

# Question Set: Acute Care Surgery

## Questions

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1. A 65-year-old obese male with diabetes and a history of IV drug abuse presents with a painful swollen left leg. Exam reveals dark purple discoloration and several large bullae over the calf. On physical exam, his temperature is 38.3 °C, heart rate is 120/min, and blood pressure is 92/68 mmHg. The CRP is 200 mg/L (normal < 10 mg/L), and the white blood cell (WBC) count is  $28.3 \times 10^3/\mu\text{L}$  (normal  $4.1\text{--}10.9 \times 10^3/\mu\text{L}$ ). Creatinine is 2.0 mg/dL (normal 0.5–1.5 mg/dL), and Na is 127 mEq/L (normal 135–145 mEq/L). Distal pedal pulses are 1+. IV fluids and IV broad-spectrum antibiotics are administered. Which of the following is the next best step?
- (A) X-ray of the leg
  - (B) CT scan of the leg with IV contrast
  - (C) Venous duplex scan of the left leg
  - (D) Measure compartment pressures
  - (E) Emergent wide surgical debridement
2. A 66-year-old woman presents to her family doctor complaining of a pain in her left groin that has appeared intermittently over the past several months. On physical exam, a soft mass is palpated in her left groin, below the inguinal ligament, and near her femoral pulse. On palpation, the mass is soft and slightly tender and disappears with gentle compression. Which of the following is true regarding these types of hernias?
- (A) They are the most common hernia type in women.
  - (B) The risk of strangulation is relatively low.
  - (C) The hernia sac travels lateral to the femoral vein.
  - (D) If discovered incidentally and the patient is asymptomatic, repair is not indicated.
  - (E) It is associated with multigravida.
3. Following open right inguinal hernia repair, a 50-year-old male complains of numbness and burning pain on the right scrotal side. This most likely represents injury to:
- (A) The genital branch of the genitofemoral nerve
  - (B) The femoral branch of the genitofemoral nerve
  - (C) The ilioinguinal nerve
  - (D) The lateral femoral cutaneous nerve
  - (E) The iliohypogastric nerve
4. A 65-year-old male presents to the ED with nausea, vomiting, and severe abdominal pain. Past history is significant for prior sigmoid colectomy for diverticulitis 10 years ago. On physical exam, his temperature is 37.9 °C, blood pressure is 110/80 mmHg, and heart rate is 110/min. His abdomen has a well-healed midline scar and is distended. Bowel sounds are hyperactive with occasional rushes and tinkles. He has marked right upper quadrant (RUQ) tenderness to palpation with guarding. The rest of the abdominal exam is unremarkable. Abdominal series x-rays demonstrates one loop of markedly distended small bowel in the RUQ with an air-fluid level. No gas is seen in the colon or rectum. Laboratory values demonstrate a WBC of  $18 \times 10^3/\mu\text{L}$  (normal  $4.1\text{--}10.9 \times 10^3/\mu\text{L}$ ) with 15% bands and a serum lactate of 5 mmol/L (normal

0.5–1.6 mmol/L), BUN 30 mg/dL (7–21 mg/dL), and creatinine 1.2 mg/dL (0.5–1.4 mg/dL). Amylase, lipase, and liver chemistries are normal. Nasogastric tube and IV fluids are given. What is the next step in the management?

- (A) Exploratory laparotomy
- (B) Admit for close observation
- (C) Upper GI with small bowel follow through with barium
- (D) Upper GI with small bowel follow through with Gastrografin
- (E) Abdominal ultrasound

5. One day following extensive debridement of the right leg for a necrotizing soft tissue infection (NSTI), a 40-year-old male remains in the ICU, intubated, and requiring 70% FIO<sub>2</sub>. WBC count has risen from a preoperative level of  $16 \times 10^3/\mu\text{L}$  (normal  $4.1\text{--}10.9 \times 10^3/\mu\text{L}$ ) to  $34 \times 10^3/\mu\text{L}$ . Serum lactate has also risen. Which of the following is the best next step in treatment?
- (A) Second-look operation
  - (B) Amputation of the right leg
  - (C) Broaden antibiotic coverage
  - (D) CT scan of the leg
  - (E) Start vasopressor
6. A 30-year-old woman is recovering from an open cholecystectomy in the hospital. On the second postoperative day, she begins to complain of cramping abdominal pain without vomiting. She has no past medical or surgical history, and her postoperative course has been unremarkable. She is receiving oral hydrocodone for pain and is on a clear liquid diet. She has a temperature of 37.8 °C, blood pressure is 128/84 mmHg, and pulse is 82/min. Her physical exam is significant for absent bowel sounds, a mildly distended abdomen with mild diffuse tenderness without rebound or guarding. Which of the following is the best next step in management?
- (A) Encouraging ambulation
  - (B) Placement of a nasogastric tube
  - (C) Neostigmine
  - (D) Conversion of hydrocodone to a nonsteroidal anti-inflammatory drug (NSAID)
  - (E) Return to the operating room for exploration
7. A Richter's hernia:
- (A) Describes a hernia in which a retroperitoneal organ protrudes into the hernia sac
  - (B) Has a low risk of incarceration
  - (C) Most commonly presents as a small bowel obstruction (SBO)
  - (D) Can mislead the clinician as strangulated bowel can easily be missed
  - (E) Should be manually reduced in the emergency department provided there is no evidence of bowel obstruction
8. A 55-year-old schizophrenic homeless man arrives to the ED with abdominal pain and vomiting. He reports that the abdominal pain started yesterday and has been worsening. He is afebrile, blood pressure is 122/86 mmHg, and heart rate is 116/min. In the ED he vomits green emesis without blood. His last bowel movement was 48 hours ago. Physical examination reveals a large scar in his right upper quadrant. On abdominal examination, the abdomen is distended, with hyperactive bowel sounds, and is tympanic to percussion, with mild diffuse tenderness, and no rebound or guarding. WBC is  $9 \times 10^3/\mu\text{L}$  (normal  $4.1\text{--}10.9 \times 10^3/\mu\text{L}$ ). Abdominal series shows dilated loops of bowel with multiple air-fluid levels. After fluid resuscitation, what is the most appropriate next step in management?
- (A) Nasogastric tube suction
  - (B) Laparoscopy
  - (C) Exploratory midline laparotomy
  - (D) Intravenous erythromycin
  - (E) CT scan of the abdomen

9. A worried mother presents to you with concerns that her 6-month-old boy has a large protrusion at his belly button that is worse when he cries but reduces when he is sleeping. On exam you palpate a 1 cm fascial defect at his umbilicus. Which of the following is true about this condition?
- (A) Elective repair is recommended.
  - (B) The condition is associated with cardiac anomalies.
  - (C) The size of the defect predicts that it will not likely close on its own.
  - (D) The risk of incarceration is significant.
  - (E) Repair should be delayed until the child is 4 years old.
10. One week after open repair of a large right scrotal hernia, a 45-year-old male returns complaining of severe pain in his right testicle. The pain has gradually worsened since surgery. On physical exam, the testicle appears to be slightly swollen and very tender to palpation. Doppler study demonstrates no flow within the right testicle with normal flow in the left. Which of the following is true about this condition?
- (A) It is most commonly due to thrombosis of the pampiniform plexus.
  - (B) Urgent exploration of the right testicle is recommended.
  - (C) It is most likely due to transection of the testicular artery.
  - (D) It most likely represents testicular torsion.
  - (E) The testicle will likely remain permanently enlarged.

## Answers

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1. Answer E  
Given leukocytosis, elevated CRP, elevated creatinine, hyponatremia, and the exam findings, there is a very high likelihood that this patient has a necrotizing soft tissue infection (NSTI). After IV fluids, blood cultures, and immediate broad-spectrum IV antibiotics, the next best step is to perform an emergent wide surgical debridement. If the diagnosis of NSTI is uncertain, yet the suspicion is high, surgical exploration is *still indicated*, as this is the gold standard of both diagnosis and treatment. The incision must be taken down to the fascia and muscle, so both can be inspected. When the diagnosis is in question, plain X-rays are useful as they may demonstrate gas in the soft tissue (A). CT scan may also be beneficial for the same reason (B). Duplex scan of leg veins is used to rule out deep venous thrombosis, which can present with leg swelling, but like compartment syndrome, it would not cause the laboratory abnormalities described (C, E).
2. Answer E  
Multigravida causes stretching of the abdominal musculature and increases the risk of femoral hernia. Femoral hernias occur in the femoral canal, inferior to the inguinal ligament traversing the empty space medial to the femoral vein (recall the mnemonic "NAVEL" {from lateral to medial/femoral nerve, artery, vein, empty space, lymphatic}) (C). The most common type of hernia in women, and in men, is an indirect inguinal hernia (A). Although femoral hernias appear infrequently (10% of all hernias), they occur more commonly in females and have the highest risk of strangulation (B). Because of the high risk of strangulation, surgical repair of a femoral hernia is indicated once diagnosed, regardless of whether the patient is having symptoms (D).
3. Answer A  
The genital branch of the genitofemoral nerve provides sensation to the hemi-scrotum (and labia), as well as the cremaster muscle. The femoral branch of the genitofemoral nerve provides sensation to the proximal medial thigh (B). The ilioinguinal nerve provides sensation to the lower abdomen and medial thigh (C). This nerve is the most commonly injured nerve in *open hernia repair*. The lateral femoral cutaneous nerve provides sensation to the lateral thigh as low as the knee and is the most common nerve injured during *laparoscopic hernia repair* (D). The iliohypogastric nerve supplies the skin overlying the pubis (E).

- ✓ 4. Answer A  
Recognizing when to operate is critically important. This patient has small bowel obstruction (SBO) with evidence of ischemic or gangrenous bowel most likely secondary to adhesions from past surgery (e.g., sigmoidectomy). Necrotic bowel generally does not occur in association with SBO unless there is a closed-loop obstruction. A closed-loop obstruction is a particularly dangerous form of bowel obstruction in which a segment of intestine is obstructed both proximally and distally. This is more common in the large bowel as a competent ileocecal valve (present in 70–80% of the population) serves as one point of obstruction. Gas and fluid accumulate within this segment of bowel and cannot escape. This progresses rapidly to strangulation with risk of ischemia, gangrene, and subsequent perforation. Clues to ischemic bowel include the presence of acidosis, fever, leukocytosis, and severe localized pain (unusual for SBO). As such the patient will need exploratory laparotomy, and any bowel that is obviously nonviable needs to be resected. Most patients with SBO (without necrotic bowel) due to adhesions improve with conservative management and do not require surgery. Observation is not appropriate for this patient (B). Upper GI studies would not be indicated since this patient has strong evidence of necrotic bowel and requires urgent surgical intervention (C–D). Abdominal ultrasound is appropriate in the workup for cholelithiasis (E).
- ✓ 5. Answer A  
A rising WBC and lactate after debridement are highly suggestive of progression of the NSTI. A second-look operation is often required but in this case would be essential in order to ensure that no additional tissues have become involved since the initial debridement. Amputation may be necessary, but only a second-look operation will indicate whether this is the case (B). CT scan in the postoperative setting would be difficult to interpret due to postsurgical changes (D). With severe sepsis, vasopressors may be necessary, but this would not be the definitive treatment (E). Furthermore, no hemodynamic parameters (blood pressure, central venous pressure) are provided that would indicate that vasopressors are needed. Patients with NSTI should always receive broad antibiotic coverage at initial presentation as it is often due to a polymicrobial infection. However, the cornerstone of management is surgical debridement (C).
- ✓ 6. Answer D  
Always consider a nonmechanical postoperative ileus in patients that have had a recent surgery. This occurs in up to 50% of patients that have undergone abdominal surgery. Although the exact cause has not been elucidated, it most likely involves impaired peristalsis of intestinal contents. Inflammatory mediators (e.g., recent surgery) and opioid analgesics are thought to contribute to the development of postoperative ileus. Initial management should begin with changing pain medication to a non-opiate analgesic. The only other options for analgesia are NSAIDs or acetaminophen. Encouraging ambulation is an important element of recovery in all postsurgical patients but is not as important as discontinuing opiates in the management of postoperative ileus (A). If the patient's symptoms worsen (e.g., emesis), bowel decompression with a nasogastric tube should be considered (B). Neostigmine is used in patients with pseudo-obstruction (Ogilvie's syndrome) (C). Returning to the OR for exploration is inappropriate for postoperative ileus (E).
- ✓ 7. Answer D  
A retroperitoneal organ (such as colon) protruding into a hernia sac describes a sliding hernia (A). With a Richter's hernia, only part of the circumference of the bowel wall is trapped within the hernia sac. That segment of bowel is prone to incarceration and strangulation but does so without associated symptoms, signs, or radiologic evidence of SBO (C). Therefore, it may easily mislead clinicians into thinking that the hernia is not incarcerated (B). Manual reduction of hernias (including Richter's) should not be attempted if strangulation is suspected as dead bowel will be reduced into the peritoneum. Strangulation should be suspected in the presence of fever, leukocytosis, acido-

sis, severe pain, or marked erythema overlying the skin of the hernia. It is often difficult to palpate a Richter's hernia, and it should be reduced in the operating room (E).

- ✓ 8. Answer A  
This patient has evidence (on history, physical, and radiologic imaging) of a SBO that is most likely secondary to adhesions from prior surgery (abdominal scar). SBO from adhesions can present many years after surgery. The initial management of SBO includes placing the patient NPO, aggressive intravenous fluid resuscitation (the patient is tachycardic and likely very dehydrated), and nasogastric tube placement. Aside from the salutatory effect of gastric decompression on the distended bowel, patients with SBO are at risk of aspiration. Once the patient has been adequately resuscitated, CT scan with oral contrast is recommended as it is useful in confirming the diagnosis of SBO, determining if the SBO is partial or complete, and ruling out other diagnosis (E). Most patients with SBO due to adhesions improve with these maneuvers and do not require surgery. Operative management with laparotomy and lysis of adhesions should be considered in the following conditions: if the patient demonstrates evidence of clinical deterioration as manifest by increasing pain, tenderness, fever, leukocytosis, or acidosis (C). Operative management can be achieved either via open laparotomy or laparoscopy (B). Evidence of a *complete SBO* is a relative indication for surgery, but recent studies suggest that some of these patients resolve with non-operative management as well. Intravenous erythromycin acts as a prokinetic agent and has some utility for gastroparesis, but not for SBO (D). In cases where a mechanical obstruction is suspected, prokinetic agents should be avoided.
- ✓ 9. Answer E  
This patient has an umbilical hernia, which is a common finding in newborns. It is recommended that repair be delayed until after the child is 4 years old, unless the defect is larger than 2 cm, the defect is growing, or there is evidence of strangulation (A). Umbilical hernias are not associated with the VACTERL (vertebral, anal, cardiac, tracheoesophageal fistula, renal, limb) complex of anomalies (B). Defects smaller than 2 cm will likely close spontaneously (C). It is very rare for umbilical hernias in children to incarcerate (D).
- ✓ 10. Answer A  
This patient likely has ischemic orchitis secondary to damage or thrombosis of the pampiniform plexus. This is most likely to occur in patients with large or densely adhered hernia sacs. The condition is usually self-limited, so urgent exploration is not indicated (B, E). Ischemic orchitis is more commonly caused by injury to the pampiniform plexus than to the testicular artery (C). Testicular torsion is less likely than a vascular injury in this case, and although it will also have a decreased or absent Doppler signal, the pain occurs suddenly (D).