Spotlight on Esophageal Perforation –
A multinational study using the Pittsburgh Esophageal Perforation Severity Scoring System

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Objective

- Esophageal perforation is a devastating condition with high morbidity and mortality.

- The Pittsburgh group has suggested a perforation severity score (PSS) for better decision-making in the management of esophageal perforation.¹

- Aim of this study was to analyze the usefulness of the Pittsburgh PSS in an independent study population.

The Pittsburgh PSS

• The PSS is a clinical score based on clinical findings at the time of presentation.

• All variables are assigned points (range 1 to 3) for a possible total score of 18.
The Pittsburgh PSS

Points are given to each variable according to the following scale:

• 1 = age > 75 years, tachycardia (> 100 bpm), leukocytosis (> 10000 WBC/ml), pleural effusion (on chest x-ray, CT or barium swallow);

• 2 = fever (> 38.5 °C), noncontained leak (on barium swallow or CT), respiratory compromise (respiratory rate > 30, increasing oxygen requirement or need of mechanical ventilation), time to diagnosis > 24 hours;

• 3 = presence of cancer, hypotension
Material and Methods

• In a retrospective study cases of esophageal perforation were collected from eleven centers of esophageal surgery.

• The study-period was 1990-2014.

• The medical records of all cases of esophageal perforation were reviewed and the variables of the score were retrospectively analyzed for the time of initial presentation.

• The score was calculated and treatment as well as outcome was compared with the result of the score.
List of the participating Centres

- Städtisches Klinikum Dresden Friedrichstadt (Dresden, Germany),
- Klinikum Nuremberg (Nuremberg, Germany),
- Klinikum Neumarkt (Neumarkt i.d.OPf., Germany),
- Salzburger Landeskrankenhaus (Paracelsus Medical University, Salzburg, Austria),
- Royal Victoria Hospital (Belfast, Northern Ireland, UK),
- Hospital Universitario La Princesa (Madrid, Spain),
- Hospital São João (University of Porto, Portugal),
- The University of Hong Kong (Hong Kong),
- Hospital St. George (Medical University of Plovdiv, Bulgaria),
- St. Sophia University Hospital for Pulmonary Diseases (Medical University, Sofia, Bulgaria),
- University of Stara Zagora (Stara Zagora, Bulgaria).
Results: Numbers & Age

A total of 288 patients: 183 men (63.5%) and 105 females (36.5%).

The mean age was 59.94 years ± 18.00 years SD (range 5 years – 98 years).

Overall 62 patients were older than 75 years (21.5%).
Results: Etiology & Site

• Etiology:
  • Spontaneous 119 (41.3%)
  • Iatrogenic (instrumentation) 85 (29.5%)
  • Traumatic perforation 84 (29.2%).

• Site of perforation:
  • Cervical 45 (16%)
  • Thoracic 202 (71.6%)
  • Abdominal 35 (12.4%).
Results: Esophageal Pathology

- Pre-existing esophageal pathology was present in 90 patients (31.0%) whereas 198 had none (69.0%).

- The most common esophageal disorders were:
  - Esophageal cancer (43),
  - Esophageal stricture (23),
  - Hiatal hernia (6),
  - Esophageal diverticulum (5),
  - Achalasia (3), Esophageal varices (3) and Mallory Weiss Syndrome (3).
Results: Management

• Operative management (200, 69.4%):
  • Primary repair 83
  • Surgical drainage 38
  • Esophageal exclusion 28
  • Esophagectomy 26
  • Repair over drain 21

• Non-operative management (88, 30.6%):
  • Endoscopic stent insertion 31 (10.8%).
Results: Morbidity and Mortality

- Perforation related morbidity occurred in 180 patients (65.3%):
  - Sepsis 61
  - Pneumonia 56
  - Mediastinitis 44
  - Pleural empyema 37
  - Leak of the repair 18.

- The overall in-hospital morality rate was 19.8% (57/288).

- Mean length of stay was 40.68 days ± 43.95 days (range 1 – 374 days).
Results: Distribution of PSS

<table>
<thead>
<tr>
<th>Min.</th>
<th>1st Qu.</th>
<th>Median</th>
<th>Mean</th>
<th>3rd Qu.</th>
<th>Max.</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.000</td>
<td>3.000</td>
<td>5.000</td>
<td>5.822</td>
<td>9.000</td>
<td>17.000</td>
<td>4.01</td>
</tr>
</tbody>
</table>
## Results: PSS Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &gt; 75</td>
<td>62 (21.5%)</td>
<td>226 (78.5%)</td>
</tr>
<tr>
<td>Tachycardia</td>
<td>94 (32.6%)</td>
<td>194 (67.4%)</td>
</tr>
<tr>
<td>Leukocytosis</td>
<td>164 (56.9%)</td>
<td>124 (43.1%)</td>
</tr>
<tr>
<td>Pleural effusion</td>
<td>158 (54.9%)</td>
<td>130 (45.1%)</td>
</tr>
<tr>
<td>Fever &gt; 38.5° C</td>
<td>63 (21.9%)</td>
<td>225 (78.1%)</td>
</tr>
<tr>
<td>Non-contained leak</td>
<td>149 (51.7%)</td>
<td>139 (48.3%)</td>
</tr>
<tr>
<td>Respiratory compromise</td>
<td>103 (35.8%)</td>
<td>185 (64.2%)</td>
</tr>
<tr>
<td>Timing &gt; 24 h</td>
<td>107 (37.2%)</td>
<td>181 (62.8%)</td>
</tr>
<tr>
<td>Hypotension</td>
<td>55 (19.1%)</td>
<td>233 (80.9%)</td>
</tr>
<tr>
<td>Cancer</td>
<td>43 (14.9%)</td>
<td>245 (85.1%)</td>
</tr>
</tbody>
</table>
Results: Perforation Severity Score

• Patients with fatal outcome had a significantly higher mean PSS than survivors (9.79 ± 3.76 SD vs. 4.84 ± 3.43 SD; p<0.00001).

• Mean PSS was significantly higher in operatively managed cases compared to non-operative cases (6.44 ± 4.00 SD vs. 4.40 ± 3.66 SD; p=0.0001).
Results: PSS Groups

In accordance with the original publication we divided the study population into three groups:

<table>
<thead>
<tr>
<th></th>
<th>Group 1 (PSS ≤ 2)</th>
<th>Group 2 (PSS 3-5)</th>
<th>Group 3 (PSS &gt; 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>63</td>
<td>86</td>
<td>120</td>
</tr>
<tr>
<td>Morbidity</td>
<td>20 (31.7%)</td>
<td>49 (57%)</td>
<td>99 (82.5%)</td>
</tr>
<tr>
<td>Length of stay</td>
<td>22.89 days</td>
<td>42.99 days</td>
<td>49.57 days</td>
</tr>
<tr>
<td>Non-operative</td>
<td>32 (50.8%)</td>
<td>21 (24.4%)</td>
<td>28 (23.3%)</td>
</tr>
<tr>
<td>management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Esophagectomy</td>
<td>0 (0%)</td>
<td>9 (10.5%)</td>
<td>17 (14.2%)</td>
</tr>
<tr>
<td>Mortality</td>
<td>2 (3.2%)</td>
<td>6 (7%)</td>
<td>45 (37.5%)</td>
</tr>
</tbody>
</table>
Results: PSS Groups Mortality

• Mortality rate Group 2 (PSS 3 – 5) vs. Group 1 (PSS ≤ 2):
  OR: 2.27; 95% CI: 0.39-23.82; p=0.468.

• Mortality Group 3 (PSS > 5) vs. Group 1 (PSS ≤ 2):
  OR: 18.33; 95% CI: 4.47-162.07; p<0.0001.

• Mortality Group 3 (PSS > 5) vs. Group 2 (PSS 3 – 5):
  OR: 8.03; 95% CI: 3.17-24.41; p<0.0001.
Conclusions

• The PSS reliably measures the seriousness of oesophageal perforation.

• Morbidity, frequency of operative treatment, length of stay and mortality were strongly correlated with the score value.

• We demonstrated that PSS ≤ 2 (Group 1), PSS 3 -5 (Group 2) and PSS > 5 (Group 3) constitute low, medium and high PSS groups with different prognosis, treatment and outcome.
Conclusions

• Affiliation to Group 1 (low PSS) is associated with the best outcome and might be an indicator for possible non-operative treatment.

• Belonging to the medium PSS group is associated with a more favourable prognosis compared to Group 3. Aggressive management is likely to be required for a considerable portion of patients in this group.

• Affiliation to Group 3 (PSS > 5) was associated with the worst prognosis and the most substantial mortality. Early and aggressive treatment is mandatory to avoid fatal outcome.
Summary

• The Pittsburgh PSS reliably correlates with the seriousness of oesophageal perforation.

• The score is easy to use and helpful to assess the dimension of oesophageal injury.

• Division into groups of low, medium and high PSS is useful to identify appropriate candidates for non-operative management.

• Introduction of the score into the clinical routine might improve efficiency and facilitate faster decision making.
Thank you for your attention!

Dresden. Capital of Saxony.