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Management of Perforated Gastroduodenal Ulcers: Evidence-Based Guidelines

Background

Gastroduodenal perforations (GDPs) are a rare but critical complication of duodenal ulcers, characterized by the rupture of the ulcer into the peritoneal cavity. These perforations, if not managed promptly, can lead to peritonitis and sepsis. The underlying causes of GDPs differ by region and can be influenced by geographic, sociodemographic, and environmental factors. In developing countries, overcrowding and poor hygiene significantly contribute to GDPs, while in developed nations, peptic ulcer disease remains the primary cause (Barkun et al., 1994). The prevalence of Helicobacter pylori infection among GDP patients is around 65-70%, although this figure is decreasing due to improved living standards and treatment advancements (Pisano et al., 2020). Non-steroidal anti-inflammatory drugs (NSAIDs) are frequently implicated in GDPs because they inhibit cyclooxygenase (COX) enzymes, which are essential for prostaglandin synthesis. Prostaglandins play a key role in promoting inflammation, pain, and fever (Schuster et al., 2019). Reports indicate that up to 50% of patients with GDPs have used NSAIDs (Weledji, 2020).

Other risk factors include renal transplantation, major abdominal surgeries, neurosurgical procedures, and cardiovascular diseases, especially those undergoing cardiopulmonary bypass. Additional contributors are burns, opiate addiction, and smoking. Prophylactic measures are essential in preventing GDPs in high-risk individuals.

The purpose of these guidelines is to offer a comprehensive approach to managing patients with perforated gastroduodenal ulcers, focusing on evidence-based practices to optimize outcomes.

Workup and Initial Management

1. **Diagnostic Imaging**:
    - **Recommendation**: Perform a CT scan of the abdomen and pelvis with both intravenous (IV) and oral (PO) contrast, if not contraindicated.
    - **Rationale**: CT imaging is crucial for confirming the diagnosis of GDP and evaluating the extent of peritoneal contamination. It provides detailed visualization of the perforation and any associated complications such as free air or fluid, which aids in planning the appropriate surgical or non-surgical intervention (Trowbridge et al., 2003). Contrast-enhanced CT scans offer superior diagnostic accuracy compared to plain films or ultrasonography, enabling better assessment of the perforation and surrounding structures.
    - **Strength of Evidence**: High. Numerous studies have demonstrated the efficacy of CT in diagnosing abdominal perforations and guiding management decisions (Barkun et al., 2001; Trowbridge et al., 2003).

2. **Antibiotic Therapy**:

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- **Recommendation**: Initiate broad-spectrum antibiotic therapy covering enteric gram-negative rods, anaerobes, oral flora, and fungi.
- **Rationale**: The polymicrobial nature of peritoneal contamination necessitates broad-spectrum antibiotics to cover a wide range of pathogens. Enteric gram-negative rods and anaerobes are commonly involved in abdominal infections due to their presence in the gastrointestinal tract. Effective antibiotic coverage reduces the risk of sepsis and other postoperative infections (Gurusamy et al., 2015). Empirical therapy should be adjusted based on culture results when available.
- **Strength of Evidence**: High. Broad-spectrum antibiotics are well-supported by evidence for managing peritoneal infections and improving outcomes in perforated ulcer cases (Gurusamy et al., 2015; Dellinger et al., 2013).

Operative Considerations

1. **Surgical Approach**:
   - **Laparoscopic vs. Open Surgery**:
     - **Recommendation**: Prefer laparoscopic surgery due to its association with lower complication rates and shorter recovery times. However, open surgery remains an option based on the surgeon's expertise and the complexity of the case.
     - **Rationale**: Laparoscopic techniques have been associated with reduced postoperative pain, fewer complications, and shorter hospital stays compared to open surgery. The minimally invasive nature of laparoscopic surgery allows for quicker recovery and less postoperative discomfort (Miller & Rogers, 2018). Nonetheless, open surgery may be necessary for patients with extensive peritoneal contamination or when laparoscopic repair is technically challenging.
     - **Strength of Evidence**: High. Multiple studies support the benefits of laparoscopic surgery for perforated ulcers, although open surgery remains a viable alternative in certain cases (Miller & Rogers, 2018; Sedaghat et al., 2017).
   - **Robotic Surgery**:
     - **Recommendation**: Consider robotic-assisted repair if available, given its potential benefits similar to laparoscopic techniques.
     - **Rationale**: Robotic-assisted surgery offers enhanced precision, improved visualization, and greater dexterity, potentially leading to better outcomes compared to traditional laparoscopic approaches. However, its availability and cost may limit its use (Sedaghat et al., 2017).
     - **Strength of Evidence**: Moderate. Evidence is growing regarding the effectiveness of robotic-assisted techniques, though further studies are needed to establish definitive advantages over laparoscopic methods (Sedaghat et al., 2017).
2. **Surgical Techniques**:
   - **Graham Patch**:

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- **Recommendation**: Use the Graham patch technique for most perforations by mobilizing the omentum to cover the defect.
- **Rationale**: The Graham patch technique involves suturing a portion of omentum over the perforation, providing a biological barrier to contamination and aiding in ulcer healing. This method is effective for many cases and is widely used due to its simplicity and efficacy (Elsherbiny et al., 2015).
- **Strength of Evidence**: High. The Graham patch is a well-established and effective technique for managing perforated ulcers (Elsherbiny et al., 2015; Noll et al., 2020).

- **Modified Graham Patch**:
  - **Recommendation**: Employ the modified Graham patch technique for small perforations that are amenable to primary closure with an omental patch.
  - **Rationale**: This technique involves closing the perforation primarily and reinforcing it with an omental patch. It is suitable for small perforations where tension-free closure is achievable, allowing for faster recovery and reduced complication rates (Noll et al., 2020).
  - **Strength of Evidence**: Moderate. The modified Graham patch is effective for small, uncomplicated perforations, although data on its comparative efficacy is limited (Noll et al., 2020).
- **Exclusion and Bypass**:
  - **Recommendation**: For perforations larger than 3 cm or those in difficult anatomical locations, consider resection with reconstruction, such as Billroth I, Billroth II, or Roux-en-Y.
  - **Rationale**: Larger perforations or those involving the pylorus may require resection and reconstruction to ensure adequate repair and functional restoration. The choice of reconstruction technique depends on the location and size of the perforation, as well as the patient's overall condition (Ambe et al., 2016). Roux-en-Y is preferred for larger perforations due to its ability to provide optimal biliary exclusion and reduce the risk of reflux.
  - **Strength of Evidence**: High. The effectiveness of various reconstruction techniques has been well-documented, with Roux-en-Y often being preferred for larger or complex perforations (Ambe et al., 2016).
- **Jejunal Serosal Patch**:
  - **Recommendation**: Reserve the jejunal serosal patch technique for cases where other methods are not feasible.
  - **Rationale**: This technique involves using a loop of jejunum to patch the perforation and is considered a last-resort option due to its high risk of complications such as leaks and morbidity, especially in critically ill patients (Regimbeau et al., 2014).

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- **Strength of Evidence**: Moderate. While effective in certain scenarios, the high complication rates associated with this technique warrant its use only as a last resort (Regimbeau et al., 2014).

- **Controlled Tube Duodenostomy**:
  - **Recommendation**: Use controlled tube duodenostomy as a damage control technique if other repair methods are impractical.
  - **Rationale**: This approach involves placing a large drain or Malecot catheter into the defect, allowing for peritoneal drainage while the defect is closed around the drain. It is a salvage technique for severe cases but has a high failure rate and associated risks (Fagenholz & Schuster, 2015).
  - **Strength of Evidence**: Moderate. This technique is useful in emergencies but carries a significant risk of complications and is not a preferred long-term solution (Fagenholz & Schuster, 2015).

- **Vagotomy**:
  - **Recommendation**: Consider highly selective vagotomy for patients with hypersecretory syndromes or recurrent ulcers that are H. pylori-negative.
  - **Rationale**: With the availability of proton pump inhibitors (PPIs), routine vagotomy is less common. However, highly selective vagotomy may be appropriate for specific conditions where acid secretion is excessive and resistant to other treatments (Loozen et al., 2018).
  - **Strength of Evidence**: Low. Vagotomy is less frequently used due to advances in medical therapy but remains an option for specific patient populations (Loozen et al., 2018).

3. **Operative Considerations**:
   - **Nasogastric Tube Placement**:
     - **Recommendation**: Place a nasogastric tube (NGT) intraoperatively to facilitate gastric decompression. Consider placement beyond the repair site for early feeding options.
     - **Rationale**: An NGT assists with postoperative gastric decompression, which is crucial for preventing distension and potential complications. Although early feeding through an NGT may be possible, it can be associated with an increased risk of failure (Barkun et al., 1994).
     - **Strength of Evidence**: Moderate. NGT placement is standard practice, though its role in early feeding is debated (Barkun et al., 1994).
   - **Drain Placement**:
     - **Recommendation**: Place drains only if the perforation closure is friable and there is a high concern for leakage.

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- **Rationale**: The benefits of postoperative drains are controversial. While they can detect leaks early, they may also delay healing or increase the risk of infections. Drain placement should be based on individual patient factors and surgical judgment (Weledji, 2020).
- **Strength of Evidence**: Moderate. Drains can be beneficial but are not universally indicated; their use should be tailored to the patient's needs (Weledji, 2020).

- **Biopsies**:
  - **Recommendation**: When technically feasible, perform biopsies of the perforation edges to assess for malignancy.
  - **Rationale**: Biopsy of the perforation margins helps rule out malignancy, especially in patients with atypical presentations or those at higher risk for gastric cancer (Fagenholz & Schuster, 2015).
  - **Strength of Evidence**: Moderate. Biopsy is a useful diagnostic tool but may not be practical in all cases (Fagenholz & Schuster, 2015).

Non-Operative Management

1. **Observation and Conservative Treatment**:
   - **Recommendation**: Consider non-operative management for stable patients with minimal symptoms and laboratory abnormalities. Use contrast imaging to confirm that the perforation is contained or walled off.
   - **Rationale**: Non-operative management is appropriate for patients with stable vital signs and limited peritoneal contamination. Keeping the patient NPO and starting a PPI can control acid secretion and promote healing. Close observation is essential to ensure the perforation does not progress (Brazzelli et al., 2015).
   - **Strength of Evidence**: High. Evidence supports conservative management for selected stable patients with contained perforations (Brazzelli et al., 2015; Kim & Park, 2015).
2. **Dietary Management**:
   - **Recommendation**: Maintain NPO status and initiate PPI therapy for non-operative management patients.
   - **Rationale**: Keeping the patient NPO reduces gastrointestinal activity and prevents further irritation of the perforation. Proton pump inhibitors reduce gastric acid production, aiding in ulcer healing and preventing further complications (Choi et al., 2018).
   - **Strength of Evidence**: High. NPO status and PPI therapy are standard components of conservative management for perforated ulcers (Choi et al., 2018).

Postoperative Care

1. **Proton Pump Inhibitors (PPIs)**:
   - **Recommendation**: Continue PPI therapy postoperatively to reduce gastric acid secretion.

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- **Rationale**: Postoperative PPI therapy helps in managing gastric acid levels, promoting ulcer healing, and preventing recurrence. This is essential for all patients, regardless of the surgical approach (Gurusamy et al., 2015).
- **Strength of Evidence**: High. PPI use is well-supported in postoperative care for ulcer patients (Gurusamy et al., 2015).

2. **Helicobacter pylori Testing**:
   - **Recommendation**: Conduct H. pylori studies postoperatively and initiate eradication therapy if infection is detected.
   - **Rationale**: Eradicating H. pylori is crucial for preventing ulcer recurrence and managing peptic ulcer disease effectively. Testing should be done as soon as practical postoperatively (Morrow & Cohen, 2019).
   - **Strength of Evidence**: High. H. pylori eradication is a standard practice to prevent ulcer recurrence (Morrow & Cohen, 2019).
3. **Follow-Up Imaging**:
   - **Recommendation**: Perform an upper GI series or CT with PO contrast on postoperative day 5 to check for leaks. If a leak is identified, keep the patient NPO for an additional 5 days and repeat CT.
   - **Rationale**: Follow-up imaging is crucial for detecting postoperative leaks. Early detection allows for prompt intervention to prevent complications (Kim & Park, 2015).
   - **Strength of Evidence**: High. Postoperative imaging is essential for identifying complications and ensuring proper healing (Kim & Park, 2015).
4. **Drain Management**:
   - **Recommendation**: Remove drains if output is non-bilious and the patient has tolerated a clear liquid diet.
   - **Rationale**: Effective management of drains helps in monitoring postoperative healing. Drains should be removed when there is no significant bile output and the patient can tolerate oral intake (Choi & Kim, 2018).
   - **Strength of Evidence**: Moderate. Drain management is important but should be individualized based on the patient's recovery progress (Choi & Kim, 2018).

Disposition and Follow-Up

1. **Clinic Follow-Up**:
   - **Recommendation**: Schedule a follow-up appointment in 2-4 weeks for evaluation of the surgical site and overall recovery.
   - **Rationale**: Regular follow-up ensures that any complications are identified and managed early. It also allows for assessment of recovery and reinforcement of lifestyle modifications (Lee et al., 2011).

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- **Strength of Evidence**: High. Follow-up visits are critical for monitoring patient progress and addressing any postoperative issues (Lee et al., 2011).

2. **Drain and Staple Removal**:
    - **Recommendation**: Remove drains and staples in the clinic as needed, based on clinical assessment.
    - **Rationale**: Removal of drains and staples should be based on the patient's healing status and clinical progress. This reduces the risk of infection and facilitates recovery (Fagenholz & Schuster, 2015).
    - **Strength of Evidence**: Moderate. Removal of drains and staples should be individualized and based on clinical judgment (Fagenholz & Schuster, 2015).

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Updating

- The guideline should be reviewed and updated annually to incorporate new evidence, changes in practice, and advances in technology.
- **Last updated 8/21/2024**

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