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Mortality after emergency Hartmann's procedure in octogenarians: a propensity score—matched analysis



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ABSTRACT

Background: Complicated diverticulitis is associated with a postoperative mortality rate of 20%. We hypothesized that age ≥ 80 was an independent risk factor for mortality after Hartmann's procedure for diverticular disease when controlling for baseline comorbidities.

Methods: Patients who underwent an urgent or emergent Hartmann's procedure (Current Procedural Terminology codes 44143 and 44206) for diverticular disease (International Classification of Diseases-9:562.xx) were identified using the American College of Surgeons National Surgical Quality Improvement Project 2005-2013 user file. Using propensity score matching to control for baseline comorbidities, a group of patients ≥ 80 years old was matched to a group of those < 80 years old. Univariate and multivariable logistic regression were performed. A *P* value < 0.05 was considered statistically significant with a confidence interval (CI) of 95%.

Results: From a total of 2986 patients, 464 patients (15.5%) were ≥ 80 years old. Two groups of 284 patients in each study arm were matched using propensity-matching. The mean age of the ≥ 80 group and < 80 group was 84.4 ± 3.3 versus 63.77 ± 9.11 ; $P < 0.0001$, respectively. There was no statistical difference in baseline comorbidities or operative time between the groups. There was a significant difference in mortality with 19% and 9.2% in the > 80 group versus < 80 groups, respectively ($P = 0.001$). Factors associated with mortality included ascites (odds ratio [OR] 4.95, confidence interval [CI] 1.64-14.93, $P = 0.005$), previous cardiac surgery (OR 3.68, CI 1.46-9.26, $P = 0.006$), partially dependent or fully dependent functional status (OR 2.51, CI 1.12-5.56, $P = 0.02$), albumin < 3 (OR 2.49, CI 1.18-5.29, $P = 0.01$), and American Society of Anesthesiologist class > 3 (OR 2.10, CI 1.10-4.46, $P = 0.05$).

Conclusions: Octogenarians presenting with complicated diverticulitis requiring an emergent Hartmann's procedure have a higher mortality rate compared to those < 80 , even after controlling for baseline comorbidities.

Study type: This is a retrospective, descriptive study.

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Introduction

Diverticulosis affects 60% of Americans more than 80 years old, with a 20% progression to acute diverticulitis and a potential for a subsequent colectomy with or without a colostomy.¹⁻⁴ Emergent surgical intervention for diverticular disease is associated with a very high postoperative morbidity and mortality, with reported morbidity rates of 60% and 20% for emergent and elective cases, respectively.^{5,6}

As the proportion of older individuals in North America continues to rise, the need for operative intervention for acute diverticulitis in this cohort is also increasing.⁷ Historically, feculent peritonitis has been associated with up to 30% mortality, and advanced age has been shown to be an independent risk factor for death after emergency surgery for diverticulitis. Older patients are also more likely to develop postoperative complications such as septic shock, prolonged postoperative mechanical ventilation, and acute renal failure.⁷ Previous studies have identified risk factors for developing postoperative complications in the emergent setting and have functioned as an adjunct to counsel patients on the consideration of elective surgery.^{5,6} The aim of this study was to identify whether age acts as an independent risk factor for mortality after emergent Hartmann's procedure for diverticular disease when controlling for baseline comorbidities.

Patients and methods

The American College of Surgeons National Surgical Quality Improvement Project (ACS-NSQIP) participant user file from the years 2005 to 2013 was queried to identify all patients aged 80 years or older who underwent emergent open or laparoscopic Hartmann's procedure (Current Procedural Terminology: 44143 and 44206) for diverticular disease (International Classification of Diseases-9:562.xx). Patients who had undergone a prior operation within 30 d of the index procedure were excluded from the analysis. Nearest neighbor propensity score matching was used to control for baseline comorbidities. Two groups of patients were created, a group of patients ≥ 80 years old and a group of patients < 80 years old. Patient demographics, baseline comorbidities and clinical characteristics were included in the analysis⁸ (Table 1). Additional, procedure-specific variables including transfusion requirement, operative time and total length of stay were assessed.

The primary outcome was overall 30-day postoperative mortality. Secondary outcomes included overall morbidity rate, specific complications rates, need for reoperation within 30 d of the index operation, and postoperative length of stay.⁸ Preoperative and intraoperative characteristics of patients in the ≥ 80 years old versus < 80 years old were compared using Pearson's chi-square tests for categorical variables and Students' t-test for continuous variables. A P value < 0.05 was considered statistically significant with a confidence interval (C.I.) of 95%.

A subgroup analysis including only those patients who expired was performed to determine predictors of postoperative mortality in patients undergoing emergency operation for diverticulitis. For this analysis, a forward stepwise multivariate logistic regression model was created using a 30-day postoperative mortality as the dependent variable and an

entry threshold of $P < 0.05$ for entry of potential predictor variables into the model. Potential predictor variables for this model included the preoperative and intraoperative patient- and procedure-related variables (with albumin level classified into low [< 3] g/dL or normal) as well as specific postoperative complications. All statistical analyses were performed using SPSS 16.0 software. Institutional review board approval was exempt given institutional policies regarding the NSQIP database.

Results

We identified a total of 2986 patients who underwent an urgent/emergent operation for diverticulitis during 2005-2013. The cohort of octogenarian patients accounted for 464 patients (15.54%); these patients were found to have a specific 30-day postoperative mortality rate of 19.6%. Subsequently, two groups of 284 patients, aged ≥ 80 years old and aged < 80 years old were matched. This was validated as the mean age of the ≥ 80 years old group and < 80 years old group was 84.4 ± 3.3 versus 63.7 ± 11.8 years; $P < 0.0001$, respectively.

The pre- and intraoperative characteristics of patients in each group are shown in Table 1. On univariate analysis, there was no statistical difference in baseline comorbidities between the groups including diabetes mellitus, congestive heart failure, body mass index, chronic obstructive pulmonary disease, myocardial infarction (MI), hypertension, angina, peripheral vascular disease, ascites, renal disease or operative time. This shows that the matching was done accurately.

There was a significant difference in mortality between the ≥ 80 years old and < 80 years old groups with a rate of 19% and 9.2%, respectively ($P = 0.001$). Univariate analysis of postoperative outcomes, revealed that the most common postoperative complication was respiratory failure, occurring in 21.9% versus 19% in the ≥ 80 years old and < 80 years old groups, ($P = 0.53$). There was no difference observed in the rate of pneumonia, septic shock, pulmonary embolism, MI, stroke, or transfusion requirement. There was a higher rate of unplanned return to the operating room in the younger group with 14.1% versus 7.4% in the < 80 years old and > 80 years old groups, respectively ($P = 0.01$) (Table 2).

Multivariate logistic regression was used to assess the potential independent preoperative/intraoperative variables and specific postoperative complications, as predictors of mortality (Table 3). Analysis of preoperative/intraoperative factors revealed a higher risk for mortality associated with the presence of ascites (odds ratio [OR] 4.95, confidence interval [CI] 1.64-14.93, $P = 0.005$), previous cardiac surgery (OR 3.68, CI 1.46-9.26, $P = 0.006$), partially dependent or fully dependent functional status (OR 2.51, CI 1.12-5.56, $P = 0.02$), albumin < 3 (OR 2.49, CI 1.18-5.29, $P = 0.01$), and American Society of Anesthesiologist class > 3 (OR 2.10, CI 1.10-4.46, $P = 0.05$).

A focused univariate analysis on postoperative complications in the patients that expired revealed that the development of septic shock (7.2% versus 36.2%, $P = 0.001$ in the alive and expired groups, respectively), pneumonia (8.6% versus 17%, $P = 0.01$), reintubation (6.1% versus 26.2%, $P = 0.001$), respiratory failure (15.2% versus 50%, $P = 0.001$), dialysis

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