Arterial pH and arterial oxygenation are not essential for risk stratification in perforation peritonitis

SUNIL AGRAWAL, DHANANJAYA SHARMA, V K RAINA

Department of Surgery, Government Medical College, Jabalpur (MP)

Background: The Acute Physiology and Chronic Health Evaluation (APACHE II) scoring system is widely used for assessing the severity of disease and prognostication in cases of perforation peritonitis. Investigations like arterial pH and oxygenation (PaO₂), which are considered important in APACHE II, are not available in most hospitals. We therefore attempted to validate a modified APACHE II (without arterial pH and oxygenation) in cases of perforation peritonitis. Methods: Fifty consecutive patients with perforation peritonitis admitted in the general surgical ward were prospectively analyzed vis-a-vis risk factors and mortality according to the modified APACHE II. Results: The mean modified APACHE II score of those who died was 15.3 (SD 5.7) as compared to 6.6 (4.7) (p<0.001) in those who survived. As the score increased, mortality rate rose (p<0.001). When the score was greater than 15, mortality was 85.9%; there was 100% mortality with score greater than 17. Conclusion: The modified APACHE II, excluding arterial pH and oxygenation, is simplified, reliable and objective for prediction of outcome in perforation peritonitis. [Indian J Gastroenterol 1999;18:5-6]

Key words: Modified APACHE II, prognostic factors

Perforation peritonitis is the commonest clinical condition with sepsis encountered in the surgical wards. Sepsis in a critically ill patient gives rise to severe physiological and metabolic alterations. The magnitude of this change can be quantified to reflect the degree of septic insult. Multiple organ failure syndrome (MOFS) represents the final common pathway to a fatal outcome in severely infected patients; it occurs in 30%-50% of operations for intraabdominal sepsis and carries a mortality that varies from 30%-50% depending on the number of organs involved.

Many scoring systems have been developed for risk stratification in intraabdominal infections. Probably the most widely used and validated is the APACHE II. APACHE II has many advantages: it is reliable and objective, is independent of diagnostic criteria, and can be obtained prior to treatment. It also has its share of criticism and limitations. The biggest limitation we found, working in a modestly equipped hospital, was inability to perform investigations like arterial pH and oxygenation (PaO₂), both of which are important parameters in APACHE II.

We therefore attempted to validate a modified APACHE II (without arterial pH and oxygenation) prospectively in patients with perforation peritonitis.

Methods

The present prospective study was undertaken to evaluate the prognosis in patients with perforation peritonitis with respect to risk factors. Fifty consecutive patients with perforation peritonitis admitted in the general surgical ward in emergency or routine hours were included. The diagnosis of perforation peritonitis was made by combination of history, clinical examination, radiological scout film abdomen (showing gas under the diaphragm) and emergency explorative laparotomy (presence of gastrointestinal contents in the peritoneal cavity along with identification of the perforation in the gastrointestinal tract).

Details of the cases were recorded in a proforma and score was given for each variable in accordance with the APACHE II severity of disease classification system. Blood samples were taken pretreatment and preoperatively and sent for examination. A modified APACHE II was computed according to the degree of deviation from normal, excluding arterial pH and oxygenation as facilities for these investigations were not available in our hospital.

All patients underwent repair of perforation, peritoneal lavage and drainage. Postoperative duration of stay in hospital and final outcome were noted; mortality related to the disease was defined as death in hospital during the same admission as the episode of perforation peritonitis. All patients were managed in the general surgical ward as our hospital does not have a surgical intensive care unit. None of the patients could receive ventilatory support.

Data so collected were statistically analyzed by Student’s t test and χ² test of independence.

Results

The 50 patients included 47 males; the age ranged from 8 to 69 years. Forty-five patients (90%) had peptic perforation and five had enteric perforation. Eighteen patients died; the maximum percentage of mortality was in the 55 to 64 years age group.

χ² test of independence was applied to all the factors in the modified APACHE II score. The analysis showed a high association of mortality with chronic health status, heart rate, respiratory rate, serum potassium and serum creatinine (Table 1) and the association was insignificant with age, serum sodium, body temperature, mean arterial pressure, PCV and WBC count.
Table 1: Significance of individual factors

<table>
<thead>
<tr>
<th>Parameter</th>
<th>$x^2$-value</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic health status</td>
<td>8.31</td>
<td>1</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Heart rate</td>
<td>7.70</td>
<td>1</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Respiratory rate</td>
<td>4.62</td>
<td>1</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Serum creatinine</td>
<td>19.5</td>
<td>2</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Serum K+</td>
<td>4.6</td>
<td>1</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

The differences in age, temperature, mean systolic blood pressure, PCV, WBC count and serum Na+ from the conventional APACHE II were statistically insignificant. Arterial pH and PaO2 were not estimated in those who survived. As the APACHE II score increased, mortality rate rose ($p<0.001$) (Table 2). When the score was greater than 15, mortality was 88.9%; there was 100% mortality with score greater than 17.

Table 2: Modified APACHE II

<table>
<thead>
<tr>
<th>Score</th>
<th>No. of patients</th>
<th>Mortality %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
<td>15</td>
<td>6.7</td>
</tr>
<tr>
<td>6-10</td>
<td>11</td>
<td>18</td>
</tr>
<tr>
<td>11-15</td>
<td>15</td>
<td>7.6</td>
</tr>
<tr>
<td>16-20</td>
<td>05</td>
<td>4.0</td>
</tr>
<tr>
<td>21-25</td>
<td>03</td>
<td>100</td>
</tr>
<tr>
<td>26-30</td>
<td>01</td>
<td>100</td>
</tr>
</tbody>
</table>

Taking 15 as a cut-off point the sensitivity was 96.9%, specificity 44.4%, predictive value for positive test 88.9% and predictive value for negative test 75.6%.

Discussion

It is now known that both APACHE II and the multiple organ dysfunction scores assess the same events.21 Such a system can be used for, apart from prognostication, clinical research, quality measurements and prioritization of resource allocation.

The modified APACHE II is a much simplified scoring system for perforation peritonitis as the number of variables is less. These variables are easy to calculate, less time-consuming and cost-effective. As this is a small series of only 50 patients, more trials are required to find out the efficacy of this scoring system.

The modified APACHE II, excluding arterial pH and oxygenation, is thus a reliable objective scoring test for prediction of outcome. It can be used for assessing severity of sepsis in patients with perforation peritonitis so that intensive treatment can be given to high-risk patients in a hospital with limited resources.

References


6 Indian Journal of Gastroenterology 1999 Vol 18 January - March