

Form "EAST Multicenter Study Proposal"

Details #6 (submitted 01/31/2023)

Please indicate if this is a...

New MCT proposal submission

If a revised proposal summarize the changes made to this proposal based on the feedback received:

Study Title

Primary Repair versus Resection for AAST Grade I and II Colon Injuries: Does the Type of Repair Really Matter?

Primary Investigator:

Caitlin A. Fitzgerald, MD

Institution that will be the primary site for the study:

University of Texas Southwestern Medical Center

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Co-PI/second point of contact for the study:

Ryan P. Dumas, MD

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Are you a current member of EAST?

Yes

If you selected "No" above please identify a Sponsor that is an active EAST member:

The incidence of colon injuries following trauma is approximately 1-3% in the civilian population (1-2). Of these injuries, blunt trauma is responsible for over 40% of injuries whereas a penetrating mechanism accounts for just over 50% of cases (1). Historically, mortality is reported to be upwards of 60%, largely due to fecal contamination and the resultant intra-abdominal sepsis (3-4). This mortality rate has subsequently decreased to approximately 25% following the introduction of fecal diversion, a concept initially pioneered by the military (5).

Use this area to briefly outline the burden of the problem to be examined.

Over the past two decades, the management paradigms of destructive colon injuries have dramatically evolved. Traditionally, colonic diversion with a colostomy has been the standard of care for all destructive colon injuries (AAST grades III-V), defined as those involving more than 50% of the circumference of the colonic wall with vascular compromise (6-12). More recently, large volume trauma centers have started to adopt a management strategy prioritizing resection and primary anastomosis. In 2022, Mitchao et al. demonstrated no difference in morbidity and mortality when comparing resection with anastomosis versus colonic diversion for destructive colon injuries (13). While there is a fair bit of data surrounding the management of destructive colon injuries, there is a paucity of data in regards to how best to manage non-destructive colon injuries (AAST grades I-II), or those involving less than 50% of the circumference of the colon wall without vascular compromise.

Briefly review what major published studies exist on the topic of the proposed project.

When considering the management of non-destructive colon injuries, Stone and Fabian first published in 1979 that primary repair was superior to colonic diversion (14). In 1991, Chappuis et al. noted similar findings and found that patients undergoing primary repair versus diversion demonstrated lower rates of intra-abdominal sepsis regardless of risk factors (15). The following year, Demetriades et al. conducted a prospective non-randomized trial involving penetrating non-destructive right sided colonic injuries which again demonstrated improved patient outcomes with primary repair when compared with colostomy creation (16). In 2003, Maxwell and Fabian reviewed the literature and found that patients with non-destructive colon injuries undergoing primary repair had lower complication rates (14% vs 31%), lower rates of intra-abdominal sepsis (5% vs 12%), and an overall lower mortality (0.11% vs 0.14%) (17). While the debate over primary repair versus colonic diversion for non-destructive colon injuries has been debunked, there is little data comparing primary repair versus resection with anastomosis. There remains a critical knowledge gap on the contemporary management of these less destructive injuries. We aim to determine if primary repair versus resection results in similar outcomes. We hypothesize that primary repair of AAST grade I-II colon injuries results in improved patient-centered outcomes.

Use this area to briefly outline how this idea is innovative and it's anticipated impact.

Preliminary data from our institutional registry included a total of 120 patients with AAST grades I and II colon injuries. Of these, 97 patients (81%) underwent primary repair whereas the remaining 23 patients were managed with resection with anastomosis. While there was no difference in mortality between the two groups, the patients undergoing resection with anastomosis demonstrated a higher rate of intra-abdominal abscesses (3.1%, 3/97 vs. 26.1%, 6/23, $p < 0.001$). We anticipate that the results of a multi-center study will definitively determine the optimal management for non-destructive colon injuries.

Describe what & how the proposed MCT will add to the existing body of knowledge & literature.

There is currently a paucity of literature regarding the management of non-destructive colon injuries. While it is clear that primary repair or resection with anastomosis is superior to colostomy creation in these patients, there is no clear evidence to support primary repair over resection with anastomosis. We aim to address this knowledge gap.

Primary aim

To compare the rates of intra-abdominal abscess development in patients with AAST grade I and II colon injuries undergoing primary repair versus patients undergoing resection with anastomosis.

Secondary aims

To describe current practices regarding the management of patients with non-destructive colon injuries.

Tertiary aim

Design

Retrospective

Inclusion Criteria

The study population includes all patients > 18 years of age who presented with a AAST grade I or II colon injury that was managed with either a primary repair or resection with anastomosis.

Exclusion Criteria

Exclusion criteria includes patients < 18 years of age, pregnant or incarcerated patients, patients presenting with AAST grades III-V colon injuries, patients initially managed with a colostomy, and patients presenting with more than one colon injury.

This study will be a multicenter, retrospective review of all patients presenting with AAST grades I and II colon injuries. The study cohorts will be established based on the management of the colon injury at the index operation. Patients who were managed with primary repair will be compared to those patients who were managed with resection and anastomosis.

All patients with traumatic colon injuries presenting between January, 2012 and December, 2022 will be identified from each participating center's trauma registry. Patients meeting the inclusion criteria, will then be identified from the operative report within the electronic medical record. Potential confounding variables such as abdominal AIS and associated intra-abdominal injuries will be controlled for during the statistical analysis.

Please describe, completely but succinctly, how the project will be conducted.

Each participating center will obtain individual IRB approval to access to the electronic medical record of each patient who meets inclusion criteria from the trauma registry. Data will be collected according to a data collection tool which will be provided by the coordinating institution. Each center will upload de-identified data to a centralized REDCap database supported by the UTSW Medical center. Data use agreements will be obtained should a participating institution require a DUA to share de-identified data. Data will then be collated for analysis.

As this is a retrospective study, no specific interventions are required, and patients will have been managed at the surgeon's discretion. There will be no payments or cost to the subjects for participating in this study as it is a retrospective review. Given the minimal risks of this study, a waiver of consent will be requested.

The primary outcome will be the rate of intraabdominal abscess development

Primary Outcome

in patients managed with primary repair versus those managed with anastomosis and resection.

Secondary Outcome(s)

Secondary outcomes include various infectious complications such as surgical site infections, the development of enterocutaneous fistulae, anastomotic failure, duration of antibiotic utilization, time to return of bowel function, length of stay data, and mortality.

Select the variables to be collected & analyzed:

Baseline Participating Institution Information, Demographics, Baseline Clinical Characteristics, Hospital Course, Treatments & Interventions, Outcomes of Interest, Additional variables noted below:

Age, gender, BMI, mechanism of injury, initial heart rate, initial systolic blood pressure, initial GCS, ISS, AIS abdomen, MTP activated (y/n), number units of blood products in 1st 24 hours, delay in OR (> 6 hours), hospital length of stay, ICU length of stay, ventilator days, mortality, location of colon injury, management of colon injury, AAST grade, open abdomen (y/n), number of abdominal surgeries, duration and type of antibiotic use, level of fecal contamination, number of other intra-abdominal injuries, MI, ARDS, UTI, pneumonia, SSI, intra-abdominal abscess, colonic/anastomotic leak, fascial dehiscence, ECF, unplanned return to OR, unplanned return to ICU, need for additional procedures.

Participating institutions will utilize the trauma registry to identify patients meeting inclusion criteria described above. Each patient's medical record number will then be used to access the electronic medical record. Data collection will then be performed based on the data collection tool provided. Each participating institution will then upload each patient's data onto a REDCap database once a DUA has been obtained. Each patient will be de-identified and will be given a unique ID number within the study to limit the risk to loss of confidentiality. The REDCap database will be password protected and access will only be given to key personnel on each institution's research team. Once the REDCap database is complete, the PI and Co-PI at the host institution will download and collate the data on password protected computers. Data sharing will only take place between approved research team members through HIPAA compliant email.

Additional variables:

Outline the data collection plan/tool succinctly

Has IRB approval been obtained at the primary site?

Yes

Is DUA required for participation in the study?

Yes

If applicable, list the primary contact (name/email) to contact to initiate & execute DUA:

Caitlin Fitzgerald, caitlin.fitzgerald@utsouthwestern.edu

Identify the individuals that will primarily be responsible for data collection process:

At our institution the PI will primarily be responsible for the data collection process. Surgical critical care fellows, residents, and medical students will also assist with the data collection process.

Is there a primary statistician assigned to assist the PI w/design & data analysis?

Yes

If no, how was study design/power analysis determined/who will handle analysis once complete?

Include detailed description of the data analysis plan:

Standardized data will be collected for each patient via the data collection tool provided. Retrospective data will be collected from January 1, 2012 through December 31, 2022. De-identified patient data will be entered into the REDCap database. Continuous variables will be compared using student's t-test and the Mann Whitney U test. Categorical variables will be compared using Chi-squared tests. Descriptive statistics will be reported as the mean +/- standard deviation for continuous normally distributed data, skewed data will be reported using median [IQR], and as frequencies for categorical variables. Univariate logistic regression will be used to evaluate the effect of candidate variables and type of colon repair on patient outcomes. Potential confounding variables will be adjusted for and controlled for using a multivariate regression model. Statistical significance will be set at $p < 0.05$.

Include Power Analysis:

Our single center retrospective study demonstrated an intraabdominal abscess rate of 3.1% in the primary repair group and an intraabdominal abscess rate of 26.1% in the group undergoing resection and anastomosis. Using this data, the study will require a total sample size of 312 patients (156 in each cohort) to achieve an alpha of 0.05 and 80% power.

Please note what your enrollment procedure for this study entails:

Patients will be identified at each institution as meeting inclusion criteria through the trauma registry and resultant operative reports. De-identified data will then be abstracted from the medical record and uploaded to a REDCap database once a data use agreement has been obtained. As this is a retrospective chart review, patients will not be paid to participate, nor will there be any costs accrued as a result of being a part of this study. While there are no direct benefits to the participants, the knowledge gained from this study may benefit trauma patients in the future.

Outline consent procedures here, if applicable:

As this is a retrospective chart review with minimal risk to each participant, a waiver of consent is requested. All collected data is pre-existing in the patient's medical record at the time of collection and thus will not impact their future care. Data that is collected will be recorded on a data collection sheet and will then be transferred to a secure REDCap database with no patient identifiers.

Please indicate what resources are available at the primary study institution:

Presence of a dedicated statistician, Research personnel, Availability of data collectors

1. Trust MD, Brown CVR. Penetrating injuries to the colon and rectum. *Curr Trauma Rep.* 2015;1:113-118.
2. Johnson EK, Steele SR. Evidence-based management of colorectal trauma. *J Gastrointest Surg.* 2013;17(9):1712-1719.
3. Hatch Q, Causey M, Martin M, et al. Outcomes after colon trauma in the 21st century: an analysis of the US National Trauma Data Bank. *Surgery.* 2013;154(2):397-403.
4. Stewart RM, Fabian TC, Croce MA, et al. Is resection with primary anastomosis following destructive colon wounds always safe? *Am J Surg.* 1994;168(4):316-319.
5. Murray JA, Demetriades D, Colson M, et al. Colonic resection in trauma: colostomy versus anastomosis. *J Trauma.* 1999;46(2):250-254.
6. Sasaki LS, Allaben Rd, Golwala R, Mittal VK. Primary repair of colon injuries: a prospective randomized study. *J Trauma.* 1995;39(5):895-901.
7. Burlew CC, Moore EE, Cuschieri J, et al. Sew it up! A Western Trauma Association multi-institutional study of enteric injury management in the postinjury open abdomen. *J Trauma.* 2011;170(2):273-277.
8. Kashuk JL, Cothren CC, Moore EE, et al. Primary repair of civilian colon injuries is safe in the damage control scenario. *Surgery.* 2009;146(4):663-668.
9. Demetriades D, Murray JA, Chan LS, et al. Handsewn versus stapled anastomosis in penetrating colon injuries requiring resection: a multicenter study. *J Trauma.* 2002;52(1):117-121.
10. Biffl WL, Moore EE, Feliciano DV, et al. Management of colorectal injuries: A Western Trauma Association critical decisions algorithm. *JTACS.* 2018;85(5):1016-1020.
11. Demetriades D, Murray JA, Chan L, et al. Penetrating colon injuries requiring resection: diversion or primary anastomosis? An AAST prospective multicenter study. *J Trauma.* 2001;50(5):765-75.
12. Brown CVR, Teixeira PG, Furay E, et al. Contemporary management of rectal injuries at Level I trauma center: The results of an American Association for the Surgery of Trauma multi-institutional study. *JTACS.* 2018;84(2):225-233.
13. Micthao DP, Lewis MR, Strickland M, et al. Destructive colon injuries requiring resection: is colostomy ever indicated? *JTACS.* 2022;92(6):1039-1046.
14. Stone HH, Fabian TC. Management of perforating colon trauma: randomization between primary closure and exteriorization. *Ann Surg.* 1979;190:430-436.
15. Chappuis CW, Frey DJ, Dietzen CD, et al. Management of penetrating colon injuries: a prospective randomized trial. *Ann Surg.* 1991;213:492-497.
16. Demetriades D, Charalambides D, Pantanowitz D. Gunshot wounds of the colon: role of primary repair. *Ann R Coll Surg Engl.* 1992;74:381-384.

Include a brief listing of key references:

17. Maxwell RA, Fabian TC. Current management of colon trauma. *World J Surg.* 2003;27:632-639.