Operative vs Nonoperative Management of Pediatric Blunt Pancreatic Trauma: Evaluation of the National Trauma Data Bank

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BACKGROUND: Traumatic pancreatic injury is associated with significant morbidity and mortality. We evaluated the differences in outcomes among children with blunt pancreatic injuries managed operatively and nonoperatively.

STUDY DESIGN: The National Trauma Data Bank was evaluated from 2002 to 2011. Patients less than18 years of age with blunt pancreatic injuries and Abbreviated Injury Scale (AIS) scores ≥ 3 were identified. Patients were divided into nonoperative (NO), operative (O), and delayed operative (DO; operation performed 48 hours or more after admission) groups. Outcomes evaluated were total length of stay (LOS), ICU use/LOS, complications, and death. Univariate comparisons were performed using Fisher's exact and Kruskal-Wallis rank tests. Multivariable analyses were performed using robust regression and logistic regression.

RESULTS: There were 424 cases analyzed. Mean ($\pm$ SD) age was 10.6 $\pm$ 5.3 years, and mean Injury Severity Score (ISS) was 23.4 $\pm$ 13.4. Operative groups differed by age ($p = 0.002$), AIS severity ($p = 0.04$), and concomitant head injury ($p = 0.01$), but were similar with regard to sex, race, and ISS. Length of stay was significantly higher in the DO group compared with the NO or O groups; the NO group had the lowest LOS (covariate-adjusted: 18.7 days vs 11.8 days, $p < 0.001$ and 12.6 days, $p < 0.001$, respectively) and infection rates (10.2% vs 1.6% and 6.2%, respectively, $p = 0.04$). The ICU LOS was greatest in the DO group (vs NO, $p = 0.03$; O, $p = 0.29$), as was the likelihood of ICU use (vs NO, $p = 0.02$; O, $p = 0.75$). Groups did not differ with respect to outcomes including death ($p = 0.94$) and overall complication rate ($p = 0.63$).

CONCLUSIONS: Overall, children managed nonoperatively have equivalent or better outcomes when compared with operative and delayed operative management in regard to death, overall complications, LOS, ICU LOS, and ICU use. (J Am Coll Surg 2016;222:977–982. © 2016 by the American College of Surgeons. Published by Elsevier Inc. All rights reserved.)

CME questions for this article available at http://jacscme.facs.org

Disclosure Information: Authors have nothing to disclose. Timothy J Eberlein, Editor-in-Chief, has nothing to disclose.

Presented at the 96th Annual Meeting of the New England Surgical Society, Newport, RI, September 2015.

Received October 22, 2015; Revised November 30, 2015; Accepted December 1, 2015.

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Trauma is the leading cause of death and disability in children, with the majority secondary to blunt traumatic injury. Although abdominal trauma accounts for less than 10% of all injuries and is less common than isolated head injury, it is potentially life threatening and is a leading cause of morbidity and mortality.[1,2] Pancreatic injuries are the fourth most common intra-abdominal organ injury, after spleen, liver, and kidney.[3,4] Although nonoperative management has become the standard of care for other solid organ injuries in children, management of major pancreatic injuries remains controversial. Because pancreatic injuries are infrequent, sample size remains low for single institutions to gather data with appropriate power to measure patient outcomes.

http://dx.doi.org/10.1016/j.jamcollsurg.2015.12.005
ISSN 1072-7515/15

Abbreviations and Acronyms

AIS = Abbreviated Injury Scale
DO = delayed operative
ISS = Injury Severity Score
LOS = length of stay
NO = nonoperative
NTDB = National Trauma Data Bank
O = operative

In this study, we evaluated major pancreatic injuries in children using the National Trauma Data Bank (NTDB). We sought to determine the differences in outcomes among children with blunt pancreatic injuries managed operatively vs nonoperatively.

METHODS

The NTDB is a nationwide database maintained by the American College of Surgeons Committee on Trauma, composed of patient data voluntarily submitted by trauma centers throughout the United States. We evaluated the research data sets from 2002 to 2011. Patients 18 years of age and younger who sustained a pancreatic injury were extracted, and the mechanism of injury was obtained for all patients. Patients who sustained any penetrating trauma were excluded from this study.

The American Association for the Surgery of Trauma categorizes pancreatic injuries based on grading system. Although the NTDB does define where on the pancreas the injury occurred, it does not report if the pancreatic duct was involved; therefore, Abbreviated Injury Scale (AIS) codes instead of grades were used to categorize patients in this study. Although grade severity is not always associated with the same AIS number, higher AIS scores do correlate with higher-grade injuries. Patients were identified using the 1998 AIS. Only patients with an AIS score of 3 or greater were included (3, serious; 4, severe; 5, critical).

Patient demographics such as age, sex, and race were obtained. For the patient population evaluated, all associated injuries, Injury Severity Score (ISS), and trauma center level designation were extracted. The outcomes evaluated were complications, total hospital length of stay (LOS), ICU LOS, ventilator use, and discharge disposition. To reduce the likelihood of immortal time bias,[5] patients who died within 24 hours of admission were excluded.

The procedures performed were extracted to determine the type and timing of operation. Patients who underwent any pancreatic operation were stratified into the operative (O) group. Operative intervention included distal pancreatectomy, partial pancreatectomy, radical pancreaticoduodenectomy, and any repair of the pancreas. Patients who had a pancreatic operation performed at greater than 48 hours from admission were classified as delayed operative (DO). Patients who did not undergo any pancreatic operative management were classified as nonoperative (NO). Patients who underwent ERCP, drainage, and/or no intervention were included in the NO group.

Subgroup comparisons were performed using bivariate tests such as Fisher exact (categorical), 1-way analysis of variance (normal), and Kruskal-Wallis rank test (ordinal). Analysis of missing data was performed on any variable missing more than 15% of patients, using similar bivariate tests. Multiple logistic regression (dichotomous) or robust regression[6] (continuous) were used to examine various outcomes, adjusting for covariates. All p values are 2-sided, with a critical significance level of ≤ 0.05. Stata 14.0 (StataCorp) was used for all analyses.

RESULTS

A total of 467 patients were found to have blunt pancreatic trauma, with an AIS score of 3 or greater in the NTDB from 2002 to 2011. Of these, 33 were excluded because they died within the first 24 hours of admission, 7 were missing LOS, and 3 were missing sex data (43 total). This left a total of 424 cases for analysis. The mean ($\pm$ SD) age was 10.6 $\pm$ 5.3 years, and most patients were male (63.9%) and white (65.1%). The groups differed by age (mean $\pm$ SD, NO, 9.6 years $\pm$ 5.3 years; O, 11.9 years $\pm$ 4.9 years; DO, 11.3 years $\pm$ 5.2 years; $p = 0.002$), but were similar with regard to sex ($p = 0.59$) and race ($p = 0.55$) (Table 1).

Patient AIS severity distribution was significantly different between the O and NO groups. The O group had a higher percentage of patients with an AIS of 5 (critical) compared with the NO group and DO group (O, 40.6%; NO, 28.4%; DO, 35.7%; $p = 0.04$). There were no significant differences in the ISS (mean $\pm$ SD, 23.4 $\pm$ 13.4) or the associated injuries between groups (Table 2).

On evaluation of complications, death rates were similar between groups ($p = 0.66$). Pneumonia, sepsis, and infection were more prevalent in the DO group, although only the latter reached statistical significance, with the difference most pronounced between the O and DO groups ($p = 0.01$) (Table 3). Univariate analysis showed that 88.6% of patients in the O group were discharged home vs 75.0% in the DO group and 75.3% in the NO group ($p = 0.005$). However, after adjustment for covariates, home discharge was similar between O (87.9%) and DO (80.6%, $p = 0.25$) groups, while the difference between O and NO groups increased (87.9% vs 75.1%, $p < 0.001$) (Table 4).