Int Surg 2012;**97:**129–134

Postoperative Course After Emergency Colorectal Surgery for Secondary Peritonitis in the Elderly Is Often Complicated by Delirium

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Postoperative delirium, morbidity, and mortality in our elderly patients with secondary perionitis of colorectal origin is described. This is a chart-based retrospective analysis of 63 patients who were operated on at the University Hospital Basel from April 2001 to May 2004. Postoperative delirium occurred in 33%. Overall morbidity was 71.4%. Surgery-related morbidity was 43.4%. Mortality was 14.4%. There was no statistical significance between delirium, morbidity and mortality ($P = 0.279$ and $P = 0.364$). There was no statistically significant correlation between the analyzed scores (American Society of Anesthesiologists classification, Mannheimer Peritonitis Index, Acute Physiology and Chronic Health Evaluation score II, physiological and operative surgical severity and enumeration of morbidity and mortality score' or short 'cr-POSSUM') and postoperative delirium, morbidity or mortality. Postoperative delirium occurred in one-third of the patients, who seem to have a trend to higher morbidity. Even if the different scores already had proven to be predictive in terms of morbidity and mortality, they do not help the risk stratification of postoperative delirium, morbidity, or mortality in our collective population.

Key words: Postoperative delirium – Secondary peritonitis – Emergency colorectal surgery – Morbidity – Mortality

The expanding life expectancy has led to an increase of emergency surgical procedures in patients older than 70 years of age. The prevalence of emergency visceral surgical procedures in patients more than 85 years accounts for up to 25% of all visceral surgical interventions carried out in these

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patients, and thus is twice as high as the overall prevalence.[1] The morbidity and mortality of emergency visceral surgery performed on elderly patients outranges the morbidity and mortality encountered in elective surgery and is as high as 48% and 25%, respectively.[2,3] This situation bears several specific medical, but also social and ethical, problems. As the management of surgical and systemic postoperative complications in these patients is a challenge, the postoperative course may further be complicated by delirium.[4–7] Specific research has been performed to describe and understand the risk factors that favor the development of a postoperative delirium. Known risk factors include poor preoperative functional status, cognitive impairment, depression, alcoholism, vascular disease, comorbidity, and older age.[4,8–16] Delirium is associated with a poorer postoperative outcome and it prolongs the hospital stay. Furthermore long-term cognitive function of the patients who suffered from postoperative delirium can be impaired with a poor functional status.[4,17,18] Often surgeons lack reliable instruments to evaluate risk factors for the development of postoperative delirium in an emergency setting. It is not known whether preoperative evaluable physiologic scores correlate with the development of postoperative delirium. To our knowledge the frequency of postoperative delirium and the associated morbidity and mortality in emergency abdominal surgery for secondary peritonitis in the elderly has not been reported yet. Furthermore in the literature there is an ongoing debate on the benefit and cost effectiveness of trained intervention groups who strive for early diagnosis and treatment of the postoperative delirium.[19–22] The aim of this study was to retrospectively review charts of patients more than 70 years of age with a secondary peritonitis of colorectal origin who underwent emergency surgery and describe the frequency of the development of a postoperative delirium and the associated morbidity and mortality. Furthermore we tried to assess perioperative physiologic parameters and scores that may correlate with postoperative delirium and its consequences.

Patients and Methods

For this retrospective analysis we selected patients 70 years of age and older, who had been operated from April 2001 to May 2004 for secondary peritonitis of colorectal origin. All patients were operated in an emergency setting at the University Hospital Basel. We analyzed 65 charts. By chart review, pertinent data on patient characteristics, parameters for the calculation of scores, and information on the postoperative course were recorded and stored in an electronic data sheet (Excel for Macintosh X, Microsoft Corporation, Redmond, Washington). Two patients were excluded because of incomplete data, leaving 63 patients for analysis.

Scores

Physical status was assessed according to the American Society of Anesthesiologists classification (ASA). The Mannheimer Peritonitis Index (MPI) is calculated at the time of the index operation (the first laparotomy performed for the secondary peritonitis) based on patient's characteristics (age and sex), organ function, risk factors (malignancy), and intraoperative findings (origin of peritonitis, nature and spread of the exudate). It may range from 0 to 47 points; a higher numerical score is correlated with increased mortality.[23] The Acute Physiology and Chronic Health Evaluation score II (APACHE II) score is calculated 24 hours after the index operation based on 12 different physiologic parameters, age, organ function, and immunocompetence. It may range from 0 to 71 points; an increasing score is correlated with a higher subsequent risk of in-hospital death.[24] The colorectal Physiologic and Operative Surgical Severity and enumeration of Morbidity and Mortality score (cr-POSSUM) is determined at the time of the index operation based on age and five different physiologic parameters (physiologic score), and four parameters describing severity, type, and urgency of the operation performed (operative severity score). It ranges from 10 to 44 points; higher scores again being correlated with higher in-hospital mortality.[25]

Delirium assessment

Outcome assessment focused on the development of a postoperative delirium and postoperative morbidity and mortality. For delirium assessment, we used the chart documentation method based on the work of Inouye *et al*.[21] Chart documentation of nurse staff, ward doctors, and consultants documenting acute or fluctuating onset of disorders of attention, orientation, behavior, or consciousness were used to diagnose postoperative delirium. Because of the retrospective setting, no criteria as such the DSM-IV[26] or the Confusion Assessment Method could be applied.[27,28] The use of neuroleptic drugs or benzodiazepines in the postoperative setting of patients who had not depended on them before, was used as a criterion for a delirium.

Table 1 Patient characteristics, etiology, and anatomic localization of the origin of the secondary peritonitis

	n	%	Median	Range
Total	63	100.0		
Gender				
Male	26	41.3		
Female	37	58.7		
Etiology of secondary peritonitis				
Perforated diverticulitis	36	57.2		
Perforation due to ischemia	8	12.7		
Anastomotic leakage	6	9.5		
Iatrogenic	2	3.2		
Malignancy	3	4.8		
Other	8	12.6		
Origin of peritonitis				
Colon	55	87.3		
Rectum	2	3.2		
Anastomosis	6	9.5		
In-hospital mortality	11	14.4		
Overall morbidity	45	71.4		
Surgery-related morbidity	26	41.3		
Age (y)			80	70.6–93.4
Length of stay (d)			23	2–90
Scores				
ASA			3	2–4
MPI			21	5–36
APACHE II			14	6–32
cr-POSSUM			23	17–29

Overall morbidity, surgery-related morbidity, and mortality are also indicated, as well as the calculated scores. See text for score abbreviations.

Statistics

The SSPS software package for Windows (SSPS, Chicago, Illinois) was used for statistical analysis. The association of postoperative delirium with various postoperative parameters has been evaluated using the Fisher's exact test for categorical variables. Significance of correlations between numerical variables has been calculated using the 2-tailed t-test. A P value of < 0.05 was considered statistically significant. All P values are 2-sided.

Results

Sixty-three patients have been operated on in an emergency setting for secondary peritonitis of colorectal origin in the given time frame. The patient's characteristics, the anatomic site of the origin of the peritonitis, and the different etiologies are listed in Table 1. Table 1 further shows the overall morbidity of the whole collective of 71.4%. The specific surgery-related morbidity was 43.4%.

Table 2 Comparison of sex, age, and physiologic scores in patients with and without postoperative delirium

Variable	Delirium = yes	Delirium = no	P value
No. of patients	21 (33.3%)	42 (66.7%)	
Sex (M:F)	(1:3)	(1:1.5)	
Age (y)	82 (71–93)	80 (71–93)	0.705
ASA score >3	10/21 (47.6%)	12/42 (28.6%)	0.120
ASA score	3 (2–4)	3 (2–4)	
APACHE score	16.4 (6–32)	15.6 (6–32)	0.659
MPI	21.5 (5–36)	19.8 (10–32)	0.415
cr-POSSUM	24 (19–29)	22.6 (17–29)	0.069
Overall morbidity	17/21 (81%)	28/42 (66.6%)	0.375
Surgery-related morbidity	11/21 (52.9%)	15/42 (35.7%)	0.279
30-day mortality	4/21 (19%)	7/42 (16.6%)	0.364

Overall morbidity, surgery-related morbidity, and mortality are compared between the two groups. Age and the physiologic scores are indicated as median with range. $P < 0.05$ is considered statistically significant. See text for score abbreviations.

The in-hospital mortality of the patients was 14.4%. In addition, the calculated scores are listed in Table 1.

Table 2 shows perioperative data of the patients with a special focus on the development of postoperative delirium. One third of all patients (n = 21, 33.3%) suffered from postoperative delirium. In the patients who developed a postoperative delirium, surgery-related morbidity and overall morbidity was higher than in the group with no delirium (52.9% versus 35.7% and 80.95% versus 66.6%, respectively). These results fail to show statistical significance ($P = 0.279$ and $P = 0.375$). Mortality was 19% in patients who developed postoperative delirium, whereas it was 16.6% in patients without delirium ($P = 0.364$). Further statistical analysis could not show any significant correlation of the postoperative delirium and a high cr-POSSUM ($P = 0.069$), MPI ($P = 0.415$), APACHE II ($P = 0.659$), or ASA value >3 ($P = 0.120$).

Discussion

This study to describes postoperative delirium, morbidity, and mortality in the highly selective collective of patients 70 years of age and older, being operated on in an emergency setting because of secondary peritonitis of colorectal origin. The main finding of this study is that delirium occurred in a high percentage, namely in one third of our patients (33.3%). Furthermore, our data show higher postoperative morbidity in patients who develop a postoperative delirium compared with patients without delirium (81% versus 66.6%, $P = 0.375$).

However, these findings do not show statistical significance. Patients who develop postoperative delirium do not have a higher mortality. None of the measured preoperative and intraoperative scores (ASA, MPI, APACHE II, and cr-POSSUM) showed any statistically significant correlation with the occurrence of postoperative delirium. In reverse, these scores cannot be used as indicators for a risk constellation, based on our data.

Two recently published comparable studies showed similar frequency of postoperative delirium. In the study by Koebrugge *et al*,[29] the incidence of postoperative delirium after abdominal surgery was 24%. Brouquet *et al*[30] showed the same incidence of 24% of postoperative delirium in their study of elderly patients more than 75 years undergoing elective major abdominal surgery. In our study, poor preoperative mental state was not an exclusion criteria. This could, in part, explain the higher incidence of postoperative delirium in our study.

The postoperative mortality of 14.4% is comparable with data from literature. Issa *et al*[31] in their study on emergency surgery for complicated diverticulitis report a mortality of 13.5% including patients of all ages. Arenal and Bengoechea-Beeby[2] report a mortality of 22% in their work on emergency abdominal surgery in the elderly. Their work takes in account all kind of abdominal emergencies. Thus secondary peritonitis of colorectal origin has a considerable mortality. In our work the median APACHE II score is 14. This goes along with an expected in-hospital mortality of 18.6% (www.sfar/scores2/apache22.html). The expected in-hospital mortality calculated from a median cr-POSSUM score of 23 is around 15% (http://www.riskprediction.org.uk/cr-possum.php). This is close to our mortality rate of 14.4%. As mortality is considerable in these patients and delirium further seems to complicate the postoperative course,[4,17,18] surgeons in clinical practice strive to dispose of reliable and objective instruments to classify a patient's risk for the development of postoperative delirium. In emergency situations, detailed medical and social histories of the patients are often hard to investigate and therefore functional assessment, like the Charlson index, is difficult to obtain. Unfortunately in our work, neither the ASA score nor the MPI, APACHE II, and the cr-POSSUM scores showed a statistically significant correlation with the development of a postoperative delirium. The ASA score has been shown to do so in other studies.[26] Therefore, we suspect the small number of our very selective collective of patients to be the reason for the absence of significant results in our study.

This study represents the status of a period where no specialized intervention group for the treatment of the delirium had been active. There is evidence that specific interventions, such as geriatric consultations with an emphasis on the treatment of the postoperative delirium, may improve clinical outcome.[21,22,32,33] The effectiveness of such dedicated intervention groups still has to be proven. Because we lack a reliable instrument to assess a patient's risk for the development of postoperative delirium in emergency situations, we should focus on clinical diagnosis and treatment of delirium, especially in patients at risk.

We acknowledge the limitations of our study. Our work is a retrospective study. Scores can reliably be calculated retrospectively if all the pertinent information is available. If information on some parameter was missing, we assumed this parameter to be within normal range. Any overscoring was avoided in this way. The choice of the calculated scores was made to focus on physical status classification (ASA), physiologic parameters (APACHE II), peritonitis assessment (MPI), and general colorectal surgery (cr-POSSUM). The calibration process for adaption of the cr-POSSUM score has not been performed for our country. We suppose that the bias from this effect to be minor. As a validated chart documentation, we used the method of Inouye *et al*.[21] As described by these investigators this method is not as exact as the prospective clinical assessment using the Confusion Assessment Method, but offers an acceptable accuracy for a retrospective analysis. It was difficult to assess delirium in intubated and ventilated patients in a retrospective setting as specific documentation often was missing in the charts. We had too little information in the charts to analyze precisely the duration and severity of the delirium.

There is evidence that specific interventions such as geriatric consultations and specific treatment may improve clinical outcome.[21,22,32,33] As a consequence it should be a goal to optimize the treatment of the postoperative delirium. The question whether morbidity and mortality in these patients can be reduced by intervention groups still has to be proven. Further studies on a prospective base will have to answer this interesting question in patients with secondary peritonitis of colorectal origin.

The goal of this study was to assess the occurrence of postoperative delirium and the asso-

ciated morbidity and mortality in this highly selected group of patients aged 70 years and more with secondary peritonitis of colorectal origin. Our results show a high percentage of postoperative delirium with higher morbidity and mortality in patients who suffer postoperative delirium. None of the assessed scores (ASA, APACHE, MPI, or cr-POSSUM) showed a statistically significant correlation to the development of postoperative delirium. Further studies will have to answer the question whether specific interventions may improve the outcome in patients who develop postoperative delirium in the context of a secondary peritonitis of colorectal origin.

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