Form "EAST Multicenter Study Proposal"
Details #127 (submitted 04/15/2021)

Study Title	Outcomes Among Trauma Patients with Duodenal Leak Following Primary vs Complex Repair of Duodenal Injuries: An Eastern Association for the Surgery of Trauma Multicenter Trial
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Are you a current member of EAST?	Yes
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My Multicenter Study proposal is...	Retrospective

BACKGROUND & SIGNIFICANCE:

Duodenal trauma is relatively rare and operative management strategies remain controversial. Historically operative approaches have involved more complex repairs with protective measures (CRPM) including duodenal repair with pyloric exclusion and gastrojejunostomy diversion, duodenal diverticulization, duoduodenectomy with enteric anastomosis, and retrograde duodenostomy drainage tubes with distal feeding tube placement. More recently there has been a trend in literature and clinical practice favoring primary repair alone (PR) of duodenal injuries without additional protective measures. While reports suggest primary repair is safe and possibly the preferred approach as it does not result in a higher leak rate, once a leak develops, it is unclear whether index complex repair with protective measures provide subsequent protection and better outcomes compared to patients who underwent primary repair alone.

Because duodenal injuries requiring operative management are relatively rare, with high volume penetrating trauma centers reporting only 25-90 patients over 5-10 years in published case series, optimal surgical management is difficult to study and almost all reports are small in sample size and retrospective by necessity. More so, patients who develop duodenal leaks after index surgical repairs are an even less studied population.

Use this area to briefly (1-2 paragraphs only) outline the burden of the problem to be examined

In 2019 a retrospective multicenter trial from the Panamerican Trauma Society by Ferrada et al. examined outcomes after the surgical management of duodenal injuries in 372 trauma patients. While this study is the first larger multi-center trial analyzing patients requiring operative management for duodenal injuries, questions remain regarding patients complicated by duodenal leak after repair. While primary repair was concluded to be common and safe, the literature has yet to address whether patients who have duodenal leaks have better outcomes when managed with complex or primary repair initially.

We plan to perform a retrospective multicenter trial over the past 11 years from January 1, 2010 to December 31, 2020 to compare outcomes among patients with duodenal leaks after primary vs complex repair with protective measures to determine whether one repair offers improved outcomes in patients who develop subsequent duodenal leaks. We hypothesize patients with duodenal leaks that underwent complex repairs with protective measures have improved mortality as compared to patients who underwent primary repair alone. Additionally, we hypothesize patients with duodenal leaks that underwent complex repairs with protective measures have improved quality of life compared to patients who underwent primary repair alone; quality of life would be defined by our secondary outcomes including less days with periduodenal drains, less days NPO, less days requiring intravenous nutrition, less time to fistula closure, and less hospital/office visits.

Primary aim

PRIMARY AIM:

Our primary aim is to evaluate the management of traumatic duodenal injuries requiring surgical repair and to compare mortality in patients who subsequently develop duodenal leaks who were managed initially by complex repair vs primary repair.

Secondary aims

SECONDARY AIM:

Our secondary aim is to evaluate secondary outcomes and the quality of life of post-operative trauma patients with duodenal leaks that underwent complex repair with protective measures vs primary repair alone of duodenal injuries. These secondary outcomes include need for unplanned reoperation or procedures, ICU length of stay, hospital length of stay, ventilator days, length of time being NPO, length of time requiring intravenous nutrition, length of time requiring peri-duodenal drains, time to fistula closure, and number of hospital/office visits. With this secondary aim we will also be better able to characterize this patient population as a whole and provide insight into their post-operative course to better inform expectations for the clinical teams, patients, and families.

Inclusion Criteria

INCLUSION CRITERIA:

Adult patients 15 years of age or greater who underwent laparotomy for trauma with duodenal injury requiring primary or complex operative repair.

Exclusion Criteria

EXCLUSION CRITERIA:

Patients who die within 24 hours of presentation would be excluded as we are interested in examining patients who develop duodenal leak complications.

Therapeutic Interventions

THERAPEUTIC INTERVENTIONS:

This is a retrospective observational study of patients who had duodenal injuries requiring operative intervention with subsequent surgical site complications, namely duodenal leaks. Of those patients with leaks, patients will be compared by those who initially underwent complex repair with protective measures vs primary repair alone.

Primary Outcome

PRIMARY OUTCOME:

Mortality

Secondary Outcomes

SECONDARY OUTCOMES:

Need for unplanned reoperation or procedures

Length of stay

Ventilator days

60-day Readmission

Number of days with surgical site drains

Number of days NPO

Number of days requiring intravenous nutrition

Time to fistula closure

Number of hospital/office visits

List specific variables to be collected & analyzed

VARIABLES to be collected and analyzed:

Demographics: age, race, ethnicity, sex, weight, BMI, co-morbid medical conditions

Mechanism of injury: blunt (motor vehicle collision, pedestrian struck, assault etc) vs penetrating (stab wound, gun shot wound, etc)

Admission vital signs/physiology: heart rate, systolic blood pressure, Glascow Coma Scale

Admission laboratory values: WBC, pH, Hb, bicarb, Cr, lactate, bilirubin

Peak hospital laboratory tests: WBC, Cr, lactate, bilirubin

Nadir hospital laboratory tests: pH, Hb, bicarb

Initial and 24-hour blood product usage: PRBC, FFP, platelets, massive transfusion protocol

Injuries and correlating AAST injury grade

Injury severity score

Planned operations and correlating hospital day of operation

Intraoperative drain placement

Unplanned operations and correlating hospital day of operation

Unplanned interventions: interventional radiology (IR) intra-abdominal drain placement, IR angiography +/- embolization, endoscopic retrograde cholangiopancreatography (ERCP)

Antibiotics: drug class, drug dose, duration of treatment

Complications: duodenal leak, surgical site infection, hemorrhage, venous thromboembolism (DVT, PE), acute kidney injury, renal replacement therapy, liver dysfunction, pneumonia, bacteremia, urinary tract infections, acute respiratory distress syndrome, myocardial infarction, stroke, tracheostomy, subsequent feeding tube placement.

Discharge Disposition: home vs long-term acute care vs rehabilitation facility vs skilled nursing facility

Outcomes: mortality, hospital length of stay, ICU length of stay, ventilator days, 60-day readmissions, number of days with surgical site drains, number of days NPO, number of days requiring intravenous nutrition, time to fistula closure, number of hospital/office visits

Outline the data collection plan and statistical analysis plan succinctly

DATA COLLECTION AND STATISTICAL ANALYSIS:

This will be a retrospective observational study. Standardized data will be collected for each patient. Continuous variables will be compared using Student's t-test and the Mann-Whitney U test for parametric and non-parametric data, respectively. Categorical variables will be compared by the Chi-squared tests or Fisher's exact test. Univariate and multivariate logistic regression will be used to determine factors associated with mortality.

We conducted a power analysis and have estimated the required sample size to compare mortality outcomes among patients who had a duodenal leak after complex repair with protective measures vs. primary repair alone of traumatic duodenal injuries. Recent literature reveals high volume trauma centers report about 25-50 operative duodenal injuries over 10 years with about a 3-to-1 ratio of patients managed with primary repair vs complex repairs respectively. Of those patients who undergo operative management of duodenal injuries, about 8-33% have duodenal leak complications with literature reporting mortality of 8-28% among those with duodenal leaks.

Assuming a 3-to-1 ratio of primary repairs to complex repair and conservatively assuming a 10% mortality among patients with duodenal leaks, a total sample of 248 patients will be required to detect a 15-percentage point difference in mortality at the 0.05 alpha level with 80% power. Assuming that each site will contribute an average of 8 patients with duodenal leaks, we anticipate recruiting approximately 31 sites to participate.

All data will be collected and entered into a secure web-based application (Research Electronic Data Capture (REDCapTM)). Data analyses will be performed using the SAS software version 9.4 (SAS Institute, Cary, NC). Analyses will be facilitated with the use of a biostatistician.

Outline consent procedures here, if applicable

CONSENT PROCEDURES:

This is a retrospective observational study of patients who were managed according to surgeon discretion. Thus, waiver of informed consent is requested. Data will be recorded in a secured database without patient identifiers.

Succinctly outline a risk/benefit analysis

RISK/BENEFIT ANALYSIS:

As this is a retrospective study, the main risk associated with this is a data/confidentiality breach which will be mitigated by using a secure database without patient identifiers, this risk is thought to be minimal. Benefits include a better understanding of outcomes among patients with operative duodenal injuries complicated by leak. While this is a small patient population overall, they often have long complicated hospital courses and require significant resources, this study therefore has the ultimate goal of better characterizing this post-operative course and improving the short and long-term care of this patient population.

Include a brief listing of key references

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