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Prognostic factors for mortality in (fecal) peritonitis: back to the roots!

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We have just a few reliable data about prognosis in abdominal sepsis in general and fecal peritonitis in particular. This alone is a good reason why the study by Tridente et al. [1] published in this issue of *Intensive Care Medicine* is an important contribution to this topic. The authors present a large cohort of patients treated in different European health-care settings and the study provides some of the best available evidence we have for these critically ill patients. Tridente et al. conclude that in a large cohort of patients admitted to European ICUs with fecal peritonitis the 6-month mortality was 31.6 %. The most consistent predictors of mortality across all time points were increased age, development of acute renal dysfunction during the first week of admission, and hypothermia on day 1 of ICU admission.

International databases show that one in four cases of severe sepsis or septic shock are caused by intra-abdominal infections (IAI). It is the second most common focus of septic shock after pulmonary causes [2, 3]. Primary inadequate and inappropriate antibiotic regimens for nosocomial peritonitis have a substantially worse

prognostic outcome for patients with IAI and cause substantial increase in health-care costs [4, 5].

The difficulties with abdominal sepsis are complicated by uncertainty about surgical source control. Source control is an important component in the treatment of IAI. Lack of adequate source control has been demonstrated to be responsible for treatment failure and may also contribute to the risk of death and the need for re-intervention [6, 7].

The Mannheim Peritonitis Index (MPI) as a prognostic scoring system in IAI was introduced in 1987 [8]. It was developed after a discriminative analysis of 17 possible risk factors and is based on eight weighted criteria. The three highest weighted criteria are age >50 years (five points), organ failure (creatinine level >177 mmol/l, urea level >167 mmol/l, oliguria <20 ml/h, seven points), and fecal exudate (12 points). The study by Tridente et al. is about the aforementioned risk factors.

The most striking prognostic risk factor in (fecal) peritonitis is increased age. It has been shown in many collectives (including the study by Tridente et al.) to be an independent prognostic factor in abdominal sepsis [9–11]. In 1995, McLauchlan et al. [12] stated in their manuscript about outcome of patients with abdominal sepsis treated in an ICU: “It may appear difficult to justify admitting a patient with abdominal sepsis over 70 years of age and with an APACHE II score over 26 to the ICU...”. Times have changed! The mean age in the study by Tridente et al. was 69.2 years and 62.4 % of the patients were aged over 65. The data reflect our environment of an aging society. The according hospital (28.7 %) and 6-month (31.6 %) mortality rates are not low, but by far no reason for a fatalistic approach to patients over 70 years. It just means that we have to double our efforts in patients with increased age.

The study by Tridente et al. has several limitations. First of all, we did not receive information about successful and unsuccessful surgical source control. Even

Table 1 Frequently isolated pathogens and density of bacteria in peritonitis following perforation of different organ sites of the gastrointestinal tract

Affected organ	Frequently isolated bacteria	Density of bacteria	Frequency of isolation (%)
Esophagus and stomach	Lactobacilli, <i>Streptococcus</i> spp.	Very low (10^3 – 10^5 /g)	<10
Duodenum and jejunum	<i>Streptococcus</i> spp., Enterobacteriaceae, <i>Bacteroides</i> spp.	Low (10^5 – 10^7 /g)	10–25
Ileum	<i>Escherichia coli</i> , <i>Bacteroides</i> spp., <i>Enterococcus faecalis</i> , <i>Klebsiella</i> spp.	Medium (10^7 – 10^9 /g)	25–75
Colon and rectum (fecal peritonitis)	<i>Bacteroides</i> spp., Enterobacteriaceae, <i>E. faecalis</i> , Eubacteria	High ($>10^{10}$ /g)	75–100

intensivists and infectious disease specialists will admit that appropriate intensive care and antibiotic treatment are useless in fecal peritonitis without surgical intervention. Second, the authors did not discriminate between community-acquired and nosocomial peritonitis. Delayed diagnosis and treatment (including psychological barriers of some surgeons who cannot believe that their anastomosis can have a leakage) and a shift towards resistant bacteria and fungi which are mainly not covered by initial antimicrobial regimen lead in some collectives to increased mortality of postoperative peritonitis in comparison to community-acquired [12, 13]. Furthermore, the authors did not find a specific antibiotic therapy that was statistically significant associated with mortality in their collective. Unfortunately information about the isolated bacteria was not provided. Without these important data, it is impossible to assess appropriately the results of the multivariate analysis regarding the different antimicrobial regimen. Fecal peritonitis is usually a polymicrobial infection with a high bacterial load due to the high density of *Bacteroides* spp., Enterobacteriaceae, and enterococci (Table 1). Antibiotic stewardship starts with adequate sampling of material for microbiological investigation. Current guidelines recommend administration of broad-spectrum antimicrobials within 1 h of the diagnosis of severe sepsis or septic shock [7]. This recommendation is based on the evidence that delaying antimicrobial therapy in patients with sepsis-related hypotension is associated with increased mortality [14]. Aiming to show a therapeutic equivalence, even the results of a Cochrane

analysis were not able to prove superiority of any one particular antibiotic or treatment scheme [15]. The value of an antibiotic treatment is evident, but the impact of surgical source control is much too high to answer the question as to whether a specific antibiotic regimen is superior.

Some more caution is in order. A possible bias might arise from the fact that the majority of patients (60 %) were recruited from only two countries (UK and Germany). There are substantial differences regarding socioeconomic conditions, health-care systems, and prevalence of resistant bacteria between those two countries and many other eastern and southern European countries.

The results from the study by Tridente et al. are valuable in order to assess the prognosis of patients with fecal peritonitis early. Looking at the criteria of the MPI, it looks like we have gone back to the roots again. The more or less unchanged high mortality rate is another indicator for this disappointing truth. What we need more than ever are solid instruments to discriminate those patients who need additional surgical (i.e., relaparotomy, CT-controlled drainage) or antimicrobial measures (i.e., antimicrobial treatment involving resistant bacteria or fungi) from those who do not. This will hopefully improve survival in fecal peritonitis.

Conflicts of interest Christian Eckmann and Matteo Bassetti declare that they have no competing interests.

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