
بسم الله الرحمن الرحيم

Management of duodenal Trauma

BY

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Anatomy

- The duodenum is the first portion of the small intestine, beginning just to the right of the spine at the level of the first lumbar vertebra.

- Extending from the pyloric ring to the duodeno jejunal flexure, commonly known as the ligament of Treitz.

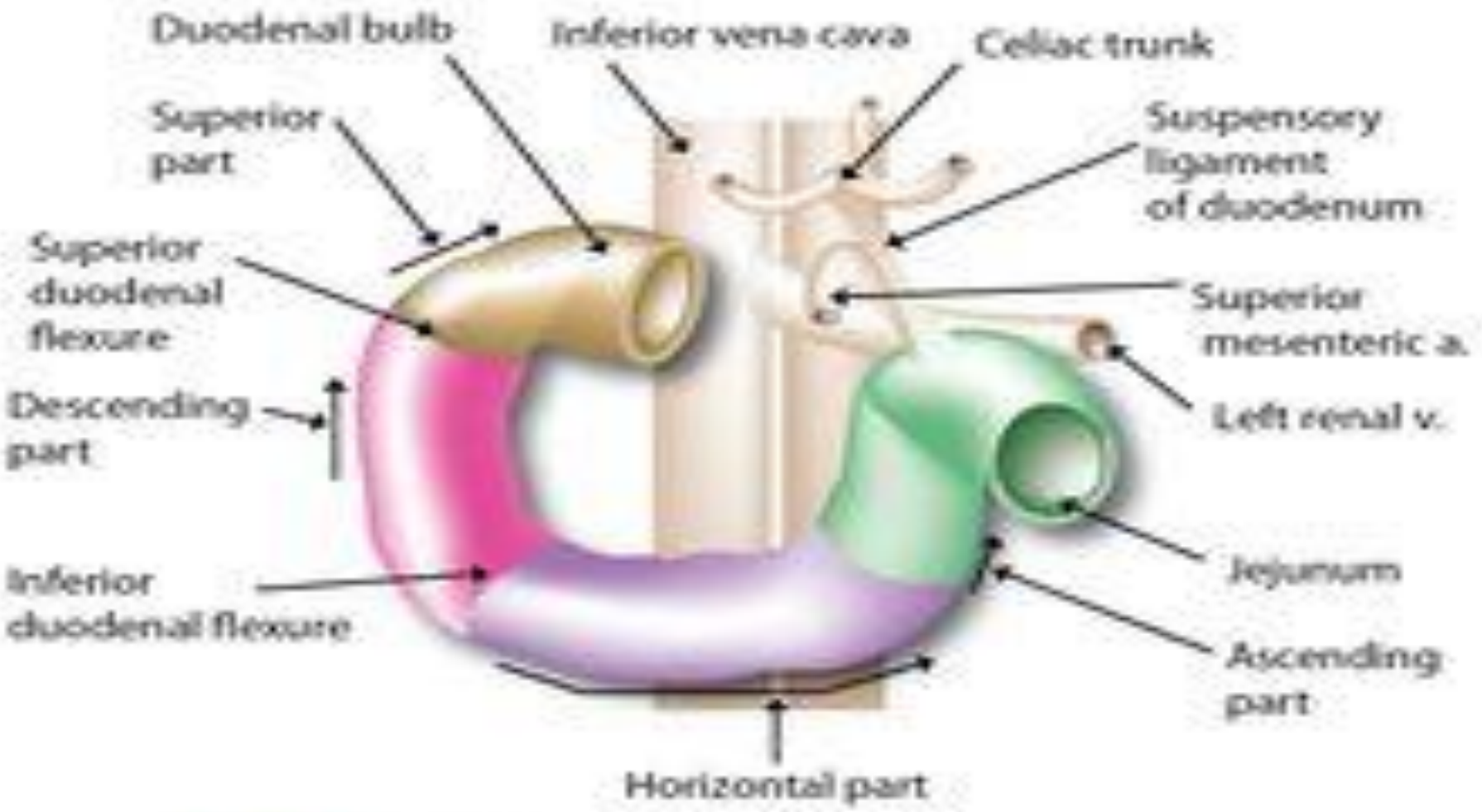
- The duodenum is named from the Latin word duodeni, which means “twelve each,” because it is in total 25 to 30 cm, or about 12 finger breadths, in length.

- divided into four divisions, differentiated by the alteration in direction of the organ.

- The superior or first portion of the duodenum passes backward and upward toward the neck of the gallbladder, and most of this portion is intraperitoneal.

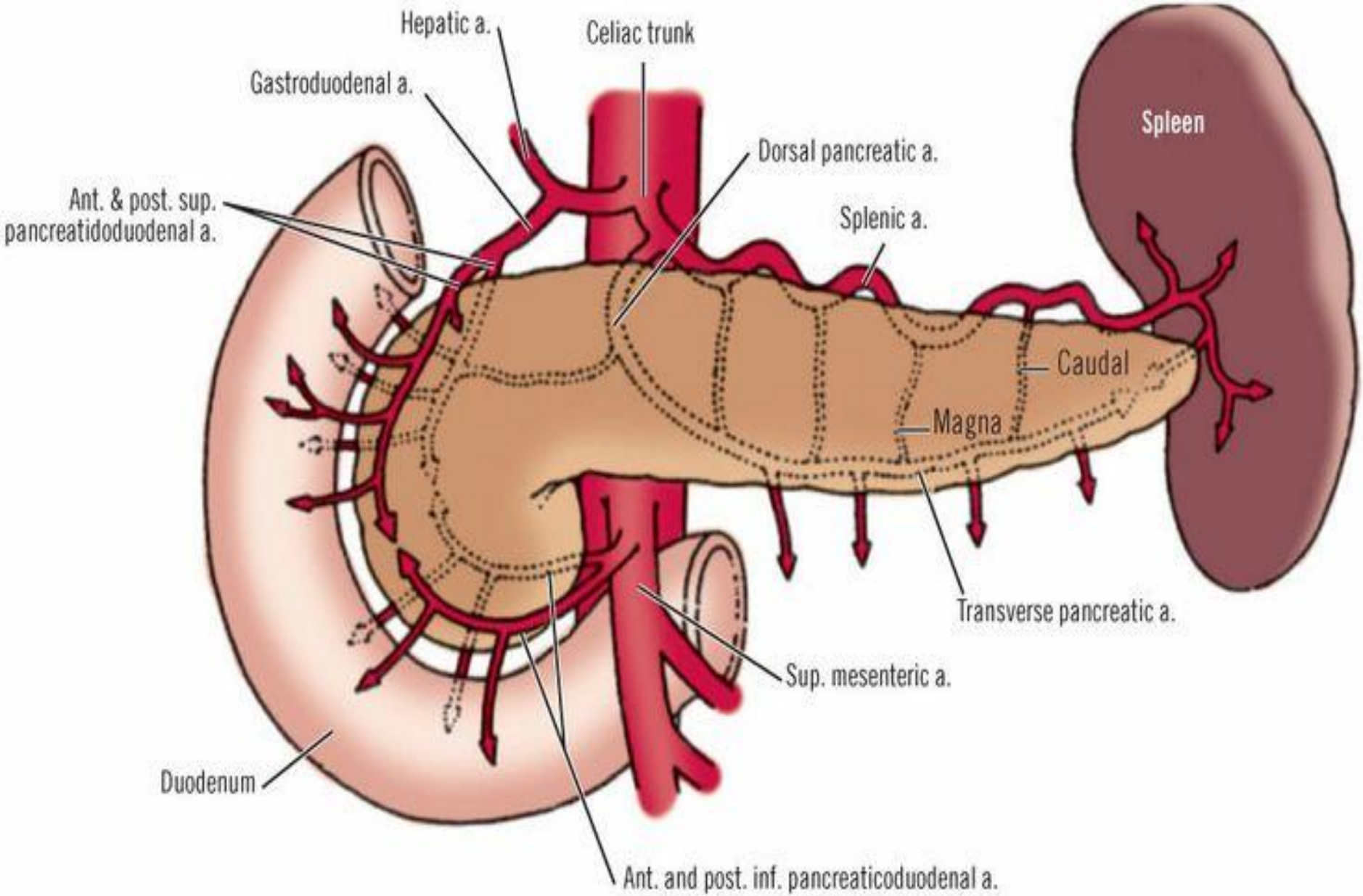
- The descending (vertical) or second portion forms an acute angle with the first portion and descends 7–8 cm. It contains the bile and pancreatic duct openings. This portion (and the remainder of the duodenum) is entirely retroperitoneal; this is the segment mobilized by a Kocher maneuver.

Duodenum



- The transverse or third portion of the duodenum runs 12 cm horizontally to the left in front of the ureter, inferior vena cava, lumbar column, and aorta, and ends at just at the left edge of the third lumbar vertebra. The superior mesenteric artery runs downward over the anterior surface of the third portion of the duodenum.

- The ascending or fourth portion of the duodenum runs upward and slightly to the left for only a short distance (2–3 cm) alongside the spine to the duodenal suspensory ligament of Treitz.



Anatomy and Injury Implications

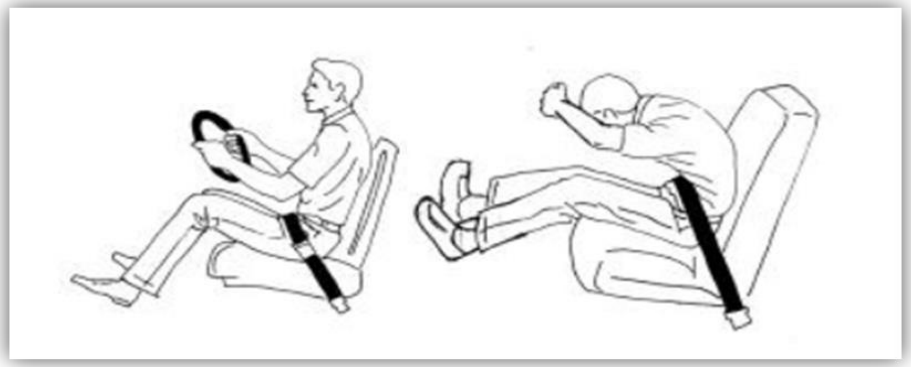
- Retroperitoneal organ
  - Exception: 1st portion of duodenum
    - ***Injury requires forceful blunt or penetrating trauma***
- Duodenum Lacks complete serosal covering
    - ***Repairs have a tendency to leak***

Physiology and Injury Implications

- Duodenum
  - Receives virtually all of GI secretions
    - Saliva: 500 -1,000 ml
    - Gastric: 1000 -2,500 ml
    - Bile: 600 – 1,000 ml
    - Pancreatic: 800 – 1,000 ml
  - ***Fistula can cause serious fluid/electrolyte problems***
  - ***Dehiscence of duodenal suture line dangerous secondary to activated enzymes***

Mechanisms of Injury

- Blunt
  - Crushing the duodenum against the spine “blow-out” of the duodenal loop
    - Partially closed at pylorus and ligament of Treitz
  - Locations
    - 2nd portion most common site
    - 25% occur in the 4th portion near ligament
      - *“MUST BE EXAMINED CAREFULLY BY INCISING THE PERITONEUM AND DISSECTING UNDER THE LOWER BORDER OF THE PANCREAS”*



Associated Injuries with Duodenal

- Blunt: Pancreas (40-50%)
- Penetrating: Liver (54%)- Major vessels (52%), Small bowel (50%), Colon (49%).

- The duodenum and pancreas can be injured simultaneously; isolated injuries are rare (<30%).

Diagnosis

- Signs and symptoms
  - Vast majority initially produce only mild tenderness

" Clinical changes in isolated pancreatic and duodenal injury may be **extremely subtle** until severe, life-threatening peritonitis develops!! "

Investigations

- Radiographic
  - Plain films
  - Contrast swallow
  - CT scan

Plain film (Historical)

- KUB or upright
  - Lucas, Surg Clin N Amer, 1977
    - Obliteration of R psoas shadow in 18/20 (90%) patients with duodenal rupture
    - Retroperitoneal air bubbles along R psoas or R kidney in 50% of patients

Contrast Swallow

- Useful to diagnosis perforation or hematoma
  - 50% of perforations using water-soluble contrast (Gastrograffin)
  - Barium probably more accurate
  - Hematoma = “coiled-spring” appearance or complete obstruction

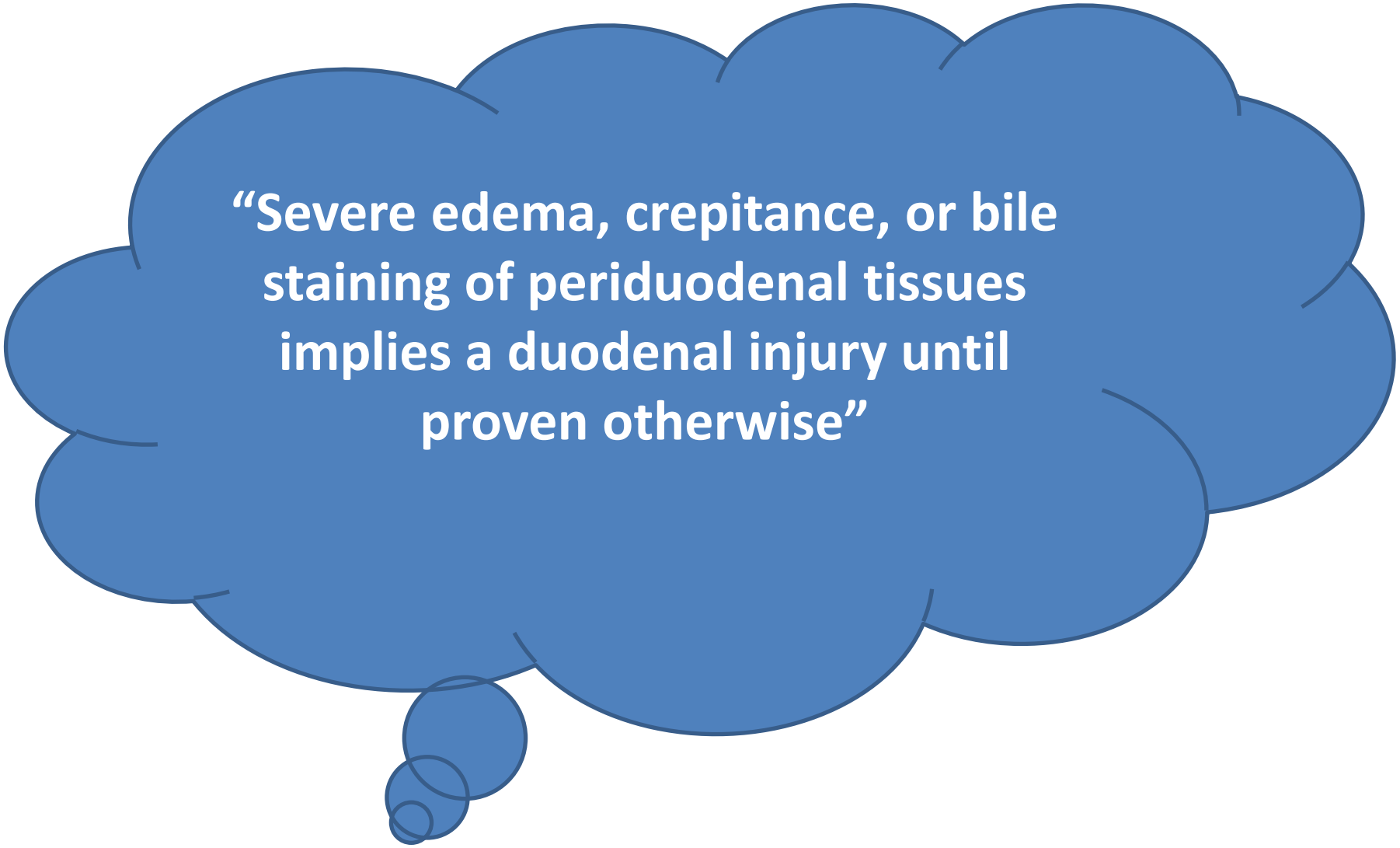
CT Abdomen

- Highly positive predictive value
  - leak of contrast, narrowing, or extraluminal air
  - Must be given Oral contrast

- Relative little negative predictive value

Diagnosis - Intraoperative

- No obvious injury, but suspicious
  - Duodenum
    - Cause must be sought if bile staining found even if minimal
    - Consider needle cholecystocholangiogram
    - Instillation of methylene blue via NGT


“Severe edema, crepitance, or bile staining of periduodenal tissues implies a duodenal injury until proven otherwise”

Diagnosis - Intraoperative

- Intraoperative evaluation
  - Careful evaluation of pancreas/duodenum
    - Particularly if hematoma overlying
  - Maneuvers
    - Kocher – expose 1st, 2nd, 3rd portions of duodenum and head of pancreas
    - Cattell – exposing root of mesentery of R colon if inadequate exposure from Kocher
    - Open lesser sac – visualize pancreatic body and tail

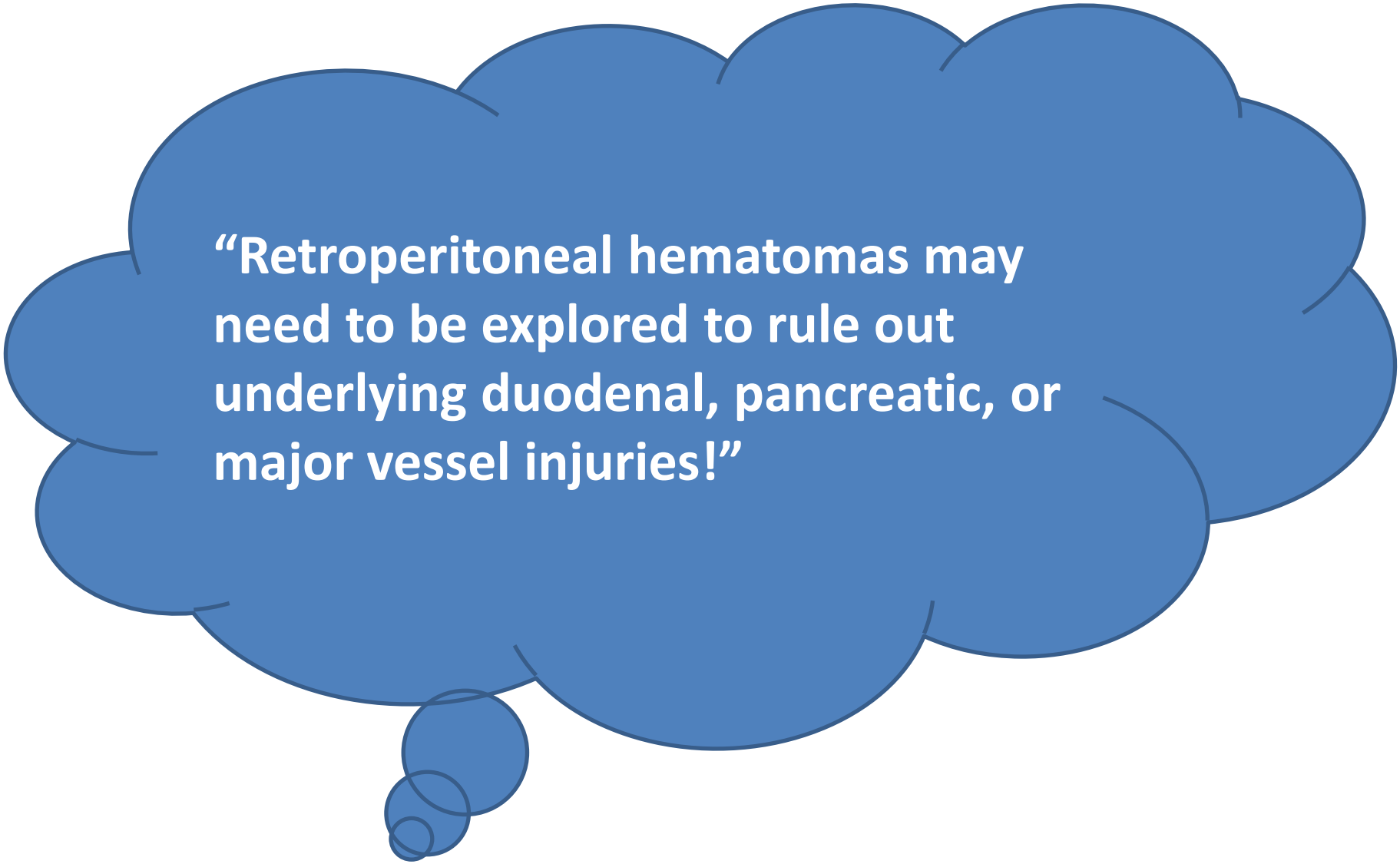
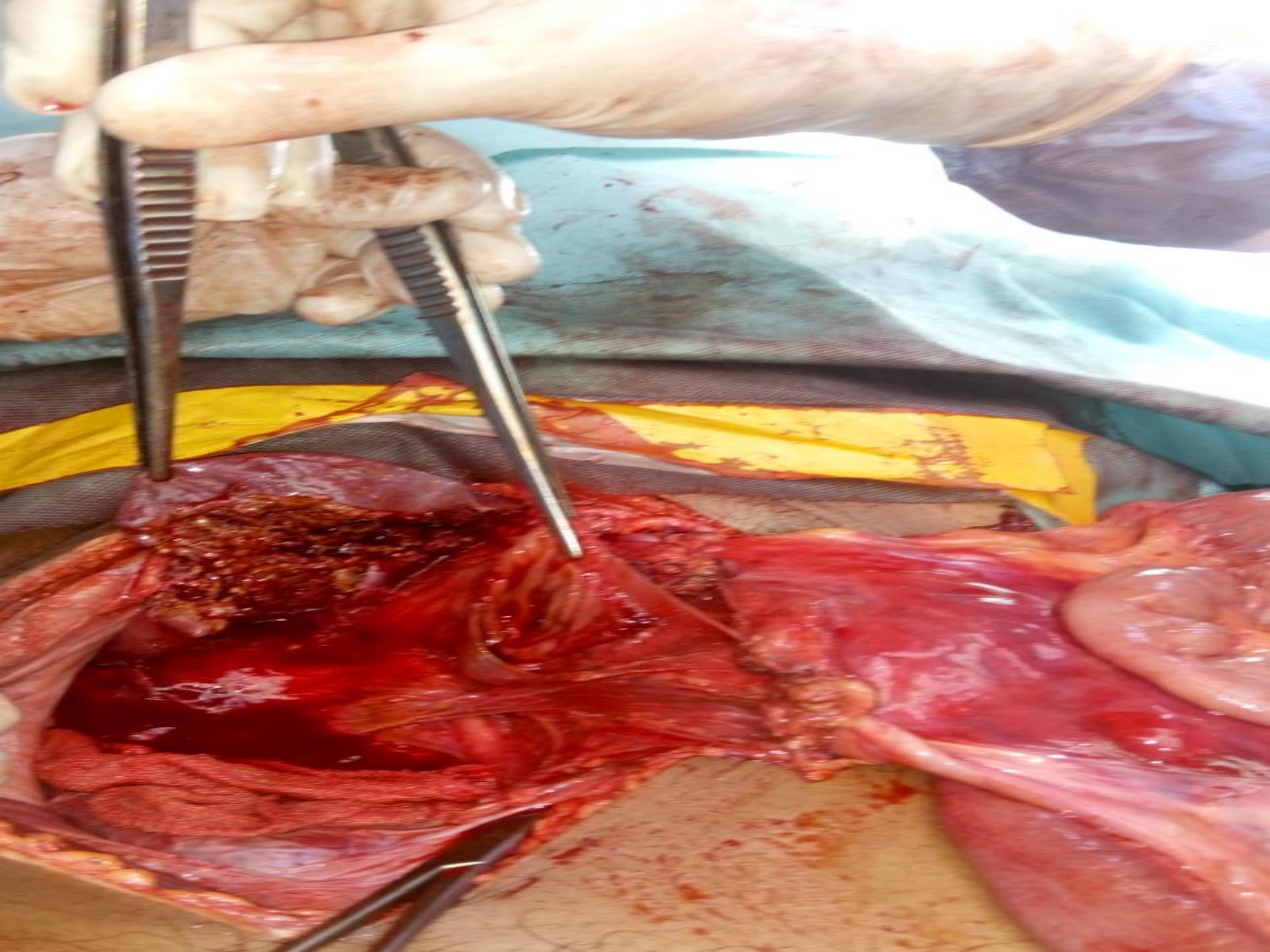
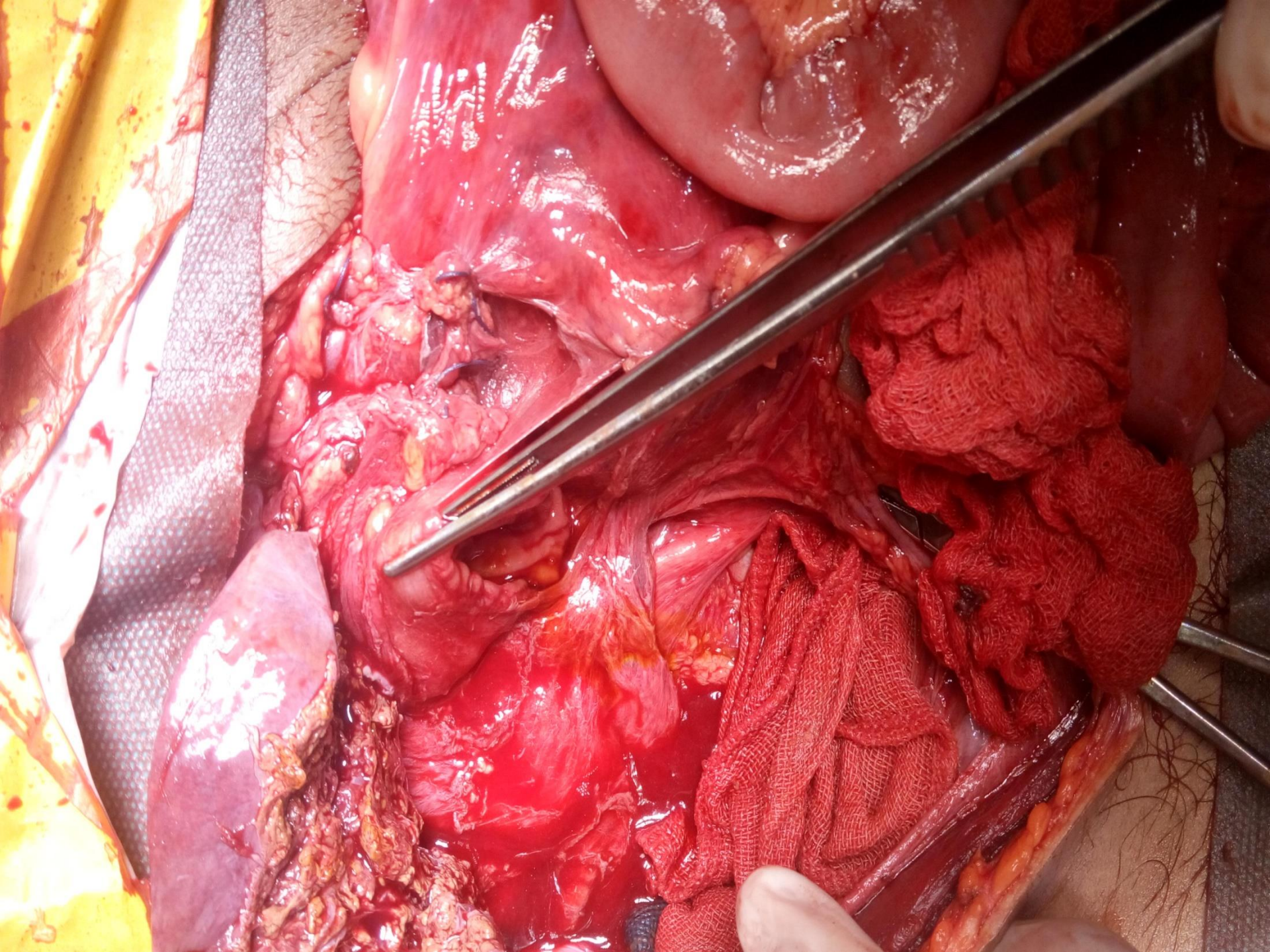

“Retroperitoneal hematomas may need to be explored to rule out underlying duodenal, pancreatic, or major vessel injuries!”

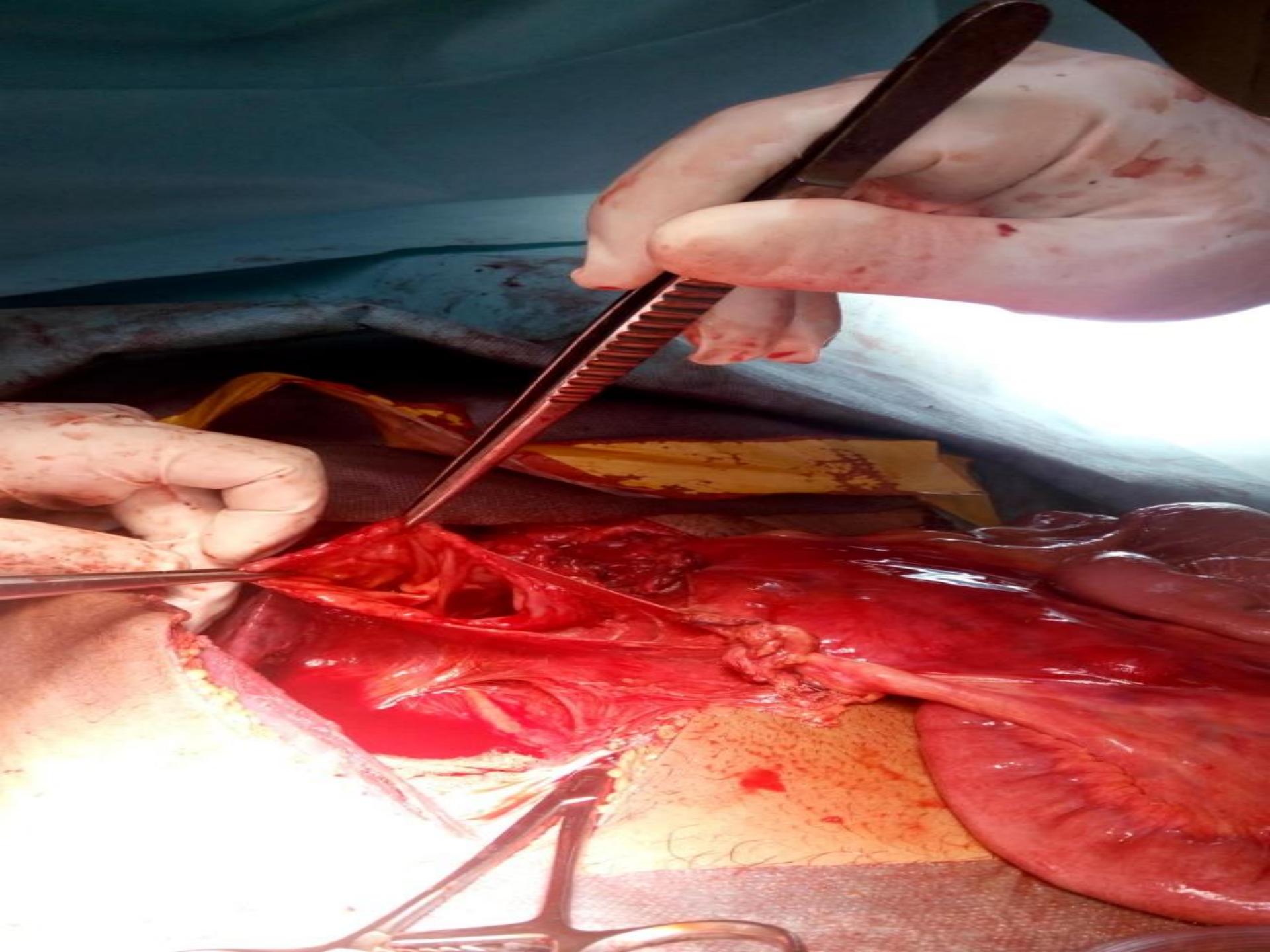
Table 2: AAST-OIS Grading of Duodenal Injury Severity

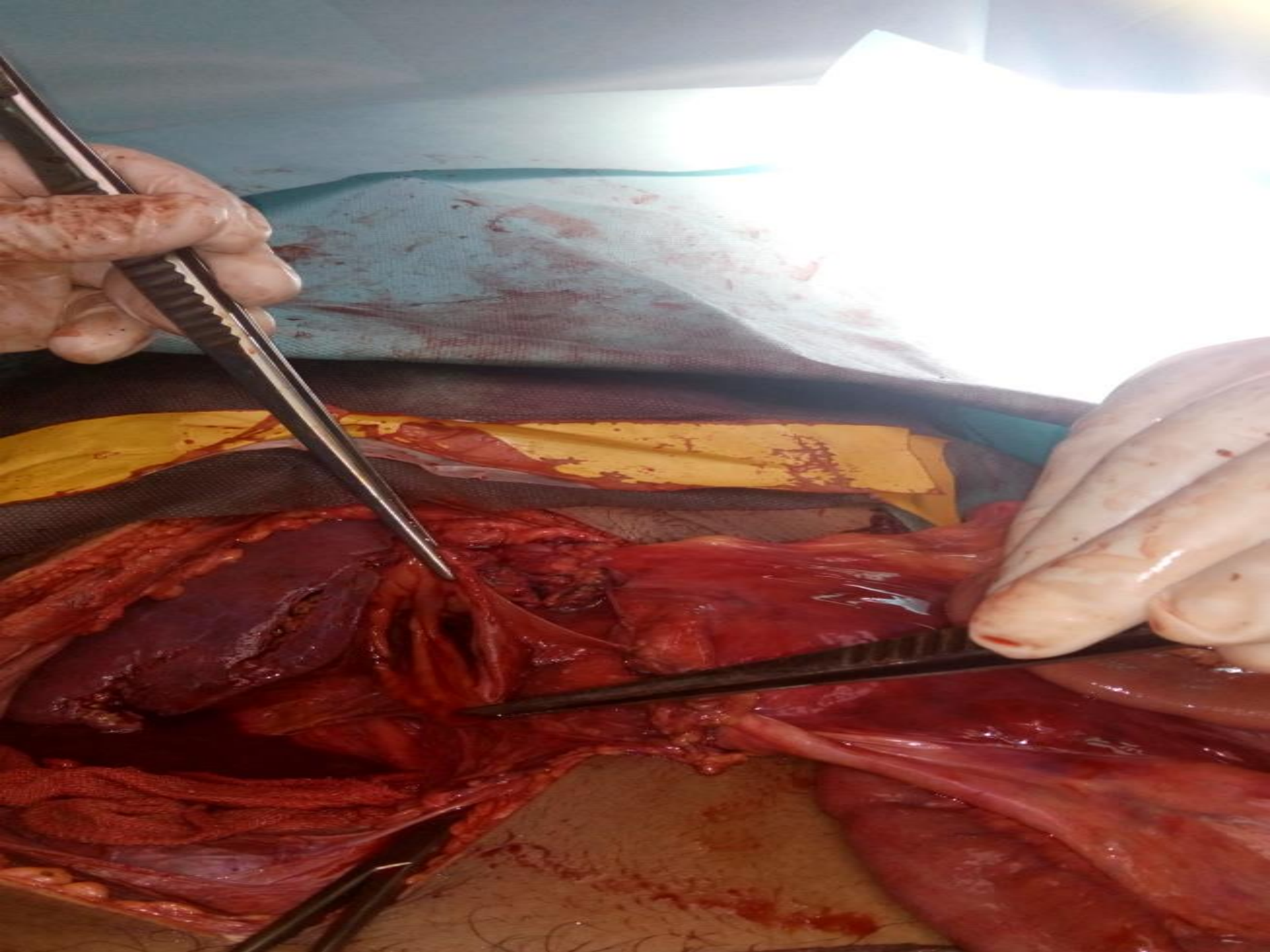
Grade	Type	Description
I	Hematoma Laceration	Single portion of duodenum Partial thickness
II	Hematoma Laceration	More than one portion <50% circumference
III	Laceration	50%–75% D2 50%–100% D1, D3, D4
IV	Laceration	≥75% D2 Involves ampulla or distal CBD
V	Laceration	Massive disruption of duodeno-pancreatic complex Devascularization

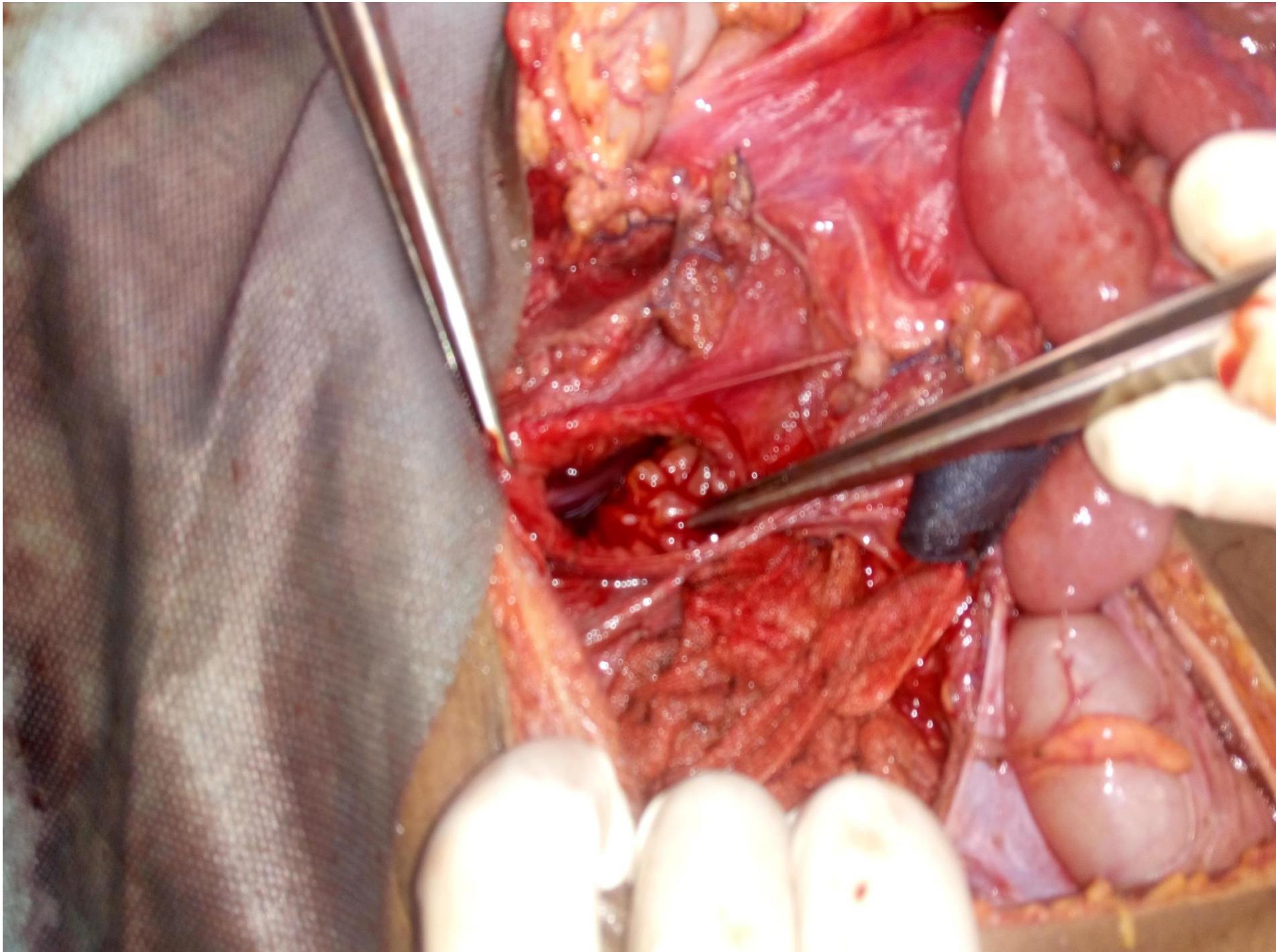
AAST-OIS, American Association for the Surgery of Trauma Organ Injury Severity scoring system.
Modified from American Association for the Surgery of Trauma (AAST).











Treatment – Duodenal Injuries

4 basic principles in managing duodenal trauma:

- Restore intestinal continuity
- Decompress the duodenal lumen
- Provide wide, external drainage
- Provide nutritional support

- **Grade 1 and 2 Duodenal hematoma**
  - Usually 2nd or 3rd portion
  - Partial or even complete obstruction
  - Symptoms of pain and bilious emesis not impressive initially
  - Treatment
  1. Detected intraoperative -------- evacuation
  2. Detected in non operative means --------- observe with NGT suction and TPN allows resolution within 1-3 weeks.

- **Grade 1 and 2 Duodenal laceration**
  - Debridement
  - Repair primarily and buttress with omentum.

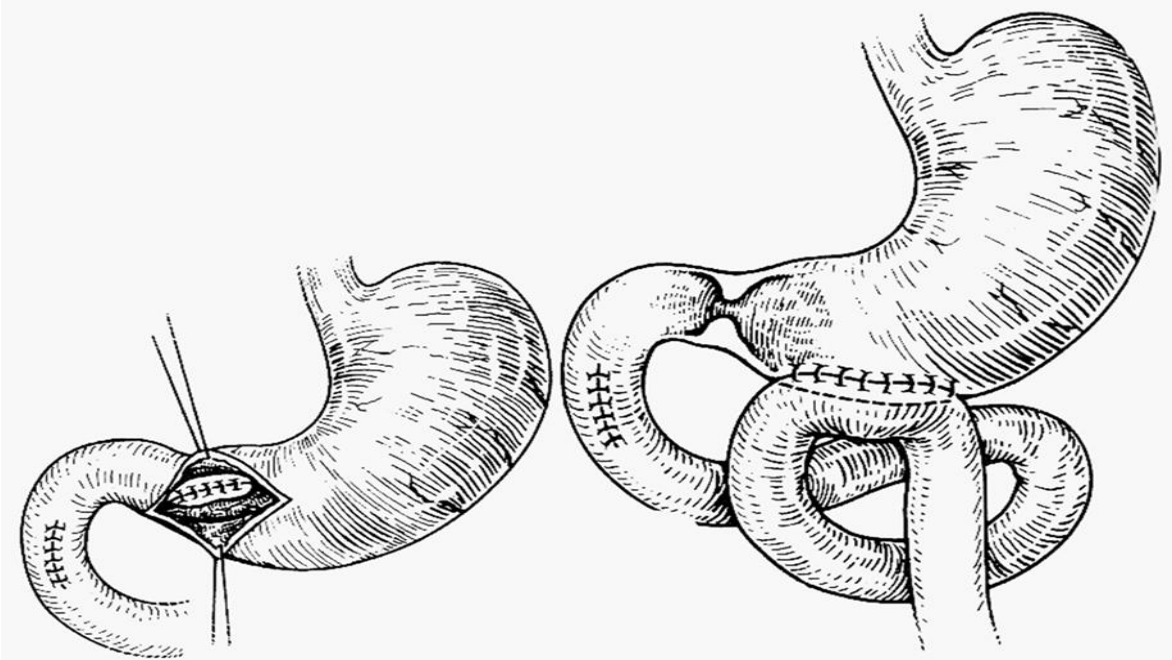
Primary repair is usually the simplest, fastest, and most appropriate way to manage duodenal injuries. It must be transverse repair line and without tension so tissue loss must be evaluated well before repair. So, Primary repair is appropriate for

1. Complete transection of the duodenum if there is little tissue loss,
2. If the ampulla is not involved, and
3. If the mucosal edges can be debrided and closed without tension.

Primary closure possible but significant concern about wound closure consider duodenal catheter drainage, pyloric exclusion, or duodenal diverticularization

Pyloric Exclusion

- This procedure is performed through a gastrotomy
- Consists of grasping the pylorus with a Babcock clamp and suturing closed the pylorus with absorbable size 0 Polyglycolic acid or polyglactin, or Maxon (polyglyconate) or PDS suture + construction of loop gastrojejunostomy.



Concept of Pyloric Exclusion

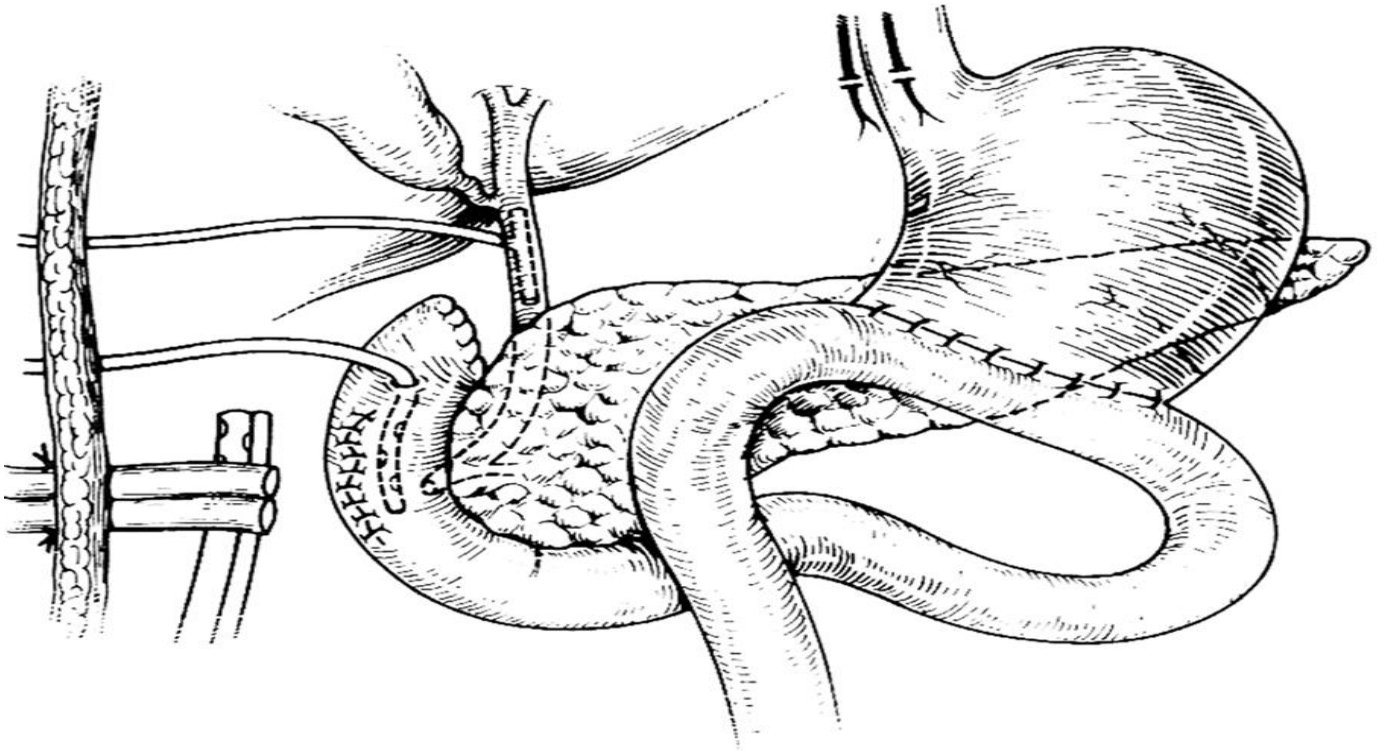
1. diverts gastric flow away from the duodenum for several weeks while the duodenal heal.

2. The pylorus eventually opens (2 weeks to 2 months) and the gastrojejunostomy functionally closes.

Duodenal Diverticularization

Primary closure of the duodenal wound + Antrectomy + vagotomy +

End-to-side gastrojejunostomy + T-tube common bile duct drainage, and lateral tube duodenostomy.



Concept of diverticularization

1. to completely divert both gastric and biliary contents away from the duodenal injury,

2. provide enteral nutrition via the gastrojejunostomy, and

3. convert a potential uncontrolled lateral duodenal fistula to a controlled fistula

Grade III

1. Attempt to close primarily with pyloric exclusion
2. If 1ry repair not feasible treat as following:

- Injury proximal to ampulla----- antrectomy + gastrojejenostomy + stump closure
- Injury distal to ampulla ------- R-Y- dudenojejunostomy to proximal end of duodenal injury + oversewing distal.

Figure 3 Extensive disruptions of the duodenum may be treated by resection with end-to-end Roux-en-Y duodenojejunostomy. *(From Asensio J, Feliciano D, Britt L, Kerstein M: Management of duodenal injuries. Curr Probl Surg 11, 1993, p. 1064, figure 9.)*

Grade IV

- Management options:

1. Pancreatico-dudenectomy.
2. Reimplantation of ampulla or distal CBD into duodenum or R- Y- Jejunal limb.
3. Reconstruction with hepaticojejunostom.
4. Delayed reconstruction.

Grade V

Pancreatico-dudenectomy (Whipple operation) is mandatory for grade V

Complications

Fistulas, duodenal dehiscence, uncontrolled sepsis, and subsequent multiple-system organ failure.

- Worse complication
- Incidence 3-12%
- Difficult fluid and electrolyte management
- If drains, usually duodenocutaneous fistula
- NPO, NGT, TPN, +/- somatostatin
- Usually takes 3-4 weeks or more for closure

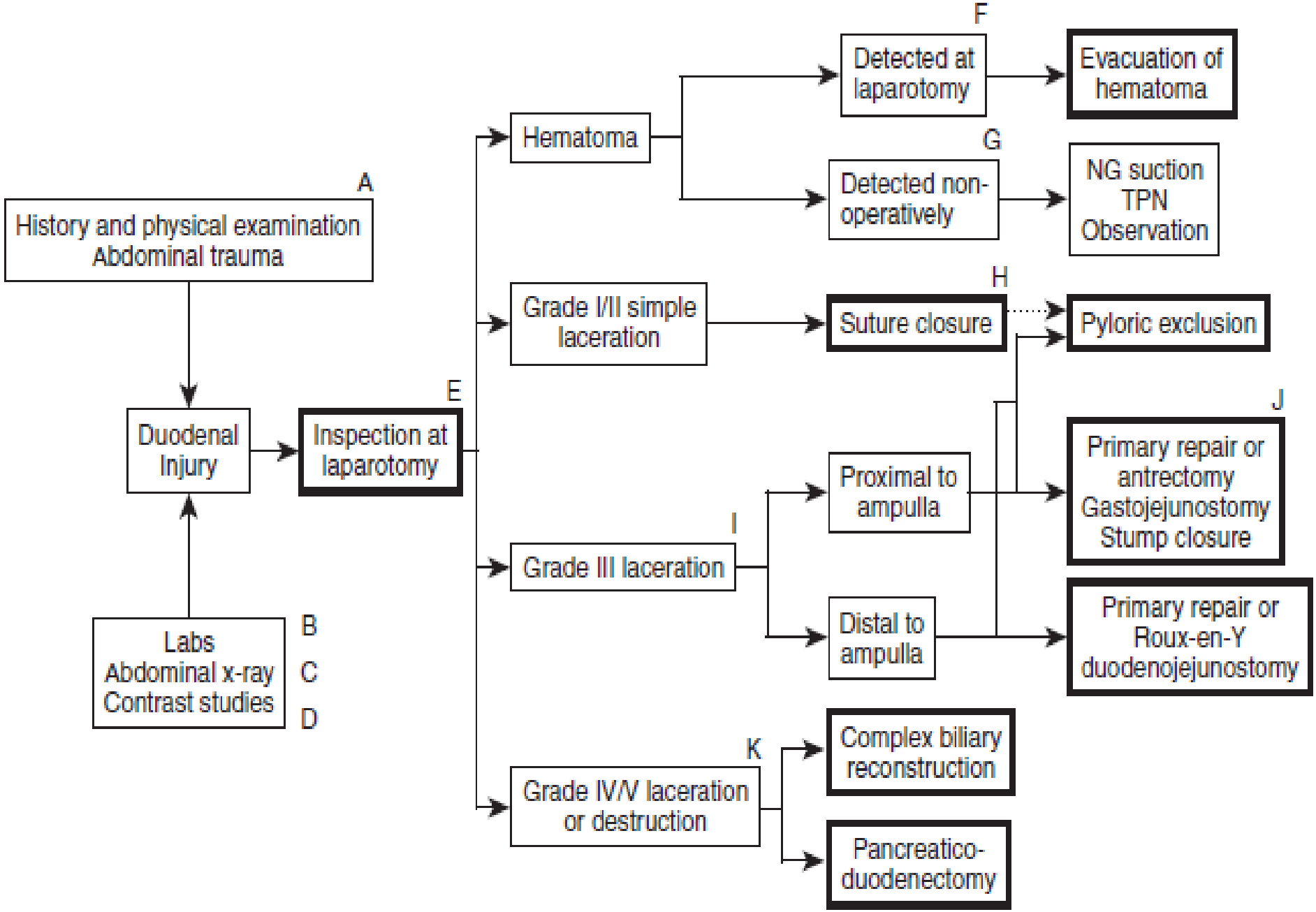


Figure 2 Algorithm for the management of duodenal injuries. *(From Jurkovich G: Duodenal injury. In McIntyre R, Van Stiegmann G, Eiseman B, editors: Surgical Decision Making, 5th ed. Philadelphia, Elsevier, 2004, pp. 512–513.)*

Thank you