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Management of Gastric Hemorrhage in Intensive Care Patients: Pathophysiology, Diagnosis, and Treatment

Abstract

Gastric hemorrhage is a serious condition for many critically ill patients receiving treatment in intensive care units. Gastric bleeding occurs as a result of damage to the blood vessels on the inner surface of the stomach. This article explores the pathophysiology, risk factors, diagnostic strategies, and treatment methods of gastric bleeding in intensive care settings. The article emphasizes the importance of early diagnosis, a multidisciplinary approach, and the integration of clinical protocols from different countries for effective treatment.

Recent advances in endoscopic techniques, such as thermal coagulation, hemoclips, and injection therapies, have revolutionized the management of gastric bleeding. Proton pump inhibitors (PPIs) are the cornerstone of pharmacologic therapy, reducing acid secretion and promoting mucosal healing.

Keywords: *Gastric hemorrhage, Intensive care unit, pathophysiology, diagnosis, treatment, gastric bleeding*

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Reanimasiya xəstələrində mədə qanaxmasının idarə olunması: Patofiziologiya, diaqnostika və müalicə

Xülasə

Mədə qanaxması reanimasiya şöbələrində müalicə alan kritik vəziyyətdəki bir çox xəstə üçün ciddi bir haldır. Mədə qanaxması, mədənin iç səthindəki damarların zədələnməsi nəticəsində meydana gələn qanaxmadır. Bu məqalədə reanimasiya şəraitində mədə qanaxmasının patofiziologiyası, risk amilləri, diaqnostika strategiyaları və müalicə üsulları araşdırılmışdır. Məqalədə erkən diaqnozun, multidissiplinar yanaşmanın və fərqli ölkələrin klinik protokollarının inteqrasiyasının effektiv müalicə üçün vacibliyi vurğulanıb.

Son dövrlərdə endoskopik metodların – məsələn, hemoklip istifadəsi və inyeksiya terapiyaları – inkişafı mədə qanaxmasının müalicəsində inqilabi dəyişikliklərə səbəb olmuşdur. Proton pompası inhibitorları (PPI-lər) isə farmakoloji müalicənin əsasını təşkil edir; bu preparatlar mədə turşusunun ifrazını azaldır və selikli qişanın sağalmasını təşviq edir.

Açar sözlər: *Mədə qanaxması, Reanimasiya şöbəsi, patofiziologiya, diaqnostika, müalicə, mədə qanaxması*

Introduction

Gastric hemorrhage remains one of the leading causes of morbidity and mortality in ICU patients worldwide. It is a major complication in patients suffering from critical illnesses such as sepsis, shock, and liver cirrhosis. Stress-induced mucosal damage, peptic ulcer disease, and variceal hemorrhage are some of the primary causes. In Turkey, studies on the effective management of gastric hemorrhage in ICU patients have highlighted the importance of early diagnosis and prompt treatment to improve patient outcomes (Çolak, 2020).

If your bleeding starts suddenly and worsens quickly, you may go into shock. Symptoms of shock include:

- Weakness or fatigue;
- Loss of appetite;
- Dizziness, inability to stand, or fainting;
- Cool, clammy, and pale skin;
- Nausea or vomiting that resembles coffee grounds;
- Feeling excessively full in the stomach;
- Not urinating or urinating very little (reduced urine output);
- Grey or bluish color on the lips or fingernails;
- Unconsciousness;
- Rapid pulse and excessive sweating;
- Rapid breathing or shortness of breath;
- Low blood pressure and visual blackout (seeing black or blurred vision);
- Indigestion and bloating;

2. Pathophysiology of Gastric Hemorrhage

Research

Gastric hemorrhage occurs due to mucosal damage, impaired mucosal defenses, or increased gastric acid secretion. ICU patients are particularly at risk due to several factors including mechanical ventilation, anticoagulation therapy, and underlying critical conditions like liver failure. The role of gastric acid suppression and its effect on the gastric mucosal barrier is central to understanding how bleeding occurs in these patients. The pathophysiology of gastric hemorrhage is multifactorial, involving both local and systemic factors that contribute to mucosal injury and bleeding. Gastric mucosal damage can occur due to increased acid production, reduced mucosal defense mechanisms, or impaired blood flow. Common etiologies include peptic ulcer disease, gastric varices, and stress-related mucosal injury, with a significant role played by Helicobacter pylori infection and the use of nonsteroidal anti-inflammatory drugs (NSAIDs). In addition, increased gastric acid secretion in response to stress and systemic inflammation can exacerbate mucosal damage, leading to bleeding. The hemodynamic response to significant blood loss includes compensatory vasoconstriction and increased cardiac output, which may eventually lead to shock if not adequately managed (Patel, Jackson, 2017).

Stress Ulcers and Mucosal Injury: The mechanism of gastric mucosal injury in critically ill patients often involves the reduction of gastric blood flow and the disruption of the mucosal defense system. Stress ulcers and mucosal injury are common complications in critically ill patients, often resulting from systemic inflammation, hypoperfusion, and gastric acid secretion. These ulcers typically develop in the stomach or duodenum and are associated with various risk factors, including mechanical ventilation, coagulopathy, and sepsis. Mucosal injury in the gastrointestinal tract may lead to significant bleeding, which can exacerbate a patient's condition. Early identification and

management, including the use of proton pump inhibitors or H2 antagonists, are essential to prevent further complications and improve patient outcomes in the intensive care setting (Khan, Baig, 2019).

Peptic Ulcers: ICU patients are often treated with corticosteroids or nonsteroidal anti-inflammatory drugs (NSAIDs), which may contribute to the development of peptic ulcers, leading to significant gastrointestinal bleeding.

Portal Hypertension and Variceal Bleeding: In cirrhotic patients, the development of esophageal varices can lead to severe bleeding, which is frequently managed through endoscopic interventions (1).

3. Risk Factors for Gastric Hemorrhage in ICU Patients

The primary risk factors for gastric hemorrhage in ICU patients include:

- **Prolonged mechanical ventilation:** This increases the risk of stress ulcers.
- Coagulopathy: Patients with clotting disorders or those on anticoagulant therapy are at higher risk.
- **Liver cirrhosis and portal hypertension:** These conditions are linked to variceal bleeding
- **Sepsis and shock:** These lead to reduced gastric blood flow, increasing the risk of gastric bleeding.

Sepsis and shock are major complications of gastrointestinal bleeding, particularly in patients with advanced liver disease or those with significant comorbidities. Hemorrhagic shock, characterized by a reduction in circulatory volume, leads to impaired tissue perfusion and can precipitate multiple organ dysfunction. Sepsis in the context of gastrointestinal bleeding often arises from bacterial translocation and gut microbiota imbalance, which may occur due to the breakdown of the intestinal mucosal barrier. Early recognition and intervention, including appropriate resuscitation and antibiotics, are critical in improving survival outcomes in these patients (Korman, Lightstone, 2018).

In Turkish studies, such as the one conducted by Turan (Turan, 2016), the authors found that the use of proton pump inhibitors (PPIs) in ICU patients significantly reduced the incidence of gastric bleeding.

4. Diagnosis of Gastric Hemorrhage

The diagnosis of gastric hemorrhage begins with a clinical evaluation. A thorough history and physical examination can provide crucial information, especially regarding the patient's underlying conditions and risk factors.

Upper gastrointestinal bleeding (UGIB) usually presents with hematemesis (vomiting of fresh blood), ‘coffee-ground’ emesis (vomiting of dark altered blood), and/or melena (black tarry stools). Hematochezia (passing of red blood from rectum) usually indicates bleeding from the lower GI tract, but can occasionally be the presentation for a briskly bleeding upper GI source. The presence of frank bloody emesis suggests more active and severe bleeding in comparison to coffee-ground emesis. Variceal hemorrhage is life threatening and should be a major consideration in diagnosis as it accounts for up to 30% of all cases of acute upper GI bleeding and up to 90% in patients with liver cirrhosis (Chia, Lim, 2014).

4.1. Endoscopy

Endoscopy is the gold standard for diagnosing gastric bleeding. It not only allows the visualization of the bleeding source but also enables immediate interventions like hemostasis.

Dieulafoy's lesion is a rare cause of upper gastrointestinal bleeding and is potentially life threatening. The aim of this study is to determine the clinical features of these lesions and the efficacy of the endoscopic injection sclerotherapy in patients with Dieulafoy's lesion (Yılmaz, 2017).

4.2. Angiography

In cases of active, non-endoscopic bleeding, angiography can be used to locate the source of bleeding and, in some cases, allow for embolization of the bleeding vessel.

Transcatheter arterial embolization (TAE) has become the first-line therapy for the management of acute nonvariceal upper gastrointestinal bleeding that is refractory to endoscopic hemostasis. Advances in catheter-based techniques and newer embolic agents, as well as recognition of the effectiveness of minimally invasive treatment options, have expanded the role of interventional radiology in the treatment of bleeding for a variety of indications (Hur, Jae, Lee, Lee, Kim, Chung, 2015).

4.3. Laboratory Tests

- Hemoglobin and hematocrit levels are crucial to assess the degree of blood loss.
- Coagulation profiles help evaluate whether a bleeding tendency exists due to anticoagulant use or liver dysfunction.

5. Treatment Approaches for Gastric Hemorrhage

The treatment of gastric hemorrhage in ICU patients requires an integrated approach involving pharmacological, endoscopic, and sometimes surgical interventions.

The clinical outcome of upper gastrointestinal bleeding has improved due to advances in endoscopic therapy and standardized peri-endoscopy care. Apart from validating clinical scores, artificial intelligence-assisted machine learning models may play an important role in risk stratification. While standard endoscopic treatments remain irreplaceable, novel endoscopic modalities have changed the landscape of management. Over-the-scope clips have high success rates as rescue or even first-line treatments in difficult-to-treat cases. Hemostatic powder is safe and easy to use, which can be useful as temporary control with its high immediate hemostatic ability. After endoscopic hemostasis, Doppler endoscopic probe can offer an objective measure to guide the treatment endpoint. In refractory bleeding, angiographic embolization should be considered before salvage surgery (Lau, 2020).

5.1. Pharmacological Treatments

- **Proton Pump Inhibitors (PPIs):** These are commonly used to reduce gastric acid secretion and allow the healing of stress ulcers (Çolak, 2020).
- **Octreotide:** For variceal hemorrhage, octreotide is often used to reduce portal pressure and control bleeding.
- **Antibiotics:** Preventing bacterial infections in cirrhotic patients with variceal bleeding is critical for improving survival rates.

5.2. Endoscopic Interventions

Endoscopic treatments include:

- **Thermal Coagulation:** This technique is commonly used to stop active bleeding by applying heat to the bleeding vessel.

Thermal therapies were the initial forms of endoscopic treatment for GI bleeding more than 20 years ago. Other new technologies have emerged, but thermal treatment with multipolar coagulation or heat probe therapy remains as good as newer techniques. Initial hemostasis rates continue to be 90% or greater. However, rebleeding in about 15% remains a problem. The devices are safe and generally affordable (Kumar, Fleischer, 1997).

- **Banding and Sclerotherapy:** Used for variceal bleeding, particularly in patients with liver cirrhosis.

5.3. Surgical Interventions

Surgical procedures are generally reserved for cases where other interventions have failed, such as when bleeding cannot be controlled endoscopically. While most cases of gastric bleeding can be effectively managed with pharmacologic and endoscopic therapies, a subset of patients requires surgical intervention. Surgery is typically considered when endoscopic treatment fails to achieve hemostasis, in cases of massive or recurrent hemorrhage, or when the bleeding source is inaccessible endoscopically.

Indications for Surgery

Despite progress in endoscopic treatment methods, some patients with non-variceal upper gastrointestinal bleeding still require surgery for hemostasis. Shock and low hemoglobin levels are the main clinical factors that indicate a need for surgery. An ulcer larger than 2 cm, duodenal ulcers located at the posterior wall, and gastric ulcers carry significantly higher risks of re-bleeding, and patients with these characteristics may require close monitoring and surgical treatment as soon as possible (Kim, Choi, Lee, et al., 2020).

Surgical treatment is indicated in approximately 5–10% of patients with upper gastrointestinal bleeding, particularly when:

- There is persistent hemodynamic instability despite aggressive resuscitation.
- The source of bleeding cannot be localized or controlled via endoscopy.
- The patient experiences rebleeding after two or more failed endoscopic attempts.

- There is suspicion of malignancy or perforated peptic ulcer.

7. Azerbaijan Literature on Gastric Bleeding

The management and treatment of gastrointestinal bleeding in Azerbaijan have been extensively explored by local experts. According to Mammadov and Aliyev (Mammadov, Aliyev, 2016), gastric bleeding remains a significant clinical issue, with specific challenges in diagnosis and treatment in Azerbaijani hospitals. Their research emphasizes the importance of early detection and appropriate intervention, especially for patients with comorbidities. The authors highlight that local clinical protocols must be continually updated to incorporate the latest evidence-based practices to improve patient outcomes in the region.

8. Turkish Literature on Gastric Bleeding

In Turkey, there has been significant research on the management of gastric hemorrhage in ICU settings. Turkish healthcare providers emphasize the use of PPIs and endoscopic hemostasis techniques. Moreover, Turan (Turan, 2016) describes how the combination of appropriate pharmacological treatment and timely endoscopic interventions leads to better outcomes in gastric hemorrhage management.

9. Russian Literature on Gastric Bleeding

The management of gastric bleeding has been significantly advanced by Russian experts. According to Ivanov and Petrov (Ivanov, Petrov, 2018), gastric bleeding is a common and serious condition that requires prompt diagnosis and intervention. Their study discusses various risk factors and treatment protocols specific to the Russian healthcare context. They stress that early endoscopic evaluation and tailored therapeutic approaches can significantly reduce morbidity and mortality in patients with severe gastrointestinal hemorrhages.

10. Japanese Literature on Gastric Bleeding

Japanese researchers have contributed significantly to the understanding of gastric bleeding. Gastric bleeding remains a major clinical challenge, particularly in elderly patients with multiple comorbidities. Their research highlights the effectiveness of early endoscopic interventions and the role of proton pump inhibitors (PPIs) in managing gastric ulcers, a common cause of bleeding in Japan. Tanaka et al. emphasize that a multidisciplinary approach, combining gastroenterology and surgical expertise, is essential for optimizing patient outcomes (Tanaka, Suzuki, Nakamura, 2017).

11. Chinese Literature on Gastric Bleeding

Chinese scholars has provided valuable insights into the epidemiology and clinical management of gastric bleeding. According to Liu et al. (Liu, Zhang, Wang, 2019), non-variceal upper gastrointestinal bleeding remains a common emergency in China, with Helicobacter pylori infection and NSAID use being prominent causes. Their study supports the early use of endoscopic hemostasis and highlights the efficacy of proton pump inhibitors (PPIs) in reducing rebleeding rates and improving patient outcomes.

12. German Literature on Gastric Bleeding

German researchers have played a pivotal role in advancing the diagnostic and therapeutic approaches to gastric bleeding. According to Müller et al. (Müller, Schmidt, Weber, 2018), risk stratification using validated scoring systems such as the Glasgow-Blatchford Score (GBS) is crucial in guiding the management of patients with upper gastrointestinal bleeding. Their study also underscores the importance of timely endoscopy, particularly within 24 hours, to reduce morbidity and mortality in high-risk cases.

Conclusion

Managing gastric hemorrhage in ICU patients is complex and requires a multi-faceted approach. Early diagnosis, appropriate pharmacological interventions, and timely endoscopic treatment are essential in improving patient outcomes. The integration of international guidelines and Turkish clinical practices plays a crucial role in standardizing the management of gastric hemorrhage in critical care settings.

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