Pediatric Surgery: Review Questions

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QUESTIONS

Choose the single best answer for each question.

1. A male infant weighing 3 kg is born via spontaneous vaginal delivery at 37 weeks' gestation. His Apgar score is 6/9 at 1 and 5 minutes. The patient is in no apparent distress. Physical examination reveals no anus. What is the most appropriate initial step in this patient's management?

(A) Colostomy
(B) Continued observation for 24 hours
(C) Intubation and mechanical ventilation
(D) Magnetic resonance imaging (MRI) of the abdomen and pelvis
(E) Posterior sagittal anorectoplasty

Questions 2 and 3 refer to the following case.

A previously healthy 5-week-old boy born at 39 weeks' gestation following an uncomplicated pregnancy is brought to the emergency department (ED) with a 3-day history of forceful vomiting after feeding. The vomitus looks like undigested food. On physical examination, a distinct 1-cm mass is palpable in the epigastrium. Surgical management is indicated.

2. Which of the following interventions is the most effective for reducing serious complications associated with the indicated operation?

(A) Concurrent fundoplication
(B) Perioperative antibiotics
(C) Postoperative food/fluid restriction for 36 hours
(D) Postoperative supplemental oxygen
(E) Preoperative fluid resuscitation

3. The patient undergoes pyloromyotomy. During the procedure, a deep mucosal injury is noted at the distal aspect of the incision. How should this patient's mucosal injury be managed?

(A) Closure of the mucosal defect with the myotomy intact
(B) Closure of the mucosal and muscular defects with repeat myotomy at a later date
(C) Closure of the mucosal and muscular defects with repeat myotomy on another side of the pylorus
(D) Wide local drainage and antibiotics
(E) Wide local drainage, antibiotics, and 10 to 14 days of postpyloric tube feeding

4. A previously healthy 5-year-old girl presents to the ED with her parents with a temperature of 100.8°F (38.2°C) and a 2-day history of decreased appetite and persistent vague abdominal pain with tenderness in the mid-abdomen and right lower quadrant. Her parents report that she has had no appetite and felt nauseous but has not vomited. Laboratory results are unremarkable except for a white blood cell count of 16,000 cells/μL (normal, 4500–11,000 cells/μL). Ultrasound of the abdomen and pelvis is inconclusive, and the patient is admitted to the hospital for observation. Eighteen hours into her hospital stay, she passes copious amounts of bloody stool. She remains hemodynamically stable with normal vital signs and no change in her abdominal pain. What is this patient's most likely diagnosis?

(A) Appendicitis
(B) Colonic arteriovenous malformation
(C) Colonic diverticulitis
(D) Gastric stress ulcer
(E) Meckel's diverticulitis

5. A previously healthy 2-month-old girl is brought to the ED with a 1-day history of abdominal pain and emesis that developed over the last several hours. The parents describe the vomitus as yellow-green and nonbloody. Physical examination reveals a fair-appearing child with moderate diffuse tenderness of the abdomen. Vital signs are normal. Laboratory results are unremarkable except for a white blood cell count of 14,000 cells/μL. What is the next step in this patient's management?

(A) Empiric antibiotics and observation
(B) Immediate appendectomy
(C) Immediate exploratory laparotomy
(D) Ultrasound of the abdomen
(E) Upper gastrointestinal (GI) contrast study

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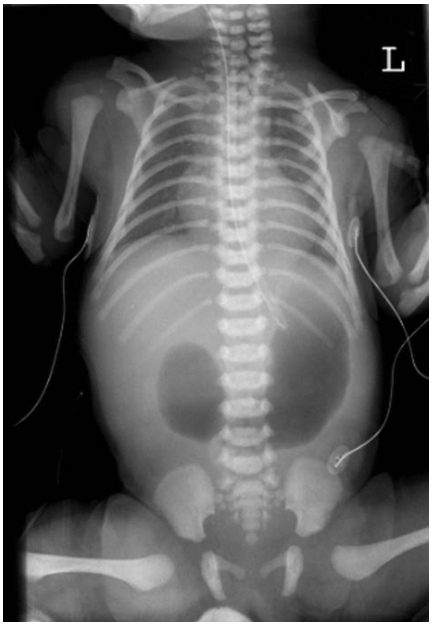

Figure 1. Radiograph of the patient described in question 6.

6. A 1-day-old male infant has been intolerant of oral feeds and is vomiting. The vomitus sometimes appears bile-colored. On examination, the patient's abdomen is mildly distended and somewhat tympanitic but is nontender to palpation. A radiograph is performed (Figure 1). What is this patient's most likely diagnosis?

(A) Annular pancreas
(B) Duodenal atresia
(C) Intestinal malrotation
(D) Jejunoileal atresia
(E) Pyloric stenosis

ANSWERS AND EXPLANATIONS

1. (B) Continued observation for 24 hours. The patient should be observed for delayed passage of meconium, as this can be normal up to 48 hours of life. If delayed beyond this period, meconium ileus, meconium plug, imperforate anus, or Hirschsprung's disease should be considered. Evaluation of imperforate anus should include inspection for drainage of meconium through a fistula to the perineum or the urinary tract because this significantly alters treatment.[1] Specifically, fistulae occur with low termination of the colon/rectum, which can be managed definitively with anorectoplasty. Absence of a fistula significantly increases the likelihood of a "high defect" imperforate anus, which can be managed with colostomy and subsequent contrast imaging of the distal colon/rectum, followed by definitive repair at a few months of age. Some surgeons obtain a cross-table lateral abdominal radiograph (not MRI) to determine where the terminal colon/rectum lies in relation to the perineum, but this approach is unnecessary and is not widely practiced. Ultrasonography and radiography are required to rule out VACTERL association, but there is no need for MRI. Intubation and mechanical ventilation are not indicated in this case.

2. (E) Preoperative fluid resuscitation. Based on the clinical presentation, this patient has hypertrophic pyloric stenosis (HPS). HPS typically affects infants aged 2 weeks to 2 months and is characterized by projectile vomiting soon after feeding; the vomitus looks like undigested food. A palpable epigastric mass that resembles an olive is considered sufficient for diagnosis, but ultrasonographic evaluation of the pyloric length and thickness (transverse muscle thickness ≥ 4 mm) confirms the diagnosis. HPS is not an emergent condition, and the best outcomes are achieved by preoperative resuscitation aimed at rehydration and correction of metabolic alkalosis.[2] Achieving a urine output of at least 1 mL/kg/hr and normalization of serum bicarbonate decreases the risk of respiratory depression, a potentially fatal complication of pyloromyotomy. Perioperative cefazolin administration is common, but antibiotics have little effect on outcomes because the incidence of surgical site infection is low (~2%) and infections are typically mild and superficial. Postoperative feeding is safe once infants have fully recovered from anesthesia. Bouts of emesis are to be expected and typically resolve after 1 or 2 postoperative feedings. Supplemental oxygen is a routine component of postanesthetic care but does not impact the hypoventilation caused by dehydration and metabolic alkalosis. Fundoplication is used to treat gastroesophageal reflux.

3. (C) Closure of the mucosal and muscular defects with repeat myotomy on another side of the pylorus. The most common technical complications of pyloromyotomy are mucosal perforation on the distal aspect of the incision and insufficient extent of myotomy on the proximal end. Injury to the mucosa is best managed by closure of the entire incision, rotation of the pylorus by 90 degrees, and repeat pyloromyotomy. While it is technically acceptable to close the myotomy and reoperate at a later date, this requires protracted parenteral nutrition, which increases the risk of other complications. Neither drainage nor extended antibiotics are indicated in this case.

4. **(E) Meckel's diverticulitis.** Hemorrhage is the most common complication of Meckel's diverticulitis in children; therefore, this condition should be considered in any child with abdominal pain of unclear etiology associated with GI hemorrhage. Intestinal obstruction is another possible diagnosis but is more common in adults. The diagnosis of Meckel's diverticulitis can be confirmed by 99mTc-pertechnetate scan, which detects heterotopic gastric mucosa or pancreatic tissue within the diverticulum. Meckel's diverticula are usually completely asymptomatic, but resection is necessary when complications develop. Colonic arteriovenous malformations can cause GI hemorrhage in children but are much less common than Meckel's diverticula. Appendicitis is common in children but very rarely causes hemorrhage. Colonic diverticulitis and gastric stress ulcers are exceedingly rare in children and are unlikely in this case.

5. **(E) Upper GI contrast study.** Bilious emesis in an infant is considered an operative emergency until the potentially fatal diagnosis of midgut volvulus is ruled out.[3] However, in the absence of indications for emergent therapy (eg, peritonitis, sepsis), an upper GI contrast study should be obtained to evaluate for disorders of intestinal rotation (**Figure 2**). Radiographs are often difficult to interpret and require evaluation by an experienced pediatric surgeon and a pediatric radiologist.[4] Accurate diagnosis with prompt therapy can be lifesaving, while passive observation can be fatal. Abdominal ultrasonography is limited for detecting malrotations. If the patient is seriously ill with peritonitis such that an operation is felt to be unavoidable, immediate laparoscopy/laparotomy may be considered.

6. **(B) Duodenal atresia.** As mentioned previously, bilious emesis in an infant is an operative emergency until proven otherwise. This patient's radiograph shows a dilated, air-filled stomach and proximal duodenum ("double bubble" sign) as well as no gas in the distal bowel. The clinical presentation and radiographic findings are highly suggestive of duodenal atresia.[5] The gasless distal intestine in a 1-day old infant could potentially represent intestinal malrotation with proximal volvulus, but the child's benign state with nontender abdomen indicate that volvulus would likely have been a remote in-utero event and would not require emergent operation. Annular pancreas is associated with almost 25% of cases of duodenal obstruction, but typically some air passes into the distal small intestine (unlike duodenal atresia, which is a complete obstruction). Similarly, in jejunoileal atresia, air can pass through the entire duodenum and at least some of the jejunum. Pyloric stenosis does not cause a dilated proximal duodenum as there is no postpyloric obstruction.

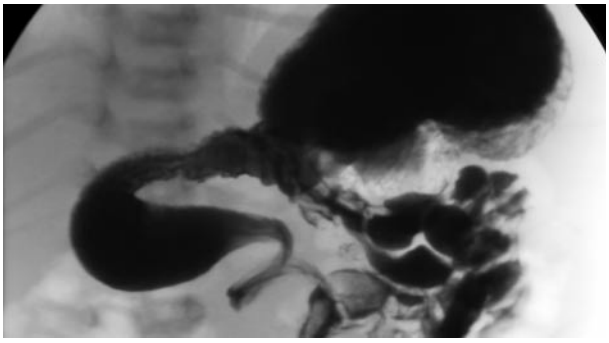

Figure 2. Upper gastrointestinal contrast study demonstrating "corkscrewing" of the duodenum and duodenal-jejunal junction, clear evidence of volvulus.

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