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Nonoperative management for perforated peptic ulcer: Who can benefit?

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Summary *Background:* Although nonoperative management for perforated peptic ulcer (PPU) has been used for several decades, the indication is still unclear. A clinicoradiological score was sought to predict who can benefit from it.
Methods: A clinicoradiological protocol for the assessment of patients presenting with PPU was used. A logistic regression model was applied to identify determinant variables and construct a clinical score that would identify patients who can be successfully treated with nonoperative management.
Results: Of 241 consecutive patients with PPU, 107 successfully received nonoperative management, and 134 required surgery. In multivariable analysis, the following four variables correlated with surgery and were given one point each toward the clinical score: age $\geq$70 years, fluid collection detection by ultrasound, contrast extravasation detection by water-soluble contrast examination, and Acute Physiology and Chronic Health Evaluation II (APACHE II) score $\geq$8. Eighty-five percent of patients with a score of 1 or less were successfully treated with nonoperative management, whereas 23 of 29 patients with a score of 3 or more required surgery. The area under the receiver operating characteristic curve was 0.804 (95% confidence interval = 0.717—0.891).
Conclusion: By combining clinical, radiological parameters, and APACHE II score, the clinical score allowed early identification of PPU patients who can benefit from nonoperative management.

1. Introduction

Because of the widespread clinical use of H_2 receptor antagonists and proton-pump inhibitors, significantly less elective surgery has been carried out for uncomplicated peptic ulcer. However, the complications associated with peptic ulcer, especially perforation, are still common in recent years.[1,2] In 1946, Taylor first reported a series of 28 patients with perforated peptic ulcer (PPU) receiving nonoperative management. The mortality rate was 14%, which was less than the approximate 20% following a direct simple closure with omental patch.[3] With the development of critical care medicine, the mortality of PPU treated by the nonoperative approach has significantly reduced.[4–6] However, the indication of nonoperative management is unclear, and urgent repair of perforation is still the standard approach for PPU in many clinical centers. The aim of this study is to establish a clinicoradiological scoring system to predict who can benefit from it.

2. Materials and methods

2.1. Patients

Between January 2002 and December 2010, all patients who presented at the general surgery unit of our hospital with clinical symptoms of PPU confirmed by abdominal plain film with pneumoperitoneum were evaluated for inclusion in this study. Patients with PPU history or suspected with gastric cancer were excluded from this study. Patients with severe diffuse peritonitis or septic shock received direct surgery after fluid resuscitation. Otherwise, the patients were initially managed nonoperatively. The study was conducted in accordance with the institutional guidelines of the Xuanwu Hospital Ethics Committee, Beijing, China.

Demographic data were collected for gender and age (continuous data, divided into the following two categories: <70 years and ≥70 years). Clinical variables included duration of abdominal pain prior to admission, the presence of fever with a threshold of 38°C, use of steroids or nonsteroidal anti-inflammatory drugs, the presence of *Helicobacter pylori* infection, and satiety during perforation. Laboratory variables were leukocyte count with a threshold of 12×10^9/L and albumin level with a threshold of 30 g/L. Radiological variables were ultrasound examination for fluid collection, plain film for pneumoperitoneum, and water-soluble contrast examination for extravasation. In addition, the Acute Physiology and Chronic Health Evaluation II (APACHE II) scoring system and Mannheim Peritonitis Index (MPI) were used to evaluate the general condition of patient and severity of peritonitis.[7]

2.2. Nonoperative management

Intravenous fluid resuscitation, appropriate antibiotics, nasogastric suction, and acid-reducing pharmacotherapy (H_2 antagonists or proton-pump inhibitor) were included in nonoperative management. Patients receiving nonoperative management were treated in intensive care unit. The vital and abdominal signs were rechecked by an experienced surgeon every 4 hours. Operative therapy was indicated for either progression or failure of improvement of peritonitis within 12 hours. Treatment for *H. pylori* began once the patients were able to tolerate oral intake. Follow-up gastroduodenoscopy was done at 4–6 weeks to monitor ulcer healing.

2.3. Statistical analysis

Continuous variables were divided into clinically meaningful categories as described earlier and compared between the two patient groups using Chi-square tests. The logistic regression analysis was used to identify variables associated with successful nonoperative treatment, as opposed to surgery therapy. All variables with univariable $p < 0.2$ were considered for the multivariable model. All variables with an adjusted $p < 0.1$ were retained in the final model. A clinical score was constructed based on the final logistic regression model, in which one point was assigned for the presence of each predictive factor.

To assess the discriminant ability of this score, a receiver operating characteristic (ROC) curve was obtained and the area under the curve (AUC) was calculated. The AUC can be interpreted as the probability that a randomly chosen patient having surgical therapy will have a higher score than a randomly chosen patient with successful nonoperative treatment. Values of 0.7 or more are often considered clinically useful.

The sensitivity and specificity of each threshold of the score were examined, as well as the likelihood ratio for successful nonoperative treatment for each value of the score. According to Bayes' theorem, the likelihood ratio represents the change in the odds of successful nonoperative treatment between pretest and post-test (post-test odds = likelihood ratio × pretest odds). A likelihood ratio of 1 indicates that the test result does not change the odds of successful nonoperative treatment, and likelihood ratios of 5 or more (alternatively, 0.2 or less) are considered to be clinically useful.[8] Statistical analysis was performed with SPSS version 17.0 (SPSS Inc., Chicago, IL, USA).

3. Results

Between January 2002 and December 2010, 241 patients with PPU admitted to our hospital were included in this study. There were 168 male and 73 female patients with a median age of 45 years (range: 21–92 years). Initially, 132 patients received nonoperative treatment; of these, 25 patients converted to surgery after 12 hours. Finally, 134 patients required surgical therapy. Clinical, laboratory, and radiological characteristics of the patients are summarized in Table 1. The clinical results of these two groups including length of hospital stay, expenditure, and morbidity were comparable (Table 2). However, the systemic infective complications were more common in the nonoperative treatment group than in the surgical group. The incidence of abdominal abscess and sepsis was 3.7% and 1.9%, respectively, in the nonsurgical group. In the surgical group, the incidence rate was 1.5% and 0.7%, respectively (Table 2).