Perforated Peptic Ulcer

Robert D. Winfield, MD

Editorial Review: Joseph M Galante, MD
Stephanie Savage, MD
Clay Cothren Burlew, MD

Injury/Disease Demographics

- Perforated peptic ulcer refers to perforation of the stomach or the duodenum.
- After bleeding, perforation is the second most common complication of peptic ulcer disease, but the most common cause for emergent surgery.
- Perforation is responsible for 37% of all ulcer-related deaths (5x higher than hemorrhage).
- This disease is less commonly seen in high-income nations secondary to identification and treatment of H. pylori and introduction of proton pump inhibitors (PPI), but mortality following presentation has remained stable in spite of these advances.

Clinical Presentation

- Classic presentation is that of severe epigastric pain that may progress to generalized abdominal pain and peritonitis.
- Valentino's Syndrome refers to an atypical presentation in which the patient develops focal peritonitis in the right lower quadrant secondary of tracking of gastric and duodenal contents through the retroperitoneum.
- The patient may report a history of NSAID or steroid use; smoking is another common risk factor.
- A history of prior diagnosis/treatment of peptic ulcer disease or history of H. pylori treatment may suggest noncompliance with (or failure of) medical management and must be elicited as this may alter the surgical approach.
- Although relatively rare, Zollinger-Ellison Syndrome should be considered in patients presenting with perforation and associated history of diarrhea and a serum gastrin level should be obtained.

Evaluation/Diagnostics/Imaging

- Physical exam may reveal focal peritonitis in the epigastrium, pain that migrates to the right lower quadrant, or generalized peritonitis.
- Upright plain film radiograph of the chest or abdomen demonstrate free intraperitoneal air and has a sensitivity of 75%.
- While prompt operation is indicated for patients with peritonitis, abdominal CT scan is the gold standard diagnostic modality, revealing retroperitoneal or intraperitoneal air and fluid with a sensitivity of 98%. CT imaging may also show inflammation of the stomach or duodenum as well as intraabdominal fluid.

Role of Nonoperative Management and Associated Considerations

- Nonoperative management is generally not indicated; however, in a patient with minimal symptomatology and CT with contained perforation, this can be

considered, provided the patients are monitored with frequent examinations to assess for deterioration.Age younger than 70, absence of fluid collection detectable by ultrasound, absence of contrast leak on water-soluble contrast study, and APACHE II score of less than 8 have been shown to correlate with successful nonoperative management.

- Greater duration of abdominal pain (>24 hours) has been associated with failure of nonoperative management.
- Treatment for these patients includes NPO, nasogastric decompression, PPI, and subsequent imaging with oral contrast.

Indications for Operative Intervention

- Patients with the diagnosis of perforated peptic ulcer should proceed immediately to surgery, as every hour of delay to operative intervention is associated with a 2.4% increase in mortality.

Pre-operative Preparation

- As these patients frequently present with sepsis, Surviving Sepsis Campaign (SSC) guidelines should be employed. Within one hour of suspected sepsis, providers should do the following:
    - Measure lactate, remeasure if initial lactate is > 2mmol/Liter.
    - Obtain blood cultures prior to administration of antibiotics.
    - Administer broad-spectrum antibiotics.
    - Begin rapid administration of 30 mL/kg crystalloid for hypotension or lactate >4 mmol/Liter.
    - Apply vasopressors if patient is hypotensive during or after fluid resuscitation to maintain mean arterial pressure ≥ 65 mmHg.

Operative Techniques/ Intraoperative Considerations

- Standard approach is either 1) closure of the perforation with an omental patch, or 2) Graham patch alone.
    - This can be achieved with laparotomy or laparoscopy.
    - Routine biopsy is not required; however, patients with gastric ulcers or ulcers in which the location is not clear should undergo follow up endoscopy at 6 weeks to evaluate for occult malignancy (up to 13%).
- In large (>2 cm) or friable ulcers, resection may be necessary
    - Finding ulcers of this type should raise suspicion for malignancy, and biopsy is indicated.
    - When indicated, resection is frequently determined by type/location of ulcer and the relative stability of the patient from their sepsis:

    - Type I Ulcer (Ulcer near lesser curvature): Distal gastrectomy with Billroth I (BI) or Roux-en-y (RNY) reconstruction +/- vagotomy. Billroth II reconstruction can be performed, but is more likely to lead to bile gastritis. Wedge resection may be challenging due to gastroepiploics on the lesser curvature and alteration of gastric anatomy on closure of the defect.
    - Type II Ulcer (Two ulcers, one near lesser curvature, one in the duodenum): Distal gastrectomy and proximal duodenectomy with RNY reconstruction. Caveat for BII reconstruction as above.
    - Type III Ulcer (Prepyloric): Wedge resection with closure if possible, antrectomy with BI, RNY, or BII reconstruction as above.
    - Type IV Ulcer (Proximal stomach): Wedge resection may cause occlusion of the GE junction, subtotal gastrectomy with RNY esophagogastrojejunostomy may be required.
    - Giant (>2cm) Duodenal Ulcer: High leak rate with omental patch (up to 12%). Can consider "triple tube" treatment (Stamm gastrostomy, retrograde duodenostomy, feeding jejunostomy, external drainage of the duodenal defect), RNY jejunoduodenostomy, pedicled jejunal graft, jejunal serosal patch, or omental plugging.
- Vagotomy and gastric resection is associated with greater perioperative morbidity than repair and is not recommended unless the patient has a history of noncompliance, or has failed maximal medical management.

Postoperative Management/ Complications

- Once again, sepsis is treated according to SSC guidelines.
- Routine use of antifungal therapy is not supported.
- Patients should undergo testing for H. pylori, and when present, 14 day eradication therapy should be undertaken with:
    - PPI
    - Clarithromycin
    - Amoxicillin
- Upper gastrointestinal series may be obtained at the discretion of the treating physician.
- EGD should be routinely obtained after repair of perforated ulcer without biopsy given the potential for malignancy (up to 13%)

Considerations for Special Populations

- In relatively healthy individuals with small ulcers (≤2 cm) and without shock, an enhanced recovery after surgery (ERAS) protocol has been shown to decrease length of stay and complications. This protocol includes:

- Multimodal perioperative analgesia with opioids only for breakthrough pain.
- Short acting opioids and anesthetics, epidural lidocaine.
- Adjuvant metoclopramide.
- Postoperative Day 0 ambulation.
- Removal of drains when output ≤ 100 mL/day, nasogastric tube when output ≤ 300 mL/day.
- Liquid diet when bowel sounds are present, advance to normal diet within 24 hours.

Suggested Readings

1. Soreide K, Thorsen K, Harrison EM, Bingener J, Moller MH, Ohene-Yeboah M, Soreide JA. Perforated Peptic Ulcer. Lancet. 2015 Sep 26; 386(10000): 1288-1298.
2. Schroeder VT, Pappas TN, Vaslef SN, De La Fuente SG, Scarborough JE. Vagotomy/drainage is superior to local oversew in patients who require emergency surgery for bleeding peptic ulcers. Ann Surg. 2014 Jun;259(6):1111-8.
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