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Peptic Ulcer Perforation: An Enigma Since Antiquity

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Author's contribution

The sole author designed, analyzed, interpreted and prepared the manuscript.

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ABSTRACT

Peptic ulcer disease (PUD) is a serious medical condition. The perforation of peptic ulcers (PPU) causes a steep rise in mortality and morbidity. It accounts for 70% of deaths associated with PUD. More than 60% of perforations occur in the anterior wall of the duodenum, while 20% of it is in the antrum. The gastric ulcer perforation contributes to approximately 20% and is in lesser curvature. The risk factor includes non-steroidal anti-inflammatory drugs (NSAID), *Helicobactor pylori (H. Pylori),* smoking, alcoholism, Corticosteroid, and stress are some of the risk factors. There is a change in the epidemiology of PUD recently. The improvement is remarkable and is due to improved socio-economic status, identification and treatment of *Helicobacter pylori,* and introduction of proton pump inhibitors. The *H pylori* infection remains one of the most important causes of PUD and its complications like PPU. The reason for reviewing and writing this paper is to evaluate the most common ideas on the treatment of peptic ulcer perforation, opinion on conservative treatment, and surgical treatment options.

Keywords: Peptic ulcer disease (PPD); Perforation peptic ulcer (PPU); Helicobactor pylori; NSAID; Peritonitis; Omentopexy.

1. INTRODUCTION

1.1 The Epidemiology

Peptic ulcer disease (PUD) is a serious medical condition; Peptic ulcer perforation (PPU) causes a steep rise in mortality and morbidity. Approximately 500,000 new cases of peptic ulcer disease are reported each year in the United States alone. Perforation occurs in 2-10% of patients suffering from PUD and accounts for 70% of deaths associated with PUD. Many a

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time the perforation is often the first clinical presentation of PUD [1]. More than 60% of perforation occurs in the anterior wall of the duodenum, while it is in the antrum in 20% of cases and gastric ulcer perforation contributes to approximately 20% in its lesser curvature [2]. Thus, the perforation of peptic ulcer occurs most commonly of the duodenal ulcer followed by antrum and gastric ulcer. There is a remarkable change in the epidemiology of PUD in the latter half of the twentieth century. The causes are many folds, for example, improvement in socioeconomic status, identification and medical therapy of helicobacter pylori, and introduction of proton pump inhibitors (PPI). The median age of diagnosis is also shifted from mid-30-40 years to 60 and above [3-6].

1.2 Etiopathogenesis

The perforated peptic ulcer (PPU) is a surgical emergency. The prevalence depends upon demography, socioeconomic status, H. Pylori prevalence, and prescription drugs. The PPU presents as acute abdomen. In order to reduce the mortality and morbidity is essential to establish the diagnosis at an earliest. The clinical signs may be obscured in elderly, obese or the immunocompromised patients, and thus delay in diagnosis [7]. The ulcer formation is attributed to imbalance between protective and ulcerogenic factors. It is also not clear that why some ulcers perforate and others do not. The ulcerogenesis is said to be due to *H. Pylori* infection, [8] injury to the mucosal barrier and increased acid production. It is also more commonly seen in smokers, NSAIDS users, and chronic consumption of alcohol. A diurnal peak of ulcer perforations has been observed with more perforations occurring in the morning, possibly related to circadian variation in acid-secretion. Perforation risk is increased by fasting, such as during Ramadan [9]. It may be due to variation in acid release and exposure. Ulcer perforation is noted to occur after bariatric surgery [10]. After crack-cocaine or amphetamine use [11] [12] and after chemotherapy with angiogenesis inhibitors such as bevacizumab. Patients with acid-hypersecretion, including those with a gastrinoma (Zollinger-Ellison syndrome) are at risk for perforation [13].

Non-steroidal anti-inflammatory drugs (NSAIDs), *Helicobacter pylori (H. Pylori),* smoking, alcoholism corticosteroids, and stress are important risk factors. A systematic review of 93 studies has shown that the average recurrence of perforation is 12.2% (95%CI:2.5-21.9) in previously successfully treated cases [14].

NSAIDs are widely used for their analgesic and anti-inflammatory effect. They are also known to increase the risk of PPU [15-16]. Steroids and selective serotonin reuptake inhibitors also cause a rise in the incidence of PUD and that of PPU.

The *H pylori* infection remains one of the most important causes of PUD and its complications like PPU. Recurrent PUD occurs in patients with H. Pylori infection, suggesting its important role in the development of PUD and complications. The mean prevalence in patients with PUD varies in different studies because of different diagnostic methods and geographical variations. The prevalence of *H Pylori* infection in perforated peptic ulcers is around 50-80% [17] H. Pylori infection and accompanying inflammation disrupt the inhibitory control of gastrin release by decreasing antral somatostatin, and this is more marked if the infecting organism is a *cag*A-positive strain. [2] These results in the increase of gastrin secretion and gastric acid secretion, which is a key mechanism of causation of PUD in *H pylori* infection.

Smoking Tobacco is thought to inhibit pancreatic bicarbonate secretion and thus increasing the acidity in the duodenum [18]. It also inhibits the healing of the duodenal ulcer. A meta-analysis has indicated that 23% of PUD could be associated with smoking [19]. The other factors responsible for PUD and PPU are chronic alcohol consumption, steroids, and excessive acid production in Gastrinomas and Zollinger Ellison Syndrome (ZES) [20-21].

2. CLINICAL FEATURES

The patient presents with severe, sudden onset of generalised abdominal pain. On clinical examination there is typical board like rigidity. The clinical picture is less obvious in obese, immunocompromised patients, patients on steroids, in elderly, children and patients with reduced level of consciousness. Only one-third of the patients presents with typical features which may explain the diagnostic delay in some patients [22].

In a typical case of perforation of peptic ulcer, the onset is sudden with acute pain in the upper abdomen, bloating, and fullness. The pathology

and clinical manifestations can be divided into three phases:

1. The first phase is within 2 hours of onset. It is due to chemical peritonitis since the gastric contents have escaped to the peritoneal cavity. There is severe pain in the epigastric region, vomiting, tachycardia, sweating. On palpation of the abdomen there is typical board-like rigidity of the abdomen, and guarding.
2. Peritoneum secretes lots of fluid to neutralize this acid the pain reduces. The patient may feel better. This stage lasts for about 6 hours.
3. After about 6 hours the bacteria migrate from the site of perforation and bacterial peritonitis develops [23].

As the definitive treatment is delayed the morbidity and mortality rise steeply. An urgent X-Ray chest shows gas below the right diaphragm (pneumoperitoneum) and is diagnostic. It has got specificity of up to 75% [24]. Serum Amylase and lipase is done to exclude pancreatic pathology. In case of suspected PPU, if the X-ray is not showing free gas under the right diaphragm, a CT scan is recommended, as it has got diagnostic accuracy as high as 98% [25].

3. THE TREATMENT

The peptic ulcer disease and peptic ulcer perforation are recognized as definite disease entities. This disease is in existence but as a disease entity, it has been recognized in the 19th century.

3.1 Non-operative Treatment

In patients with minimal or localized symptoms and in good clinical condition, the non-operative strategy may be considered. The operative interference is deferred deliberately and the patient is kept under observation. Non-operative management is not a new concept and was recommended for a long [26]. The case for the conservative treatment should be selected carefully. The patient is kept nil by mouth, nasogastric tube aspiration, tube, IV fluids, and antibiotics. PPI is added to the treatment. A water-soluble dye is used to confirm the sealing of the leak, if there is no leak patient can be continued on a conservative line of management. The randomized control trial (RTC) shows the success of the non-operative strategy in the majority of cases. There is a high failure rate in elderly patients [27]. The non-operative treatment should be considered carefully in view of the fact that mortality increases steeply with every hour of delay [28].

3.2 Operative Management

The delay in surgery is considered to be one of the most important factors to increase mortality [29]. The most widely practiced surgical procedure is laparotomy with the closure of perforation with or without an omental patch (omentopexy). Another approach is the laparoscopic repair of perforated peptic ulcers. In recent systemic reviews and three RTCs, it has been found that there is no difference in mortality between open and laparoscopic repair of peptic ulcer perforation [30-31]. Currently there is nothing to suggest that laparoscopic repair is better than open surgery. There is no difference in mortality also in open Vs laparoscopic surgery. However, the operating surgeon's experience and patient's evaluation must be considered before undertaking any procedure. Few perforations are not suitable for repairs by either means, like in large ulcers or big gastric ulcers. In such circumstances resection is a better option. In big gastric ulcers, there is suspicion of malignancy also [32-33].

Post-operative care aims at preventing, detecting, and treating sepsis. It also includes risk stratification, sepsis screening, minimization of surgical delay, fluid resuscitation, and broad-spectrum antibiotics. A meta-analysis of 5 RTCs has confirmed that the eradication of *H. Pylori* significantly reduces the incidence of ulcer recurrence at 8 weeks and at one year after surgery. It consisted of only duodenal ulcer perforations [34]. A 2013 Cochrane review showed that eradication rates using a standard triple regimen (PPI + clarithromycin + amoxicillin) increased with a longer duration of treatment (e.g., 14 days compared to 7 or 10 days) [35]. Upper gastrointestinal endoscopy is suggested to be performed after 6 weeks to assess healing of the ulcers and to evaluate *H. pylori* status [23].

4. CONCLUSION

The peptic ulcer perforation is an enigma since antiquity. Its typical presentation is sudden pain in the abdomen, board-like rigidity, and signs of shock. The prognosis worsens with every hour of delayed treatment. The diagnosis is easy with the plane x-ray abdomen in an erect position which shows gas below the right diaphragm.

Operative treatment has stood the test of time. It includes closure of perforation by simple closure or with a patch of omentum. It can be undertaken by a laparoscopic or open method depending upon the expertise available. The prognosis is best with the early operative interference.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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