The American Journal of Surgery (2015) 210, 483-491

The American Journal of Surgery®

Clinical Science

A nationwide analysis of the use and outcomes of perioperative epidural analgesia in patients undergoing hepatic and pancreatic surgery

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KEYWORDS:
Epidural analgesia;
Liver resection;
Pancreatic resection;
Outcome

Abstract

BACKGROUND: We sought to define trends in the use of epidural analgesia (EA) for hepatopancreatic procedures, as well as to characterize inpatient outcomes relative to the use of EA.

METHODS: The Nationwide Inpatient Sample database was queried to identify all elective hepatopancreatic surgeries between 2000 and 2012. In-hospital outcomes were compared among patients receiving EA vs conventional analgesia using propensity matching.

RESULTS: EA utilization was 7.4% (n = 3,961). The use of EA among minimally invasive procedures increased from 3.8% in 2000 to 9.1% in 2012. The odds of sepsis (odds ratio [OR] .72, 95% confidence interval [CI] .56 to .93), respiratory failure (OR .79, 95% CI .69 to .91), and postoperative pneumonia (OR .77, 95% CI .61 to .98), as well as overall in-hospital mortality (OR .72, 95% CI .56 to .93) were lower in the EA cohort (all $P < .05$). In contrast, no association was noted between EA and postoperative hemorrhage (OR .81, 95% CI .65 to 1.01, $P = .06$).

CONCLUSIONS: EA use among patients undergoing hepatopancreatic procedures remains low. After controlling for confounding factors, EA remained associated with a reduction in specific pulmonary-related complications, as well as in-hospital mortality.

Epidural analgesia (EA) has been used to manage peri- and postoperative pain among patients undergoing major abdominal surgery over the last several decades.[1,2] More recently, there has been increasing interest in locoregional analgesia as EA has become an important component of enhanced recovery after major surgery (ERAS) programs.[3] EA has been proposed as a mechanism to help improve the perioperative surgical and anesthetic management of patients

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The authors declare no conflicts of interest.

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Manuscript received January 18, 2015; revised manuscript April 13, 2015

0002-9610/$ - see front matter © 2015 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.amjsurg.2015.04.009

undergoing surgical procedures in general. Several studies have suggested that EA may not only improve pain control after surgery,[4,5] but is also associated with better surgical outcomes compared with conventional analgesia.[6–8] Improved outcomes with EA may be related to the ability of locoregional anesthesia to suppress physiologic surgical stress through blockade of nociceptive afferent nerve signaling while preserving motor function.[9,10] Furthermore, less narcotic use with EA may also be associated with better bowel function, preservation of pulmonary function, and earlier ambulation after surgery.[1,11]

Compared with other general surgical procedures, hepatic and pancreatic surgery has historically been associated with poor pain control and more prolonged hospital stays.[12,13] The use of EA may therefore be particularly relevant among this patient population. Witzigmann et al[14] reported that patients who had better pain relief following hepatopancreatic surgery had less psychological distress, fewer surgical complications, and faster mobilization. In a small randomized clinical trial, Basu et al[15] demonstrated the efficacy of EA among patients undergoing liver resection.

EA, however, has not been universally adopted for patients undergoing hepatopancreatic surgery. While some studies have reported that EA was associated with decreased postoperative complications, shortened length of hospital stay, and less hospital costs,[2,16] other reports have suggested that EA may be associated with increased chance of rapid fluid shifts, more intraoperative hypotension, and perhaps higher blood loss.[6,12,17] Moreover, epidural hematoma, a potential complication, may dissuade some surgeons from using EA especially in the setting of a major hepatectomy when postoperative coagulopathy may be a concern.[18,19]

Currently, data on the utilization of EA among patients undergoing hepatopancreatic surgery are limited. Most previous reports on the use of EA among patients undergoing hepatopancreatic surgery have been limited to single institutions, which may not reflect population-based outcomes.[7,12,15,20] As such, we sought to evaluate the relative use of EA among patients undergoing hepatopancreatic surgery in a nationally representative dataset. In particular, the objective of the current study was to define trends in the use of EA for hepatopancreatic procedures, as well as to characterize the perioperative outcomes of patients relative to the use of EA vs non-EA analgesia.

Patients and Methods

Data sources and samples

An analysis of the National Inpatient Sample (NIS) database between January 1, 2001 and December 31, 2012 was performed. The NIS database is the largest publicly available all-payer inpatient care database in the United States that is maintained by the Agency for Healthcare Research and Quality as part of the Healthcare Cost and Utilization Project. NIS contains deidentified data on patients enrolled in Medicare, Medicaid, private insurances, and the uninsured. The NIS contains nationally representative data on approximately 8 million hospital discharges gathered from about 1,000 hospitals sampled annually, which represents an approximate 20% stratified sample of all the community hospitals in the United States. To increase the information of the total sample of discharge and improve the estimates representing the entire hospitals, NIS was redesigned in 2012 drawing a sample of discharges with sample size of 20% from all hospitals. The NIS collects data on patient demographics, diagnosis codes, procedure codes, and hospital features. Information regarding laparoscopic procedures was available for all time periods; however, data for robotic information was only available since October 2008.[21]

All patients with an International Classification of Disease, Ninth Revision, Clinical Modification (ICD-9-CM) procedure code for liver resection (50.12, 50.22, 50.3, and 50.4) and pancreas resection (52.5, 52.51, 52.52, 52.53, 52.59, 52.6, and 52.7) who underwent elective surgery were included in the analysis. Urgent and emergent cases were excluded. Minimally invasive surgery (MIS) was defined as a composite of laparoscopic and robotic procedures using ICD-9-CM coding (laparoscopy: 54.21, robotic: 17.4, 17.41, 17.42, 17.43, and 17.49). Patients who underwent EA placement for perioperative pain control were identified using ICD-9-CM procedure codes 03.90 and 03.91. All other cases were included in the "conventional analgesia" group. For all patients, demographic-specific data on age, sex, race, payer type, hospital location, hospital teaching status, household income, hospital region, and admission type were collected. The Charlson comorbidity index[22,23] was used to assess comorbidities. In-hospital perioperative complications were defined using the corresponding ICD-9-CM diagnostic codes and categorized as sepsis, wound infection, wound complication, bleeding complication, pneumonia, respiratory failure, ileus, thromboembolic events, urinary tract infection, liver failure, cerebrovascular accident, cardiac complication, and postoperative shock. In-hospital mortality and length of stay (LOS) were extracted directly from the database. The composite endpoint of postoperative complications defined as 1 or more perioperative complications or death was used as a primary endpoint for analysis.

Statistical analysis

Descriptive statistics of the study population were reported as frequencies with percentages for categorical variables or median values with interquartile ranges (IQRs) for continuous variables. Standard demographic and clinicopathologic data including age, sex, race, comorbidities, household income, payer type, surgical procedures, hospital size, hospital location, hospital teaching status, and hospital region were analyzed in the study. Chi-square test and