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Current perioperative outcomes for patients with disseminated cancer

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ABSTRACT

Background: Surgical morbidity and mortality (M&M) for patients with disseminated malignancy (DMa) is high, and some have questioned the role of surgery. Therefore, we sought to characterize temporal trends in M&M among DMa patients, hypothesizing that surgical intervention would remain prevalent.

Methods: We queried the American College of Surgeons National Surgical Quality Improvement Program from 2006–2010. Excluding patients undergoing a primary hepatic operation, we identified 21,755 patients with DMa. Parametric and/or nonparametric statistics and logistic regression were used to evaluate temporal trends and predictors of M&M.

Results: The prevalence of surgical intervention for DMa declined slightly over the time period, from 1.9%–1.6% of all procedures ($P < 0.01$). Among DMa patients, the most frequent operations performed were bowel resection, other gastrointestinal procedures, and multivisceral resections, these all showed small statistically significant decreases over time ($P < 0.01$). The rate of emergency operations also decreased ($P < 0.01$). In contrast, the rate of preoperative independent functional status rose, whereas the rate of preoperative weight loss and sepsis decreased ($P < 0.01$). Rates of 30-d morbidity (33.7 *versus* 26.6%), serious morbidity (19.8 *versus* 14.2%), and mortality (10.4 *versus* 9.3%) all decreased over the study period ($P < 0.05$). Multivariate analysis identified standard predictors (e.g., impaired functional status, preoperative weight loss, preoperative sepsis, and hypoalbuminemia) of worse 30-d M&M.

Conclusions: Thirty-day morbidity, serious morbidity, and mortality have decreased incrementally for patients with DMa undergoing surgical intervention, but surgical intervention remains prevalent. These data further highlight the importance of careful patient selection and goal-directed therapy in patients with incurable malignancy.

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1. Introduction

Patients with disseminated malignancy (DMa) commonly present with complex surgical needs, whether for symptom palliation or to treat an acute condition such as bowel obstruction [1–3]. However, providing surgical intervention to patients with incurable cancer is not without risk. Surgical intervention, even for purposes of symptomatic palliation and improving the patient's quality of life, comes with substantial morbidity and mortality (M&M). Multiple studies have shown rates of postoperative M&M to be approximately 28–44% and 9–11%, respectively [2,4–6].

Although recent studies have highlighted the importance of estimating the risk of M&M and defining goals of care before surgical intervention in patients with DMa [4,7], few studies have addressed whether this heightened attention on this unique patient population has impacted the frequency and outcomes of surgical operations among patients with DMa. The purpose of this study, therefore, was to evaluate temporal trends among patients with DMa undergoing surgical intervention with respect to frequency of operations performed and nature of the operations performed. We also sought to evaluate the predictors of M&M among this patient population to determine other time-dependent changes. We hypothesized that despite greater awareness of the role of nonoperative palliative care for patients with terminal disease [8,9], surgical intervention would remain prevalent over time and that M&M would remain high for this patient population.

2. Methods

We queried the American College of Surgeons (ACS) National Surgical Quality Improvement Program (NSQIP) from 2006–2010 to identify all patients with DMa undergoing surgical intervention ($n = 25,172$ before exclusion). ACS NSQIP defines DMa as "patients who have cancer that (1) Has spread to one site or more sites in addition to the primary site and (2) in whom the presence of multiple metastases indicates the cancer is widespread, fulminant, or near terminal" (ACS, [10]). For statistical analysis of patient characteristics, morbidity, and mortality, we chose to exclude patients undergoing a primary hepatic operation ($n = 3417$), as research has shown that this can be a potentially curative operation, and our goal was to identify patients with incurable cancer [11–14]. Our final cohort was 21,755 patients.

We abstracted data on 5 demographic, 10 preoperative, 3 intraoperative, and 22 postoperative variables. Using NSQIP definitions [15], preoperative functional status was defined as impaired if the patient required some or total assistance from another person for activities of daily living, such as bathing, feeding, dressing, toileting, or mobility. Preoperative sepsis was defined as a positive culture from suspected infection with two or more of the following: fever, tachycardia, tachypnea, leukocytosis, leukopenia, or anion gap acidosis. Preoperative weight loss was defied as a greater than 10% decrease in body weight 6 mo before surgery excluding patients who have intentionally lost weight. An operation was deemed as emergent if the operation was performed no later than 12 h after onset symptoms or admission and the surgery was reported as emergent by the surgeon and anesthesiologist.

Current procedural terminology (CPT) codes were used to classify procedures as orthopedic, skin and soft tissue, thyroid and/or parathyroid, hepatic, gastric, biopsy and/or lymph node excision, bowel resection, cholecystectomy and/or appendectomy and/or lysis of adhesions, vascular, other abdominal procedures, which included various gastrointestinal procedures, and other. Multivisceral resections were identified based on the classification of the primary procedure CPT codes in combination with additional procedure CPT codes.

Postoperative morbidity was defined as a diagnosis of one or more of the following events within 30 d of the principal operation: superficial or deep wound infection, organ space infection, wound dehiscence, pneumonia, reintubation due to onset of respiratory or cardiac failure or requiring prolonged intubation, which was defined as intubated for >48 h postoperatively, pulmonary embolism, progressive renal insufficiency, which was defined as creatinine rise of >2 mg/dL from preoperative value, acute renal failure, which was defined as renal dysfunction requiring dialysis postoperatively, urinary tract infection, stroke, coma for >24 h, peripheral nerve injury, cardiac arrest, myocardial infarction, graft and/or prosthesis and/or flap failure complications, deep vein thrombosis, reoperation, sepsis, and septic shock. Septic shock was defined as meeting the criteria of sepsis, as noted previously, with documented organ and/or circulatory dysfunction. We defined postoperative serious morbidity as pulmonary embolism, respiratory or cardiac failure requiring reintubation, prolonged intubation, acute renal failure requiring dialysis, reoperation, stroke, coma, cardiac arrest, or systemic shock within 30 d after the principal operation [4].

Pearson chi-squared analysis was performed to evaluate differences over time with respect to the number of operations performed, type of operations performed, patient functional status, Do Not Resuscitate (DNR) status, weight loss before surgery, and preoperative sepsis. One-way analysis of variance was used to evaluate differences over time with regard to age, body mass index (BMI), preoperative creatinine, albumin, hematocrit, and white blood cell (WBC) count. Multiple comparisons were performed using the Tukey procedure.

Logistic regression analysis was performed to identify independent predictors of 30-d M&M. Gender, age, BMI, functional status, DNR status, preoperative weight loss, sepsis, creatinine, albumin, WBC count, hematocrit, emergency operations, and multivisceral resections were selected as potential predictors for analysis based on prior research [4]. Missing data were most common for BMI (2.3%), preoperative creatinine (5.1%), albumin (21.2%), WBC count (3.8%), and hematocrit (3.8%). All other variables had less than 1% missing data consistent with prior research demonstrating the reliability and completeness of NSQIP data [15]. As missing data could not be assumed to be missing at random [16], multiple imputation, using SPSS software (SPSS Statistics version 22), was used to provide values to the missing predictor variables. Significance was set at $P < 0.05$. Because all patient information was deidentified, this study was exempt from the University of California Davis Institutional Review Board approval.