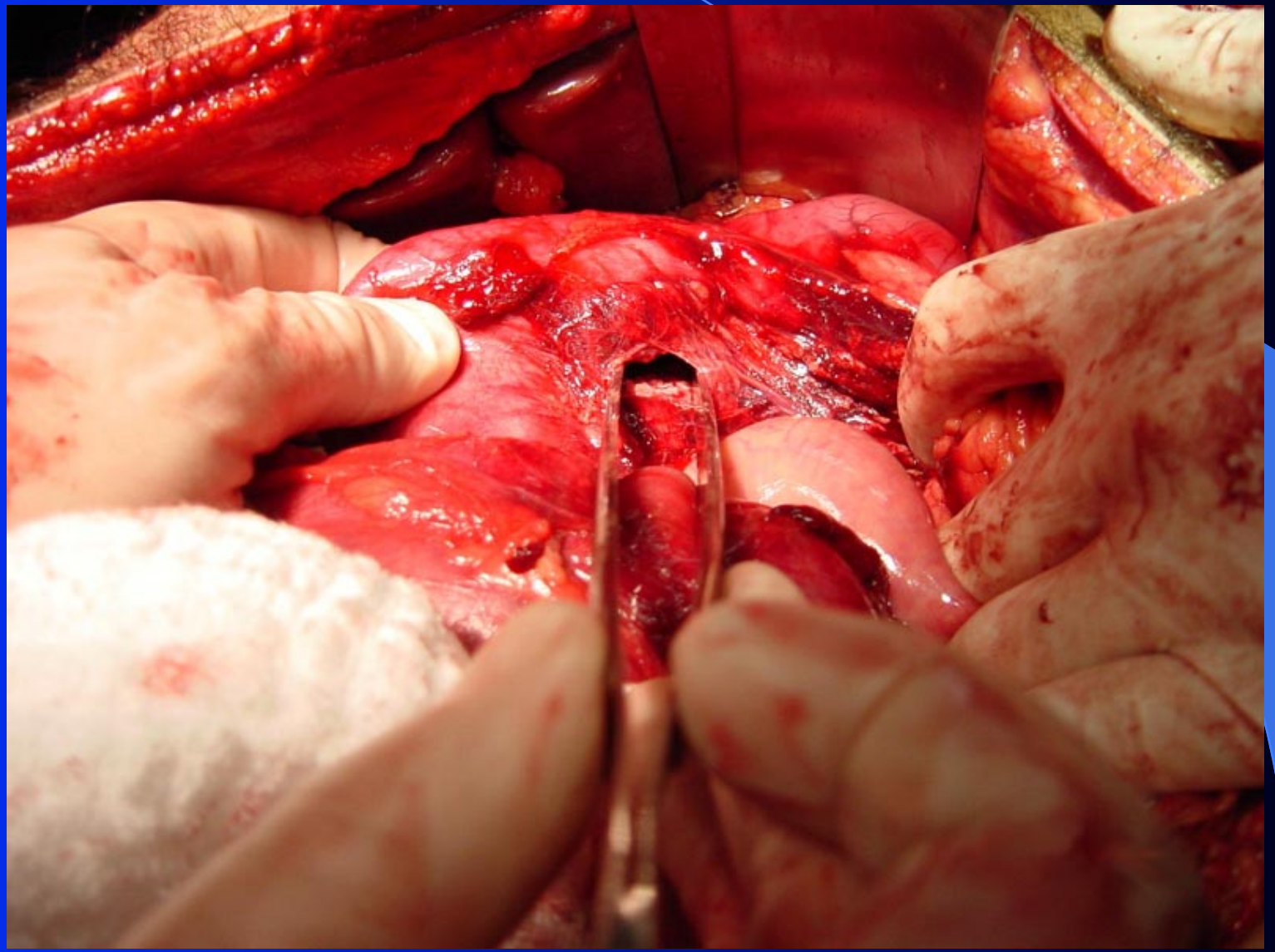
Leziune hepatică prin împuşcare
Orificiu de ieşire



Leziune de cap de pancreas prin împuşcare

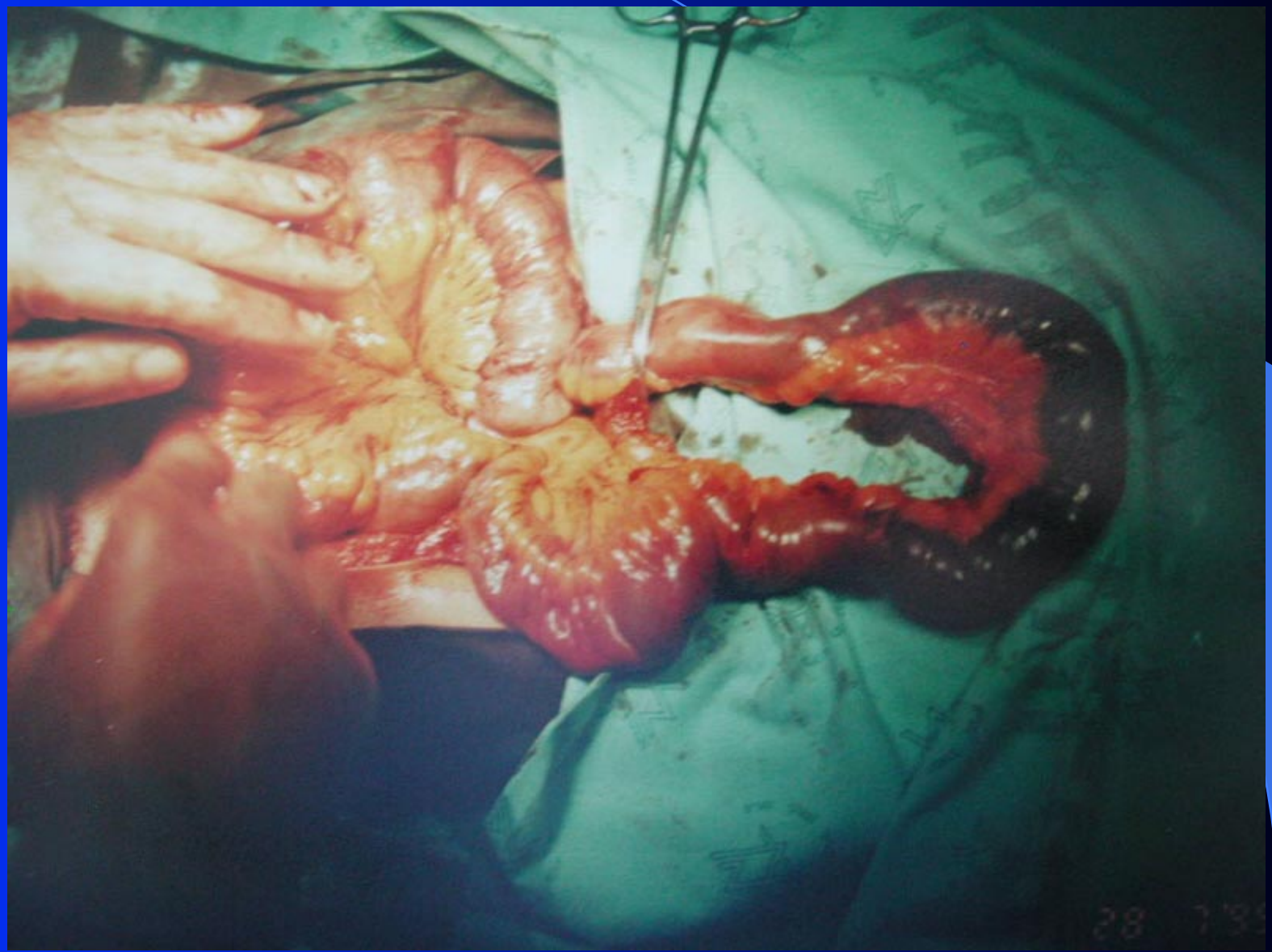


Leziune de cap de pancreas prin împuşcare



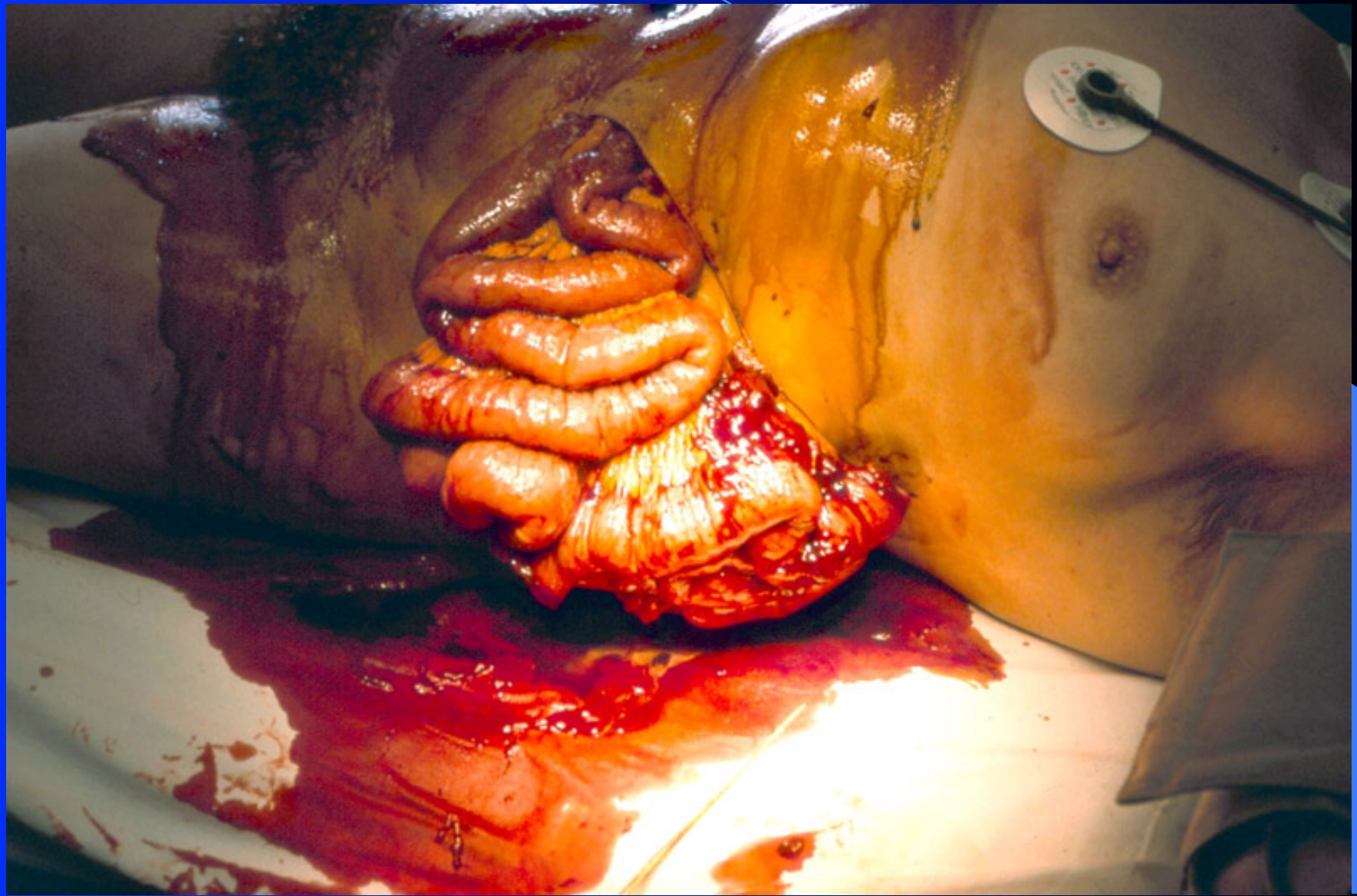
Leziune de cap de pancreas prin împuşcare

Leziune de intestin subţire prin împuşcare



Leziune de intestin subţire prin împuşcare

Plagă abdominală cu evisceraţie



Abdominal Trauma
Indications for Urgent Laparotomy Based on Secondary Survey Data

- Abd. Flat plate / upright or decubitus films:
  - Free intraperitoneal or retroperitoneal air
  - Signs of bowel obstruction
  - Signs of diaphragm rupture
- Eleveted serum amylase
- Computed tomography showing operable injuries
- Leak of contrast outside GI or GU tract
- Angiography showing arterial lesion

Abdominal Trauma
Important Items of the History to Elicit

- Type of mechanism(s) of injury
- Time of injury
- Associated injuries
- Prior abdominal problems or surgeries
- Drug or alcohol use
- Current medications / injuries

Abdominal Trauma
Physical Exam

- Mainly is part of secondary survey
  - Inspection
  - Auscultation
  - Percussion
  - Palpation

Abdominal Trauma
Physical Exam

- Inspection – look for:
  - Abrasions / lacerations
    - may signify injury also to underlying organs
  - Distensiion
    - May signify bowel obstruction or bleeding
  - Scars from prior surgeries
  - Masses or bulges
- Important to logroll patient and assess back also

Abdominal Trauma
Physical Exam (con't.)

- Auscultation:
  - should listen over all 4 quadrants
  - Absent sounds may signify ileus from injury or bleeding
  - High pitched sounds may signify bowel obstruction
  - Some vascular injuries may result in audible bruits
  - Bowel sounds in chest imply ruptured diaphragm

Abdominal Trauma
Physical Exam (con't.)

- Percussion:
  - Should check on all 4 quadrans
  - If tympanic, implies ileus or bowel obstruction
  - If dull, implies intraabdominal bleeding or fluid
  - If tender, correlate with tender areas on palpation

Abdominal Trauma
Physical Exam (con't.)

- Palpation:
  - Assess for tenderness, guarding, mass, crepitus
  - Differentiate lower rib tenderness from true abdominal tenderness
  - Also palpate back (slip examining hand under patient) even if patient cannot yet be rolled
  - Assess pelvic wings for stability & tenderness

Abdominal Trauma
Physical Exam (con't.)

- Exam of genitalia
  - Very important to do in essentially all patients
  - Inspection
    - Blood at urethral meatus
    - Perineal or scrotal hematomas
  - Palpation
    - Assess for hernias, tenderness, masses
  - Should do at least digital exam & guiac of vagina; speculum exam also preferred if possible mucosal injury
  - Severe vaginal bleeding may require emergent guaze packing

Abdominal Trauma
Physical Exam (con't.)

- Rectal exam
  - Important to do in almost all patients
  - Check for:
    - Sphincter muscle tone
    - Tenderness / mass
    - Prostate position (if "high-riding" implies urethral disruption)
  - Stool guiac
  - Should be done before placing foley catheter

Abdominal Trauma
Initial Radiographs to Consider

- AP (anteroposterior) pelvis
  - Should be done routinely for major blunt truncal trauma
- Flat plate and upright (or lateral decubitus)
  - If free air or bowel obstruction suspected
  - Flat plate sometimes needed to document position of NG tube
- Lumbar spine AP & lateral

Abdominal Trauma
Initial Lab Studies to Consider

- Type and crossmatch
  - Should be drawn first
  - Can be type & hold if patient stable & no evident major blood loss
- Complete blood count (CBC)
- Urine or serum pregnancy test
- Serum amylase
- Urinalysis
- Serum alcohol
- Drug / toxin screen
- Liver function tests (LFT's)
- Electrolytes, blood urea nitrogen (BUN), creatinine, glucose
- Medication serum levels (i.e., digoxin)
- Platelet count / protime / partial thromboplastin time

Abdominal Trauma
Usefulness & Interpretation of Lab Results

- CBC – should be obtained in all major cases
  - Elevated WBC count can be from:
    - General stress of trauma
    - Fractures
    - Liver or splenic injury
    - Concurrent infections
  - Elderly or immunocompromised patients may not increase the WBC count appropriately
  - Hematocrit can be normal initially even with acute hemorrhage

Abdominal Trauma
Usefulness & Interpretation of Lab Results

- Serum amylase
  - May be normal with pancreatic injury
  - May be elevated from trauma to salivary glands
  - Height of elevation not correlated with injury severity
- Urinalysis
  - Dipstick for hemoglobin just as accurate as full microscopic exam for hematuria
  - Can be normal even with some types of GU tract injury

Abdominal Trauma
Usefulness & Interpretation of Lab Results

- LFT's
  - SGPT & SGOT elevated with liver injuries
  - SGOT increased also with muscle injuries
  - Not needed on most trauma cases
- Glucose
  - Important emergently if altered mental status (to rule out hypoglycemia)
- Electrolytes / BUN /Creatinine
  - Usually not needed unless patient has known renal failure or is on diuretics

Abdominal Trauma
Reliability of Physical Exam

- 20% of patients with major blunt intraperitoneal injury may not manifest usual physical signs

  - Exam is definitely unreliable (tenderness or guarding may be absent, reduced, or "masked") if:
    - Head trauma / altered mental status
    - Alcohol intoxication
    - Drug intoxication
    - Patient is mentally retarded
    - Patient is extremely uncooperative
    - Spinal cord injury

Abdominal Trauma
Indications for Diagnostic Peritoneal Lavage (DPL)

- Should generally be done as part of secondary survey (NG and foley should be placed first)
- Blunt trauma
  - Unstable patient – possible intraabdominal bleeding
  - Suspected diaphragm rupture
  - Stable patient with unreliable physical exam
- Penetrating trauma
  - Stable patient
    - Stab wound of abd. & no peritoneal signs
    - Stab or gunshot wound of chest below nipple
    - Flank or back stab wound

Abdominal Trauma
Contraindications to DPL

- Need for laparotomy already known
  - Gunshot wound
  - Evisceration
  - Peritoneal signs
  - Free air
- Prior laparotomy scar
  - Open technique may still be possible
- Advanced pregnancy
  - Supraumbilical approach may still be possible

Abdominal Trauma
Prerequisites to Perform DPL

- NG tube placed and is on suction
- Foley placed
- Abdominal exam completed
- Abdominal films to rule out free air done (not necessary first if patient is unstable; DPL can introduce air into the peritoneal space)

Abdominal Trauma
Percutaneous ("Closed") DPL Procedure

- Prep abdominal skin with iodine
- Local anesthesia at puncture site (midline, 1 to4 cm. below umbilicus)
- Nick skin with # 11 knife blade
- Insert 18 gauge needle at slight angle toward pelvis
- Advance needle till second "pop" felt as needle penetrates posterior rectus fascia & peritoneum
- Insert guide wire thru needle & withdraw needle
- Remove guide wire
- Draw back on catheter with syringe
- If no blood drawn, attach IV tubing & run in fluid

Abdominal Trauma
Open DPL Procedure

- Iodine prep and local anesthesia
- Incise skin, fat, & fascia with knife – usually need 3 to 5 cm. length incision
- Retract wound edges (with hooks or wound retractor)
- Identify, lift &incise peritoneum
- Lift peritoneum and insert dialysis catheter toward pelvis
- Draw back on catheter with syringe
- If no blood drawn, attach IV tubing and run in fluid

Abdominal Trauma
Conclusion of DPL Procedure
(either closed or open)

- If gross blood drawm back in syringe, stop procedure, withdraw catheter, & take patient to operating room for laparotomy
- If aspirate is negative:
  - Infuse 1 liter of normal saline or lactated Ringers (infuse 20 cc. per kg. for children)
  - After infusate is in, drop IV tubing below level of patient & allow fluid to run back out
  - Check RBC & WBC counts (+ /- amylase, gram stain) on the lavage fluid
  - Withdraw catheter & suture skin wound

Abdominal Trauma
Positive Peritoneal Lavage Criteria

- Any of these indicate need for laparoromy:
  - RBC count> 100,000 / mm^3 (blunt)
  - RBC count >10,000 / mm^3 (chest penetrating wounds)
  - WBC count > 500 / mm^3
  - Stool or food fibers or bile
  - Lavage fluid exits via chest tube, NG tube, or foley
  - Elevated amylase in lavage fluid
- If unable to get fluid return, may need to consider as positive

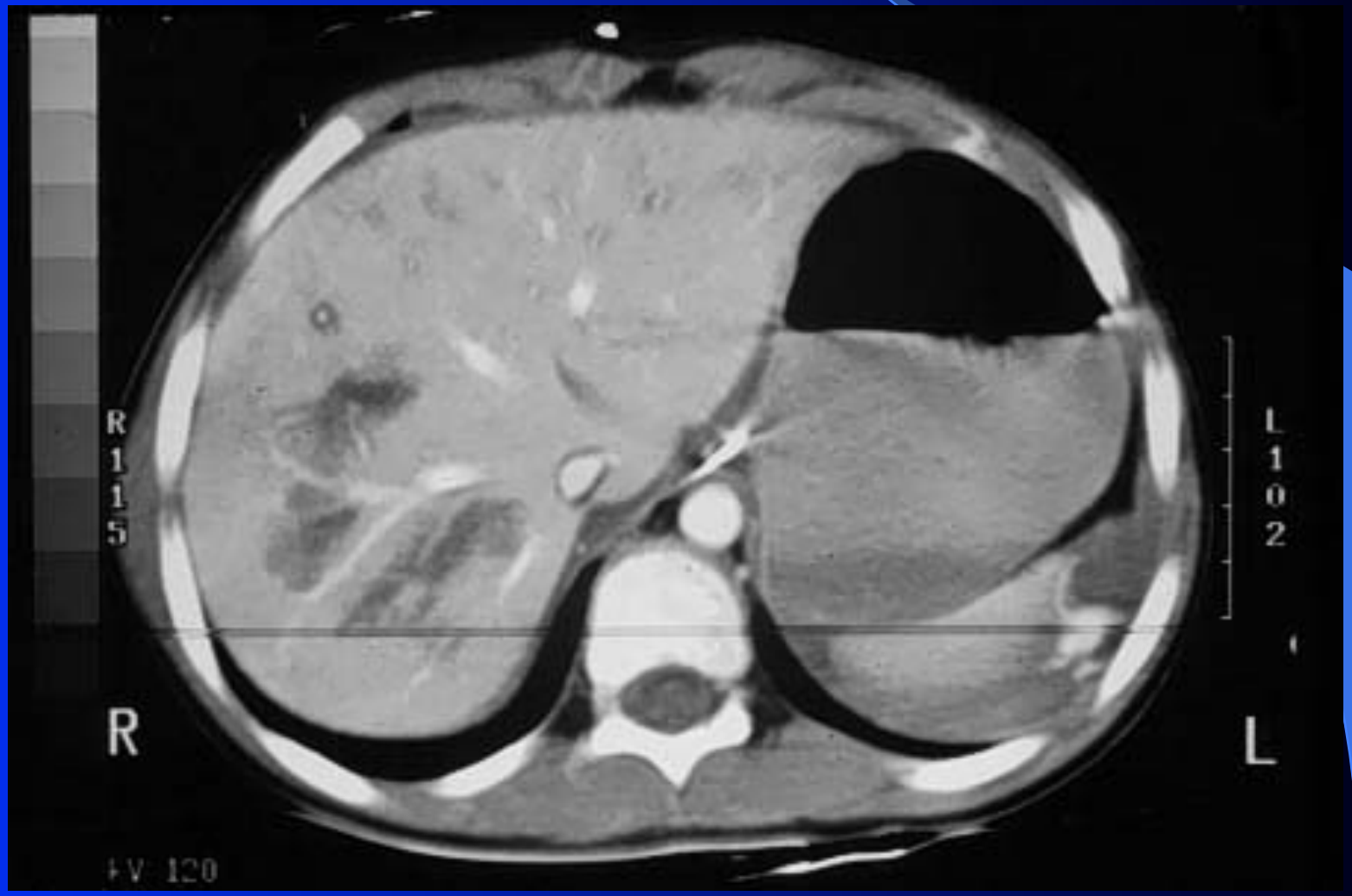
Abdominal Trauma
Computed Tomography (CT) Versus DPL

- DPL has high sensitivity but low specificity for source of intraabdominal bleeding
- DPL sometimes will detect small bowell perforations missed by other studies
- CT highly accurate to delineate solid organ lacerations (spleen, liver)
- CT can determine retroperitoneal injuries missed by DPL
- If oral (via NG) & IV contrast used, CT can readily identify GI tract perforations & GU injuries

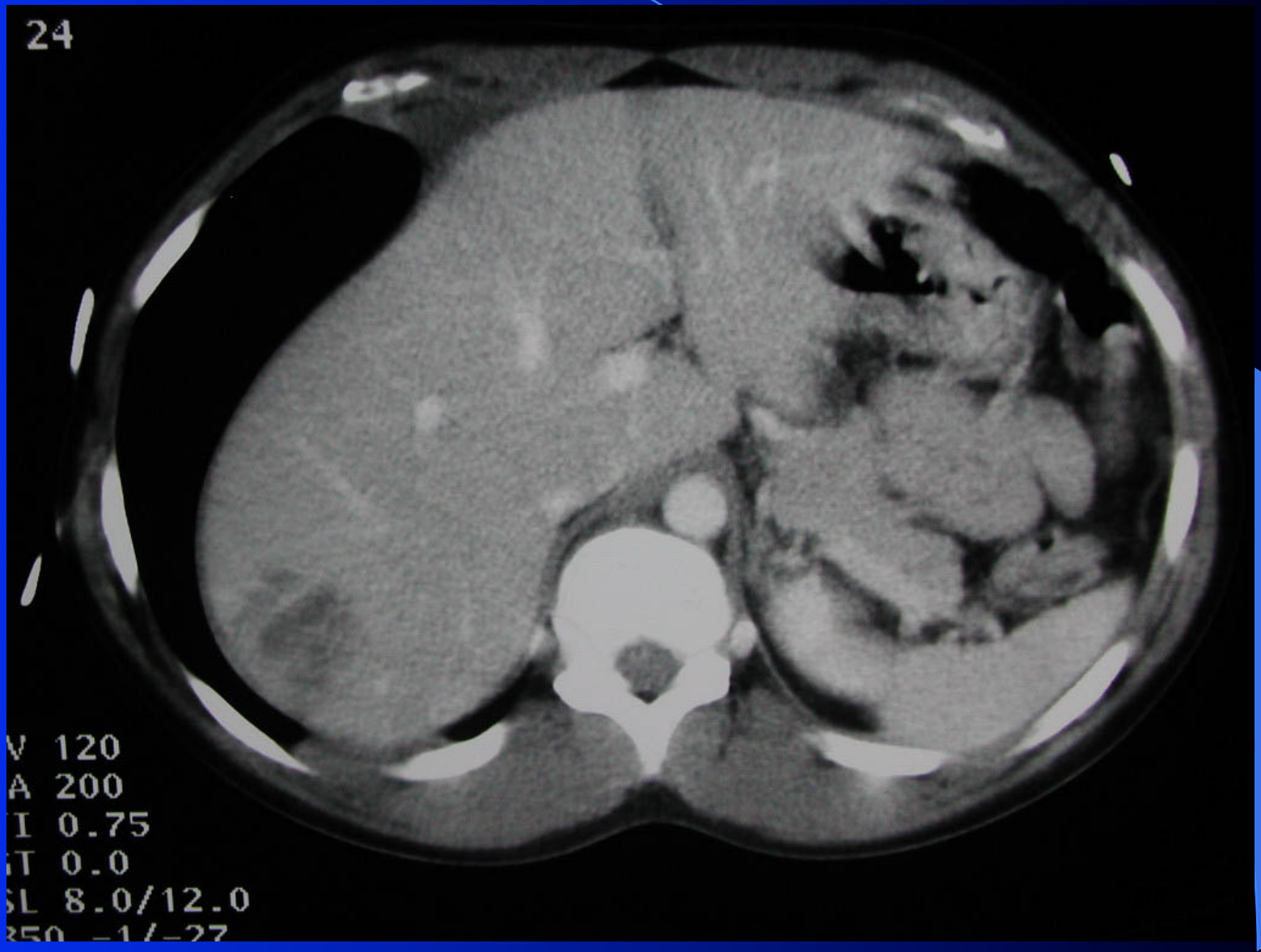
Abdominal Trauma
Computed Tomography Versus DPL

	Advantages	Disadvantages
CT	Identifies organ – specific injury, & retroperitoneal & GU injuries	Slower, requires movement of patient, requires use of IV and NG contrast
DPL	Faster to perform, ? cheaper	Doesn't identify anatomic site of bleeding, may affect followup exams, invasive

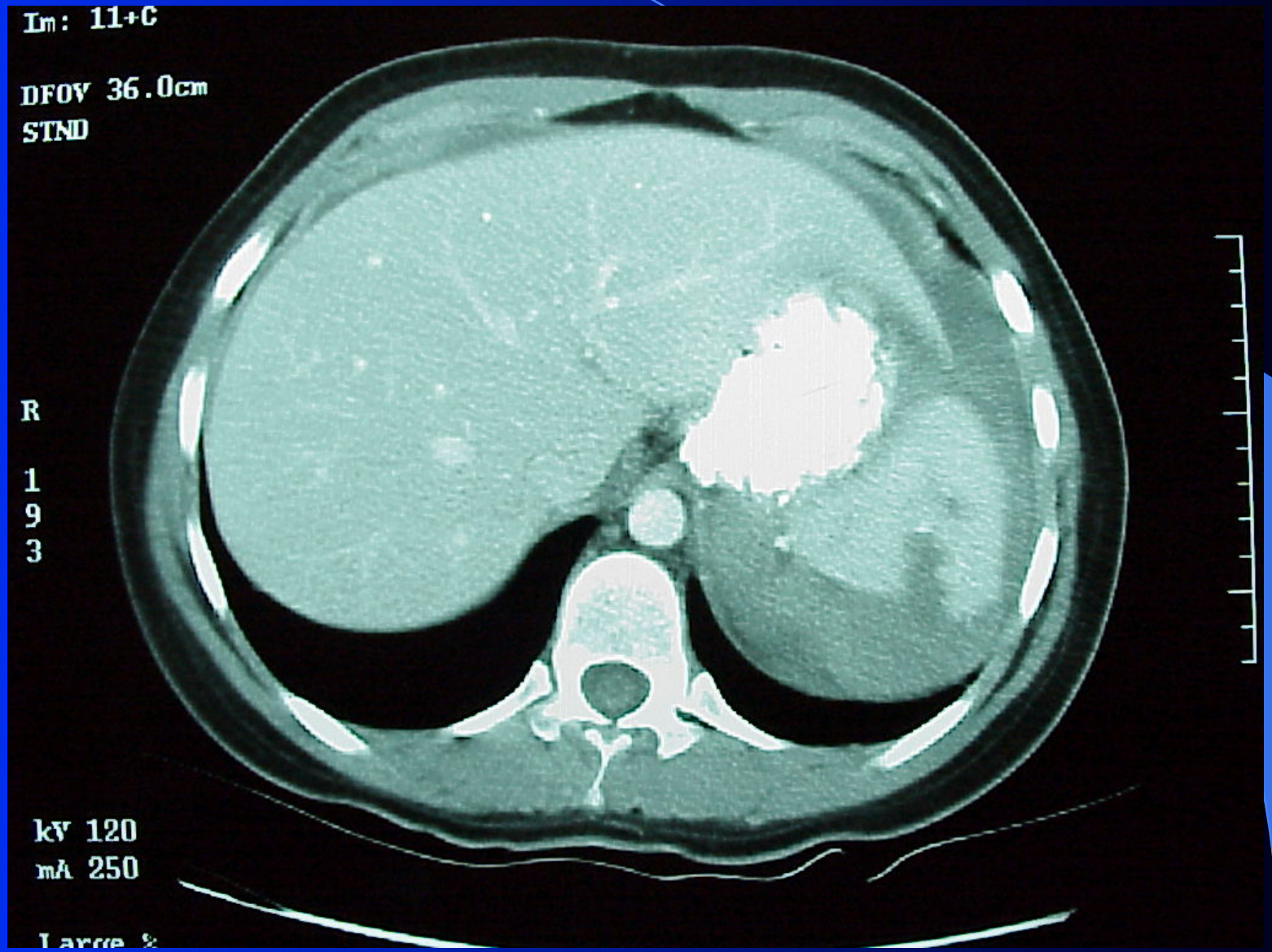
Traumatism abdominal închis
Leziune hepatică intraparenchimatoasă



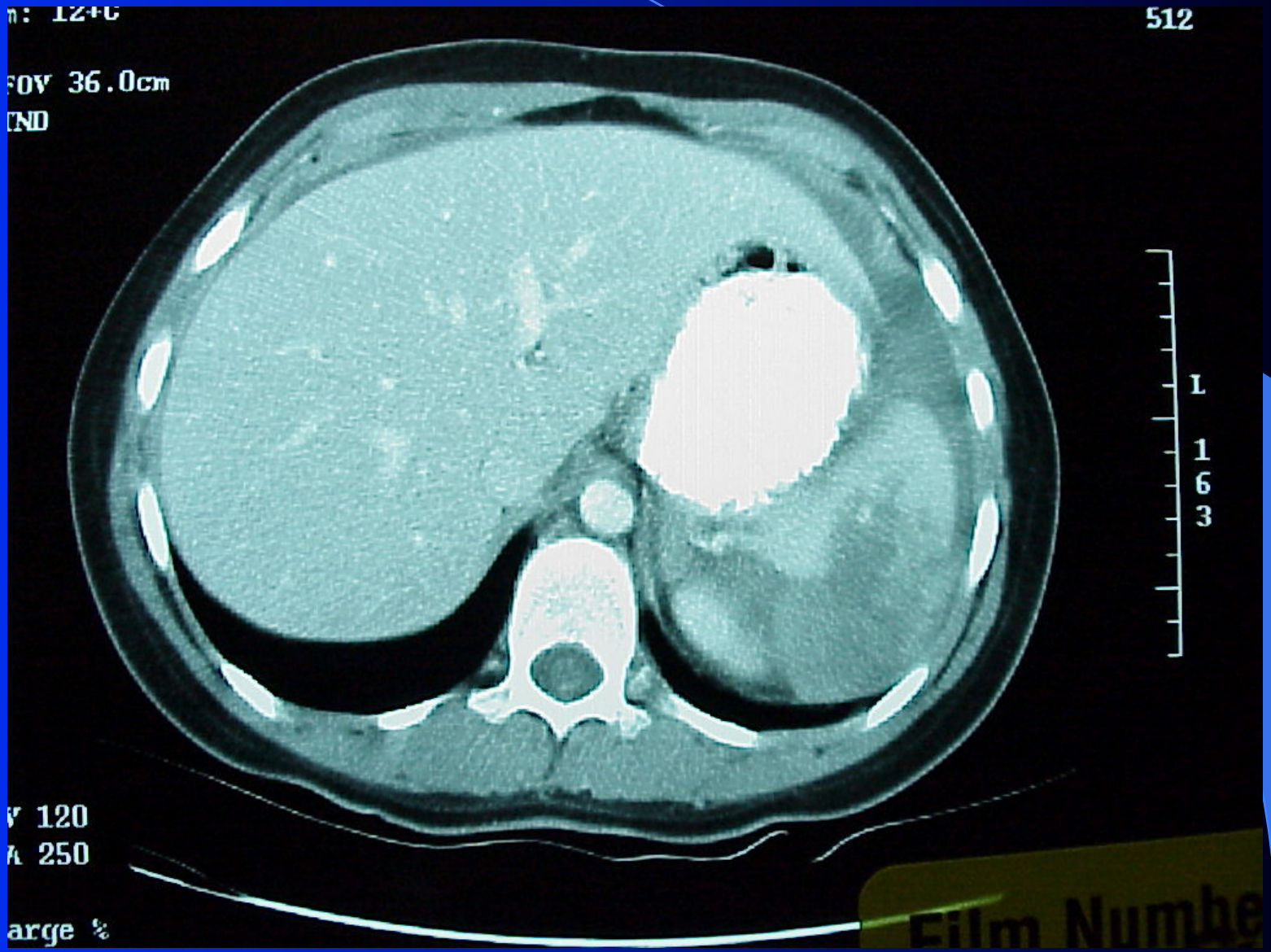
Traumatism abdominal închis
Leziune de lob drept hepatic



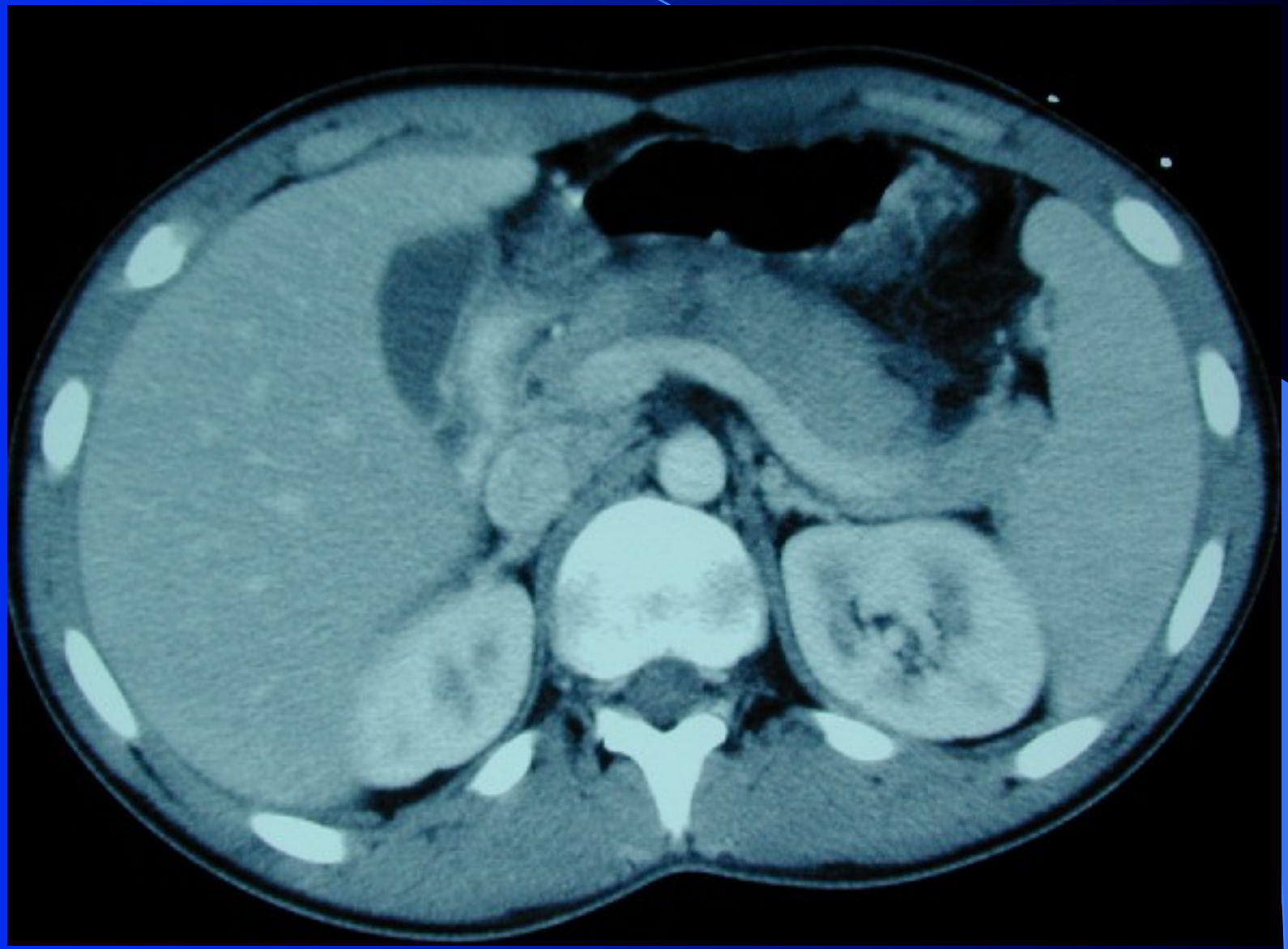
Traumatism abdominal închis
Leziune de splină



Traumatism abdominal închis
Leziune de splină

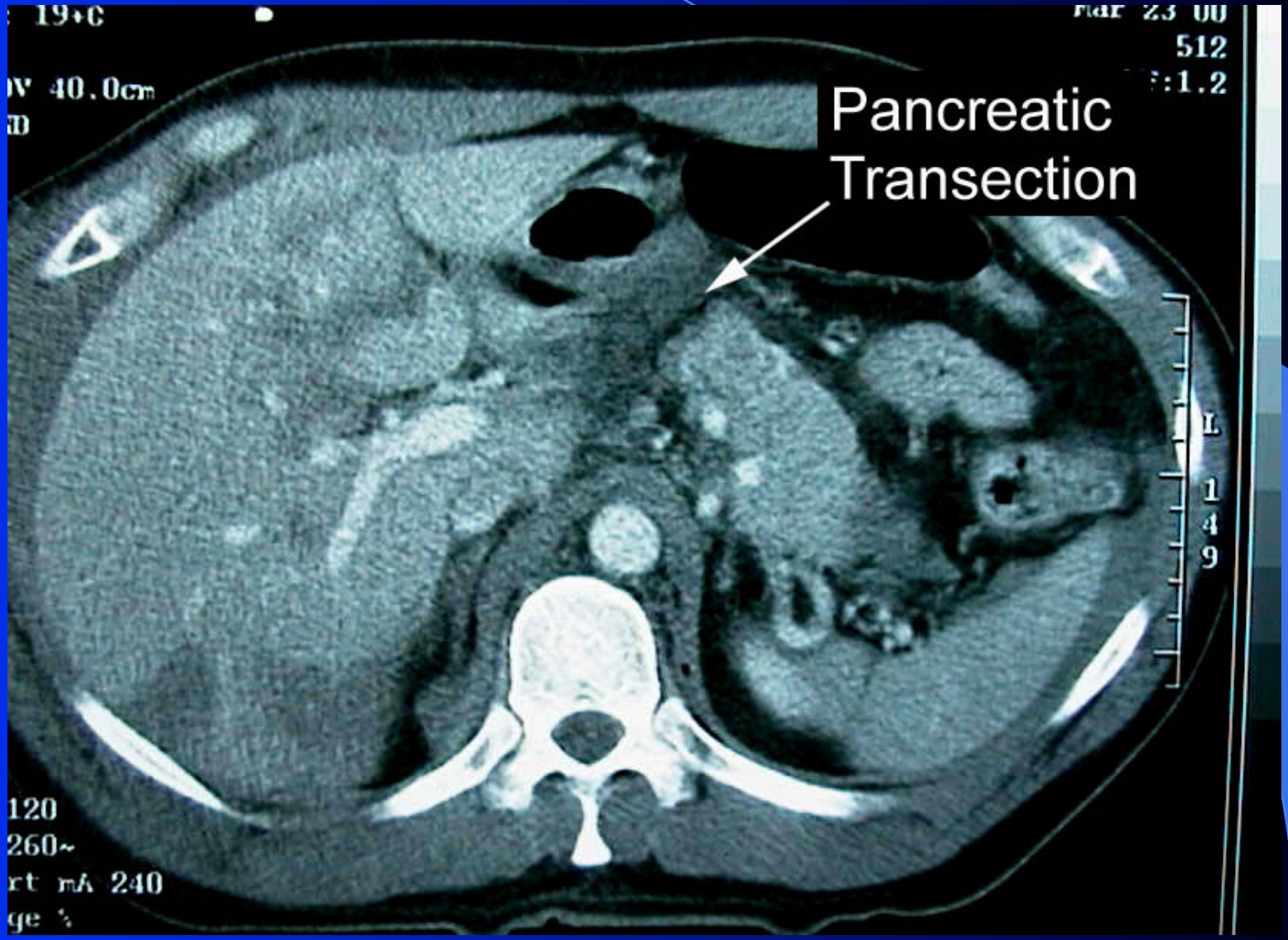


Traumatism abdominal închis
Leziune de pancreas



Traumatism abdominal închis
Leziune de pancreas

Traumatism abdominal închis
Leziune pancreatică



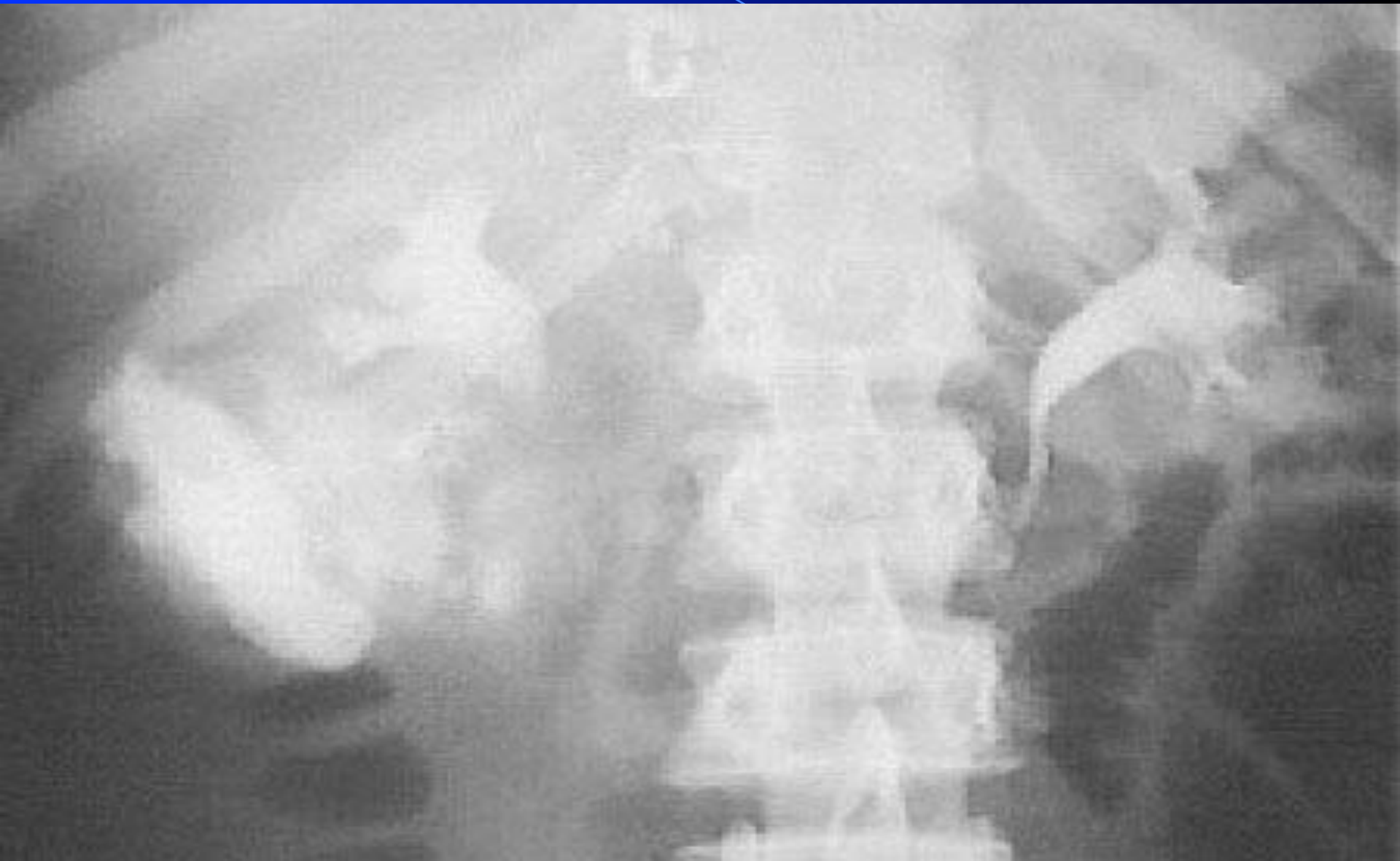
Abdominal Trauma
Nonoperative Management of Solid Organ Injuries

- Some nonhilar splenic & liver lacerations found by CT can be managed nonoperatively:
  - Patient must be hemodynamically stable
  - Age < 50 years
  - Intensive care unit monitoring required
  - Transfusable blood & operating room must be available
  - Frequent follow up physical exams and hematocrits needed

Abdominal Trauma
Other Diagnostic Studies

- If contrast CT not available:
  - Gastrografin Upper GI
    - Suspected bowel perforation
    - Suspected diaphragm rupture
    - Possible duodenal hematoma
  - Intravenous pyelogram
    - Suspected GU tract injury
    - Not as accurate as CT for renal trauma
  - Angiography
    - Possible arterial injury or continued bleeding from pelvic fractures

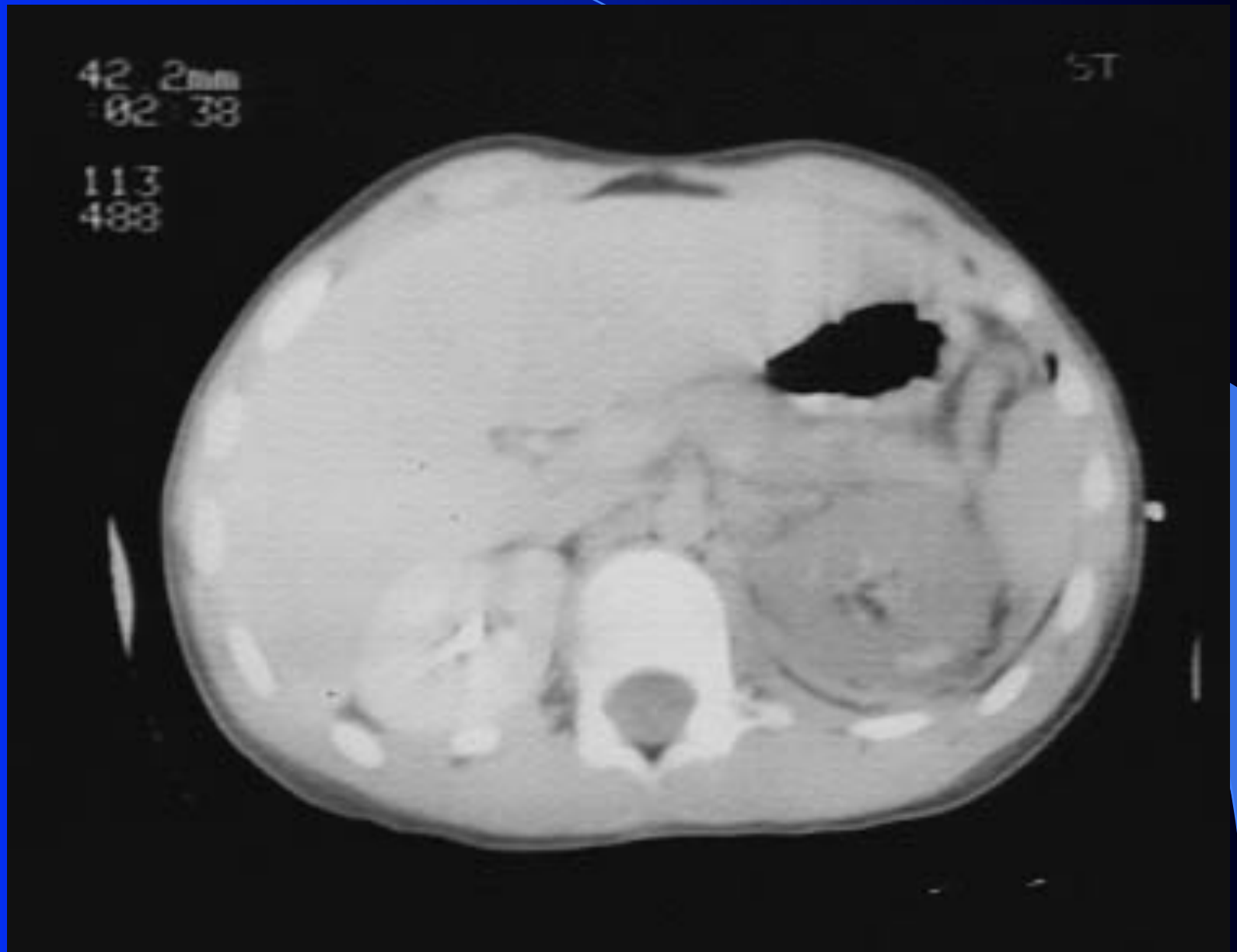
Rinichiul drept
Extravazarea substanţei de contrast



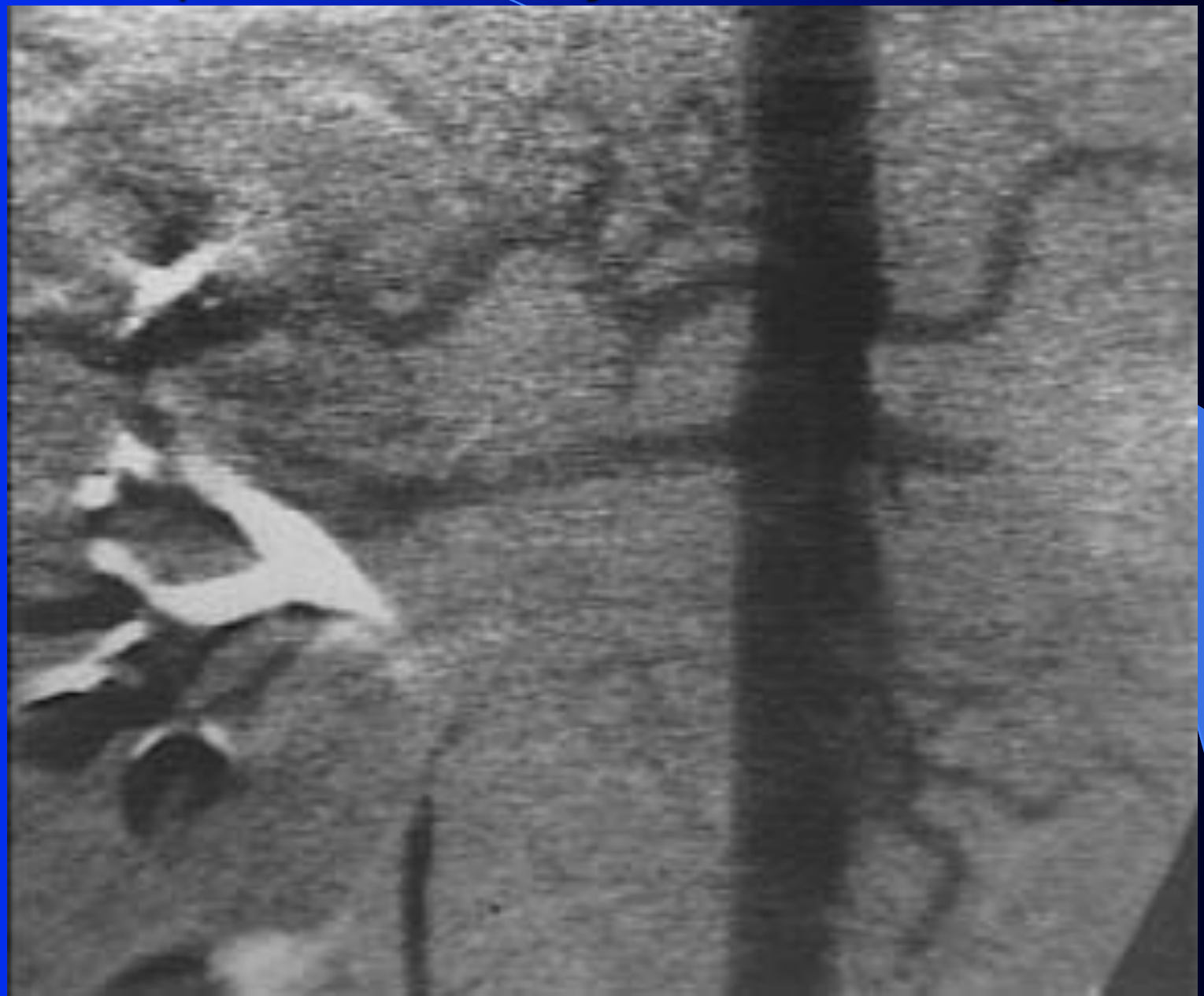
Rinichiul drept
Defect de umplere – pol superior

Rinichiul stâng
Sistem caliceal, ureter, vezică urinară ocupate de un cheag de sânge

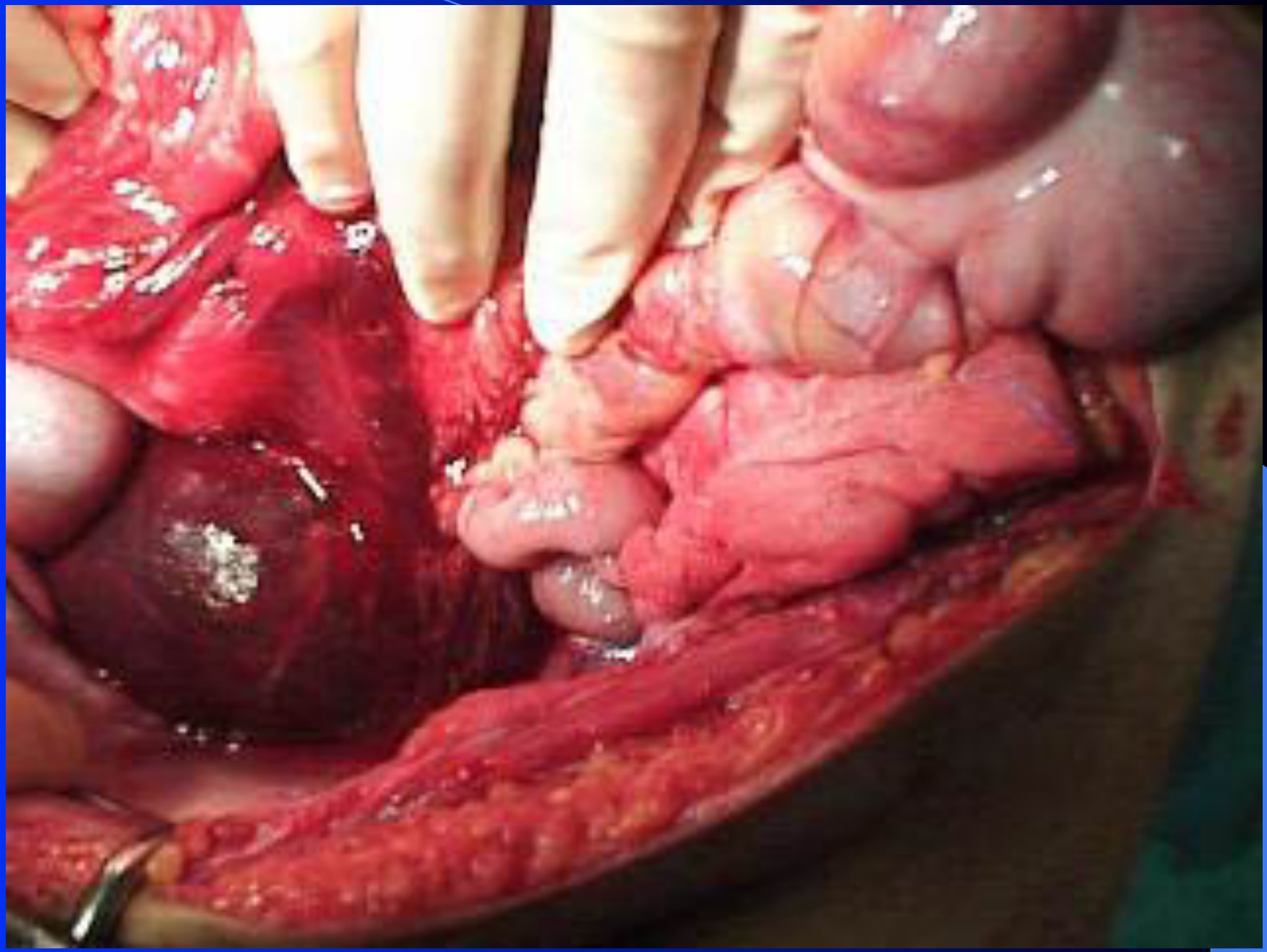
Lipsa vascularizaţiei rinichiului stâng



Angiogramă
Lipsa vascularizaţiei rinichiului stâng



Leziune renală



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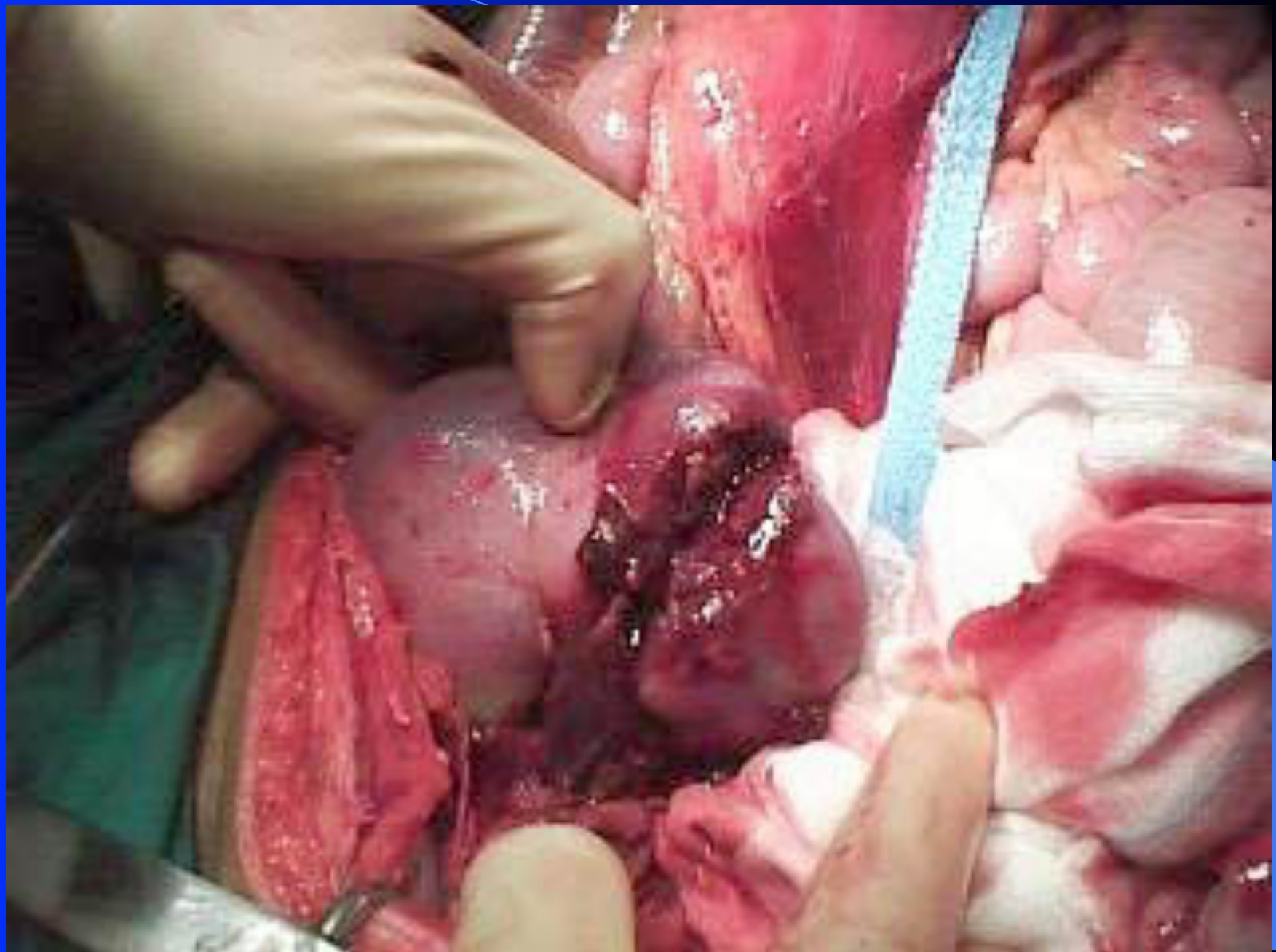

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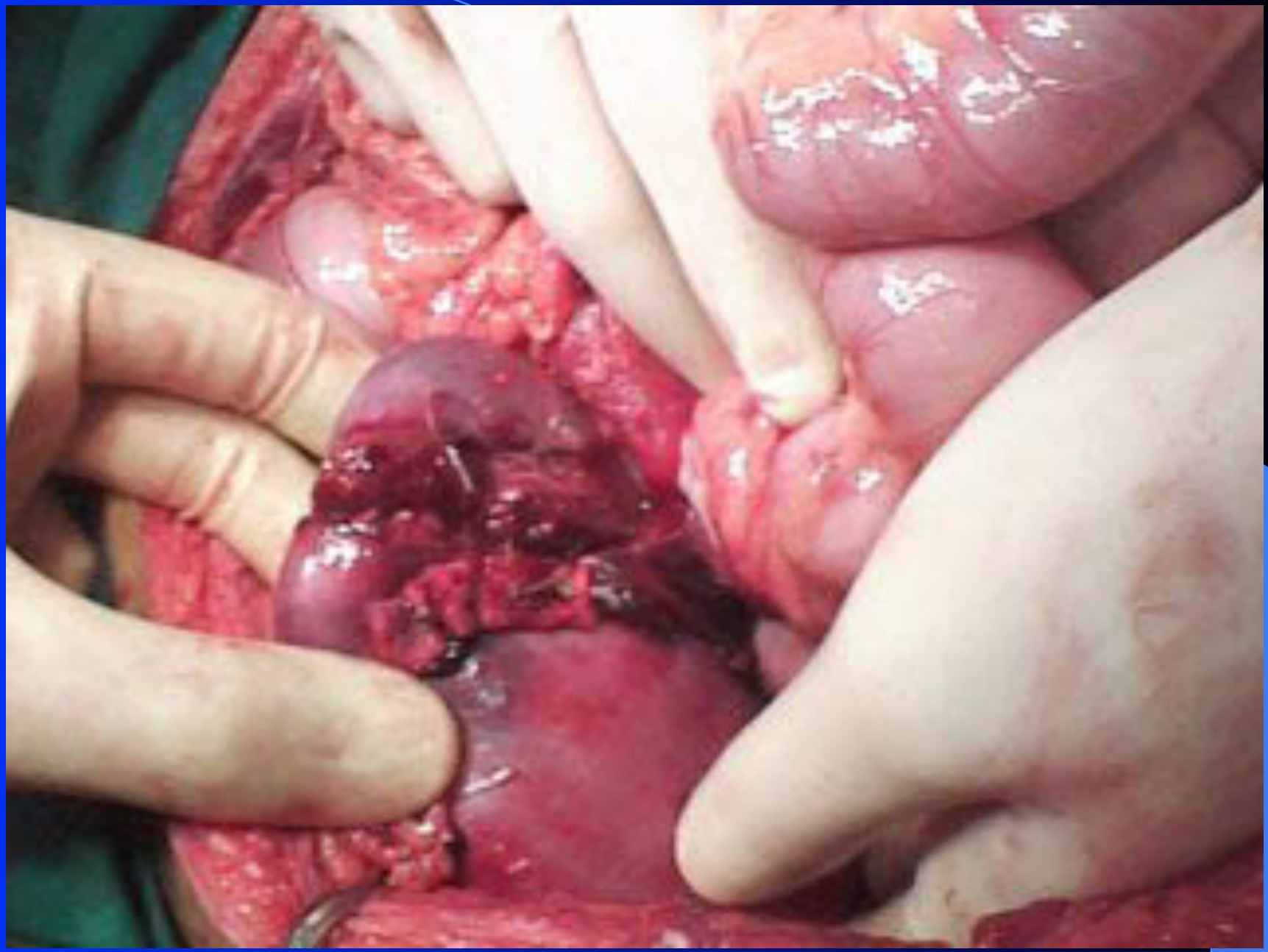
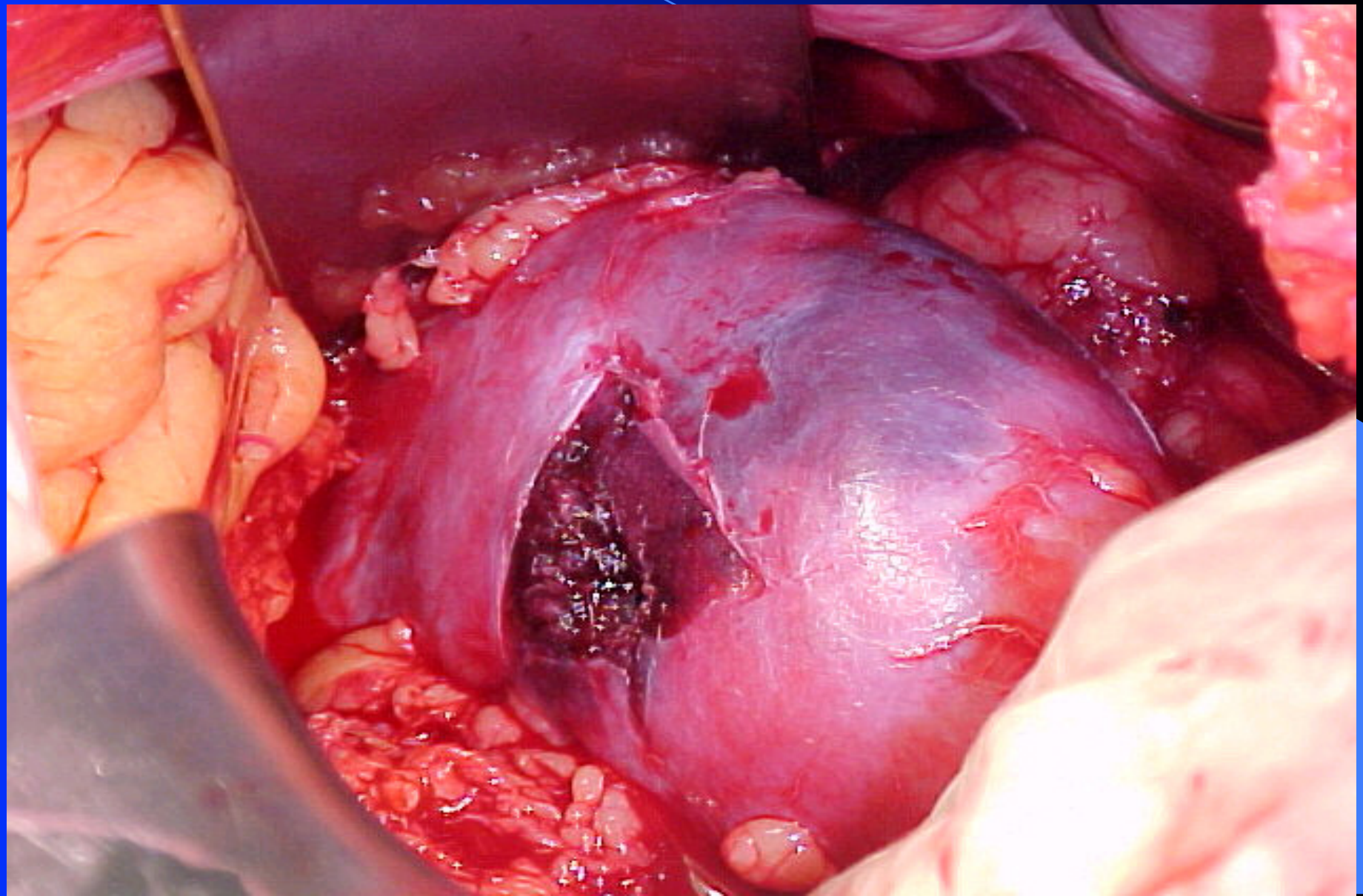
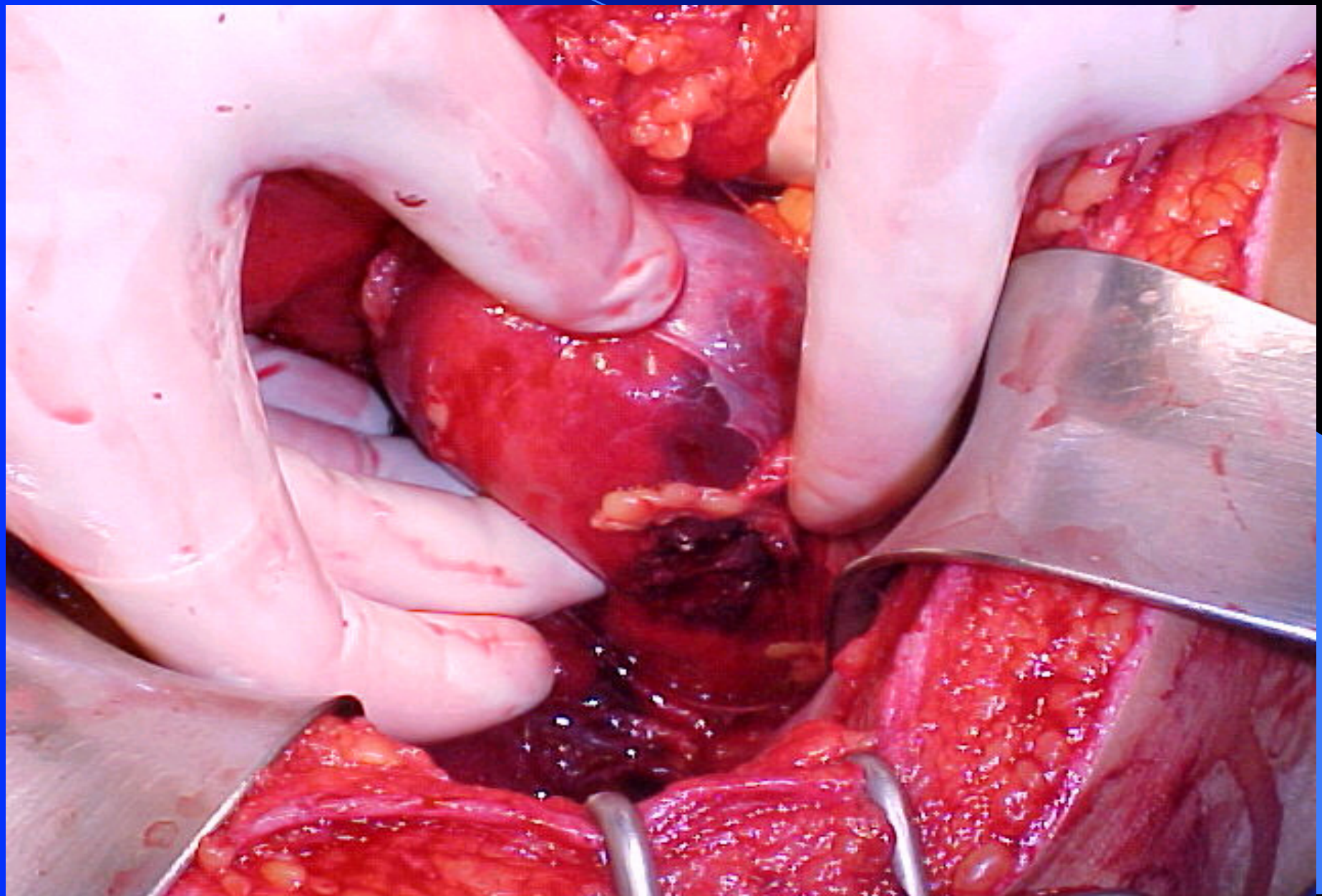


Leziune renală prin împuşcare
Orificiu de intrare

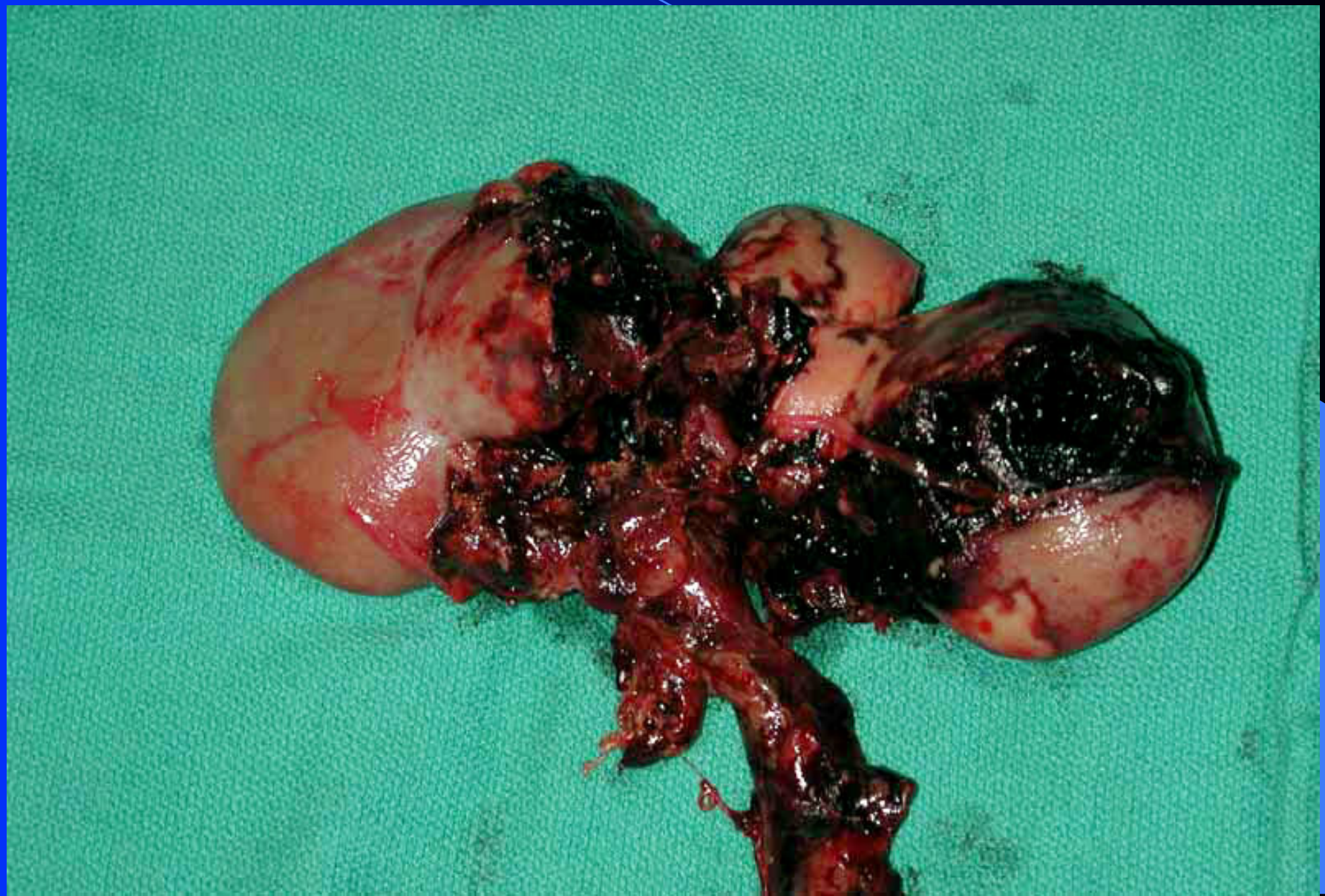


Leziune renală prin împuşcare
Orificiu de ieşire



Explozie de rinichi
Angiogramă

Explozie de rinichi
Piesă pentru examen morfopatologic



Abdominal Trauma
Usefulness of NG Tube Suction

- Allows decompression of stomach
- Lessens risk of aspiration
- Removes residual toxins in stomach
- May demonstrate upper GI bleeding
- Necessary before peritoneal lavage
- Contraindicated if nasal or midfacial fractures or bleeding diathesis (should be orogastric instead)

Lumbar or Thoracic Spine Fractures

- Anterior wedge compression fractures are usually mechanically stable
- May require admission for pain control or concurrent ileus
- Lumbar fx may be associated with bowel perforations from lap belt injury
- If any neuro deficit, should obtain emergent consult with spine surgeon
- Maintain back immobolization

Lumbar or Thoracic Spine Fractures (con't.)

- Indications to obtain spine CT after plain films:
  - Neuro deficit or sx
  - Fx of posterior elements
  - Vertebral body fx's other than simple anterior wedge fx
  - Possible but not definite fracture line seen (such as in cases with marked DJD or congenital or surgical spine abnormalities)
  - Suspected pathologic fracture

Fractură de coloană vertebrală T7-T8 cu compresie medulară

Fractură – luxaţie T12

Fractură complexă de coloană vertebrală lombară

Abdominal Trauma
Final Considerations

- Antibiotics – consider for any penetrating trauma
  - Ampicillin + anti-anaerobic antibiotic (Metronidazole, Clindamycin, etc.) or third generation cephalosporin (Cefoxitin, etc.)
  - Indicated if any suspected bowel injury
  - Should be given as early as possible
- Tetanus toxoid (+/- tetanus immune globulin) if >5 years since last tetanus booster
- Plain medications if hemodynamically stable and diagnostic tests are completed
- Discuss need for surgery with patient and family

Abdominal Trauma Summary

- Assess abdomen as potential source of shock or bleeding
- Start resuscitation
- Complete the abd. Exam with the secondary survey
- Decide if emergent or urgent laparotomy needed
- Decide if additional diagnostic studies needed
- Reassess frequently
- Decide if transfer to a trauma center needed