The use of serum Amylase as a predictive factor for mortality in Perforated Duodenal Ulcer

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Abstract:

Background: High serum amylase is frequently found in perforated duodenal ulcer (PDU), the rise in serum amylase occurs in cases of perforated peptic ulcer partly as a result of increase leakage of pancreatic enzymes rich fluid from the perforation site with subsequent absorption by peritoneal lymphatics & partly due to damage of pancreases by digestive enzymes that spilled through the perforation.

Objectives: To determine the significance of abnormally high level of serum amylase in patients undergone operation for PDU, to study the factors that tend to bring about elevated serum amylase level in these patients.

Patients and Methods: A prospective study of 250 patients with perforated duodenal ulcer (PDU) at al kindy teaching hospital, Baghdad, Iraq from June 2008- August 2010. patients were examined clinically and investigated by blood test, chest x-ray, plain X-ray of the abdomen & ultrasonography (U/S). Resuscitation by intravenous fluid, antibiotic were done. Explorative laparotomy performed for all patients, repair of perforation done by simple omental patch. Data regarding site, size of perforation, amount of spilled fluid and operative finding were recorded.

Results: Two hundred fifty patients included in this study with proven PDU, 222 (88.8 %) were male and 28 (11.2 %) were female, male to female ratio is 8:1. The mean age was 38 years, ranging from 22-70 years. The overall mortality was 14.4%. In 210 patients( 84%), the serum amylase was within normal range, the mortality in this group was 10 %. The other 21 patients (16%) had level of 200 or above, the mortality in this group was 37.5 %. Mortality was 5 % in cases with mild intra peritoneal fluid spillage, 9% in moderate, 25% in large amount & 39 in massive intra peritoneal spillage. The size of perforation has prognostic significance, for the larger the perforation, the higher the mortality.

Conclusions: Limiting surgical delay in patients with PDU seems to be of paramount importance in reducing the mortality in these patients. In patients with PPD, the high serum amylase the high mortality rate.

Keywords: PDU, serum amylase, mortality rate, time delay.
abdominal pain, shock, peritonitis, marked tenderness and decreased liver dullness offers little difficulty in diagnosis of perforations. Since the first description of surgery for acute perforated peptic ulcer disease, many techniques have been recommended. The recent advances in antulcer therapy have shown that simple closure of perforation with omental patch followed by eradication of H. Pylori is a simple and safe option in many centers and have changed the old trend of truncal vagotomy and drainage procedures. Although surgery is normally the correct treatment for perforated duodenal ulcer, the whole patient and the comorbidity need to be taken into account. Perforations may seal themselves by adherence to liver, gallbladder, or omentum.

Patients and Methods:
This is a prospective study of 250 patients with PDU who attend to the emergency department and treated surgically with explorative laparotomy at Al-Kindy Teaching Hospital, Baghdad from period June 2008-August 2010. The diagnosis of PDU in all patients was based on the presence of history of acute epigastric pain with generalized tenderness and rebound tenderness with board like rigidity. The diagnosis supported by history of chronic dyspeptic symptoms, previous endoscopic finding of DU, with history of long-term ingestion of steroid or NSAID. Blood samples were aspirated from all patients to assess the level of serum amylase in addition to hemoglobin or NSAID. Blood samples were taken from all patients. All patients underwent explorative laparotomy by midline incision and some of patients (20 patients, 8%) by right paramedian incision .Identification of the site size and nature of the perforation done, closure of the perforation was done with omental patch (grahams omentopexy) using 2/0 absorbable suture. Peritoneal lavage done by using 1-3 liters of warmed saline. 2 tube drain were inserted, 1st the site of repair and second in the pelvis. The Wound was closed in layers. Patients were followed up during hospitalization and one month after discharging home and complications were recorded. The data were analyzed by computer using Minitab statistical software version 14, for analysis. P value of < 0.05 was considered statistically significant.

Results:
Two hundred fifty patients included in this study with proven PDU, 222 (88.8 %) male and 28 (11.2 %) female, male to female ratio is 8 : 1. The mean age was 38 years, ranging from 22-70 years. PDU was noted to occur most commonly at the age group of 30-40 years and less frequently at other age group, as shown in table 1. In 84% (210 patients) of cases of PPU, the serum amylase was within normal range. The other 16% patients had level of 200 or above, these findings are summarized in table 2. The mortality for those patients who had essentially normal serum amylase was 10%, while those with high serum amylase was ranging from 27.77 % - 80%.

Table 1: Distribution of patients with PDU according to the different age groups

<table>
<thead>
<tr>
<th>Age group</th>
<th>No. of pts</th>
<th>% of pts</th>
<th>M/F ratio (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-29 yrs</td>
<td>44</td>
<td>17.6</td>
<td>40/4</td>
</tr>
<tr>
<td>30-39yrs</td>
<td>98</td>
<td>39.2</td>
<td>98/8</td>
</tr>
<tr>
<td>40-49yrs</td>
<td>53</td>
<td>21.2</td>
<td>53/5</td>
</tr>
<tr>
<td>50-59yrs</td>
<td>33</td>
<td>13.2</td>
<td>33/6</td>
</tr>
<tr>
<td>60 &amp; above</td>
<td>22</td>
<td>8.8</td>
<td>22/5</td>
</tr>
<tr>
<td>total</td>
<td>250</td>
<td>100%</td>
<td>222/28</td>
</tr>
</tbody>
</table>

Table 2: Serum amylase value in 250 cases of PDU Elevated serum amylase and abdominal fluid spill

<table>
<thead>
<tr>
<th>Serum amylase Range (somogi)</th>
<th>No. of cases</th>
<th>% of cases</th>
<th>No. of death</th>
<th>Mortality rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 200</td>
<td>210</td>
<td>84%</td>
<td>21</td>
<td>10%</td>
</tr>
<tr>
<td>200-300</td>
<td>18</td>
<td>7.2%</td>
<td>5</td>
<td>27.77%</td>
</tr>
<tr>
<td>300-400</td>
<td>12</td>
<td>4.8%</td>
<td>4</td>
<td>33.3%</td>
</tr>
<tr>
<td>400-600</td>
<td>5</td>
<td>2%</td>
<td>2</td>
<td>40%</td>
</tr>
<tr>
<td>Over 600</td>
<td>5</td>
<td>2%</td>
<td>4</td>
<td>80%</td>
</tr>
</tbody>
</table>

For purpose of analysis, the cases in which the amount of fluid spill had been estimated roughly by the surgeon were grouped in categories ( >250, 250-500,500-1000, and >1000) ml. In general the greater the fluid spill, the higher the mortality rate.

In group with massive spill, the mortality was 55%. Higher serum amylase with large and massive amounts of abdominal
fluid were statistically companionate as shown in table 3.
The mortality in group with large spill was double that in
patients with small or moderate spill.

Table3: Amylase value in relation to amount of fluid spill
in PDU Relation of duration of perforation to the serum
amylase

<table>
<thead>
<tr>
<th>Amount of spilled fluid</th>
<th>Total cases</th>
<th>Amylase level</th>
<th>%with elevated amylase</th>
<th>No. of death (% of total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small (less than 250 ml)</td>
<td>89</td>
<td>81 Normal</td>
<td>9.5 %</td>
<td>5 (5.6 %)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Elevated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate (250-500ml)</td>
<td>82</td>
<td>72 Normal</td>
<td>11 %</td>
<td>8 (9.7 %)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Elevated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large (500-1000ml)</td>
<td>56</td>
<td>45 Normal</td>
<td>19 %</td>
<td>14 (25 %)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Elevated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Massive (more than 1000ml)</td>
<td>23</td>
<td>12 Normal</td>
<td>50 %</td>
<td>9 (39 %)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Elevated</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Eighty seven patients had a duration of perforation less
than 8 hrs, in whom only 14% had high amylase, while 13 pts had
duration of more than 48 hrs in whom 23% had high serum
amylase as shown in table 4.

Table 4 : Duration & serum amylase level .Size of perforation

<table>
<thead>
<tr>
<th>Duration (hrs)</th>
<th>Total cases</th>
<th>Normal amylase</th>
<th>Elevated amylase</th>
<th>%of elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 8</td>
<td>87</td>
<td>75 Normal</td>
<td>12</td>
<td>13.8 %</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 - 16</td>
<td>108</td>
<td>93 Normal</td>
<td>15</td>
<td>13.8 %</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 - 24</td>
<td>26</td>
<td>19 Normal</td>
<td>7</td>
<td>26.9%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 - 48</td>
<td>16</td>
<td>12 Normal</td>
<td>4</td>
<td>25 %</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over 48</td>
<td>13</td>
<td>10 Normal</td>
<td>3</td>
<td>23%</td>
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</tbody>
</table>

A strong correlation of the size of ulcer with amount of amylase
was noted (r=0.68) . The correlation was not constant, however
in 4 cases in which perforations were 1.5-2 cm in diameter, the
serum amylase level were within normal limits.

Discussion :
While peptic ulcer disease has decreased in incidence
over the past decades, the epidemiological pattern of the
complications, including hemorrhage and perforation, have
changed little15. Although outcomes from bleeding ulcers
have improved with modern endoscopic and interventional
radiological Strategies16, the outcomes of perforations have
remained fairly unchanged17. A number of scoring systems
for outcome prediction have been reported, yet none appear
to be superior and most are investigated in isolation. The Boey
score was the first score directly aimed at mortality prediction
for perforated peptic ulcer 18. The original work by Boey et al
stated that delay of surgery after onset of symptoms for more
than 48 hours, shock upon admission and a high degree of co-
morbidity, were associated with a 100% mortality when all
factors where present 19. In many series, the mortality rates
vary from 6.5% to as high as 20% 19,20. Mortality rates as high
as 25–30 per cent also have been reported. The present study
showed a mortality rate of 36 (13.3%) out of 250 cases. Few
attempts have been made to study the direct effect of serum
amylase on the mortality but a lot of study analyze the factors
that may tend to increase the level of serum amylase such as
the size of perforation ,time delay before surgery and amount
of fluid spilled in the peritoneal cavity. The results revealed
a strong correlation between the factors and serum amylase
level so that the rise in serum amylase level is directly
proportional the size of perforation , time interval before
surgery and amount of peritoneal contamination and there is
an agreement with other study done by Buck, et al.21 in the
present study, we found that these factors are interrelated and
act as a precursors for high serum amylase, we study these
factors separately.It is also known that the size of perforation
is more likely associated with higher mortality and morbidity
due to increased peritoneal contamination 22. The present
study showed the strong correlation between the amount of
peritoneal contamination with high serum amylase level and
thereby with high mortality(table 3), so that more than 50% of
those with more than 1000 ml of spilled fluid into peritoneal
cavity have raised serum amylase and mortality was 39 %,
these findings was in agreement with other findings by other
authors23. In the current study , a strong correlation of the size
of ulcer with amount of amylase was noted so that the larger
size the perforation the higher amylase level and hence the
higher mortality, between the correlation , however in many
cases in which perforation size were 1.5-2 cm in diameter, the
serum amylase level were within normal limits, furthermore
there is no clear cut definition for size of ulcer perforation
even though the size less than 2.5cm carries good prognosis
by simple closure with omental patch 24. These findings were
in accordance with studies done in Italy and India by Syanes &
Gupta et al.24,25 Treatment delay in PPU is a well established
negative prognostic factor25. However, the evidence derives
from studies with a high risk of bias26, and no study has
assessed the association between hourly surgical delay and
adverse outcome25. In our current work we found a dramatic
rise in the mortality (26%) in those patients whom undergone
surgery after more than 24 hrs of perforation, these results
were identical to results obtained by other work26.

Conclusions:
Serum amylase is not a specific enzyme in PDU, it may increase
in many surgical diseases like pancreatitis , cholecystitis ,
in addition to PDU , but it may be considered a predictive
factor for mortality .In this study we concluded that serum
amylase is an essential factor that affect the outcome after
surgery for PDU; all the factors which favors the production
of increased serum amylase; the size of the perforation, the
amount of fluid accumulation in the abdominal cavity and the
duration of perforation those are also factors in increasing the
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mortality from perforated ulcer. A successful outcome could be obtained by prompt recognition of the diagnosis, aggressive resuscitation and early institution of surgical management.

Authors Contribution:

Ragad E. Naji : Biochemical investigation, statistical analysis and writing.
Yaser Abbas : Reference collection and writing.

References:

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