Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.JournalofSurgicalResearch.com

Association for Academic Surgery

The utility of presacral drainage in penetrating rectal injuries in adult and pediatric patients

Kate B. Savoie, MD, MS,[a] *Thomas M. Beazley, BS,*[a] *Brent Cleveland, BA,*[b] *Sina Khaneki, MD,*[b] *Troy A. Markel, MD,*[b] *Peter M. Hammer, MD,*[b] *Stephanie Savage, MD, MS,*[b] *and Regan F. Williams, MD, MS*[a,*]

[a] *Department of Surgery, University of Tennessee Health Science Center, Memphis, Tennessee*
[b] *Department of Surgery, Indiana School of Medicine, Indianapolis, Indiana*

ARTICLE INFO

Article history:
Received 9 February 2017
Received in revised form
15 April 2017
Accepted 17 May 2017
Available online xxx

Keywords:
Penetrating trauma
Penetrating rectal
Pediatric trauma
Adult trauma

ABSTRACT

Background: With changing weaponry associated with injuries in civilian trauma, there is no clinical census on the utility of presacral drainage (PSD) in penetrating rectal injuries (PRIs), particularly in pediatric patients.

Methods: Patients with PRI from July 2004-June 2014 treated at two free-standing children's hospitals and two adult level 1 trauma centers were compared by age (pediatric patients ≤16 years) and PSD. A stratified analysis was performed based on age. The primary outcome was pelvic/presacral abscess.

Results: We identified 81 patients with PRI; 19 pediatric, 62 adult. Forty patients had PSD; only three pediatric patients had a drain. Adult patients were more likely to have sustained gunshot wounds (84%), whereas pediatric patients were more likely to sustain impalement injuries (59%). Pediatric patients were more likely to have distal extraperitoneal injuries (56% *versus* 27% in adults, $P = 0.03$). PSD was more common in adult patients (59% *versus* 14%, $P = 0.0004$), African-Americans (71% *versus* 11% Caucasian, $P < 0.01$), and those sustaining gun shot wounds (63% *versus* 18% impalement, $P < 0.01$); only race remained significant in stratified analysis for both adult and pediatric patients. There were three cases of pelvic/presacral abscess, all in the adult patients ($P = 0.31$); one patient with PSD and two without PSD ($P = 0.58$). In stratified analysis, there were no differences in any infectious complication between those with and without PSD.

Conclusions: Pelvic/presacral abscess is a rare complication of PRI, especially in pediatric patients. PSD is not associated with decreased rates of infectious complications and may not be necessary in the treatment of PRI.

* *Corresponding author*. Department of Surgery, University of Tennessee Health Science Center, 49 N Dunlap, 2nd Floor, Memphis, TN 38105. Tel.: +(901) 287 6301; fax: +(901) 287 4434.
E-mail address: rfwillia@uthsc.edu (R.F. Williams).
0022-4804/$ – see front matter
http://dx.doi.org/10.1016/j.jss.2017.05.056

Introduction

Historically, the management of penetrating rectal injuries relied on principles developed during World War II and the Vietnam War to address high-velocity combat-related injuries. Of these experiences, the central tenets of (1) fecal diversion, (2) primary repair, (3) distal rectal washout, and (4) presacral drainage (PSD) became the mainstay of treatment of penetrating rectal injuries in both combat and civilian arenas.[1-6] More recent data have called into question the utility of fecal diversion, distal rectal washout, and PSD in the adult population.[7-12] All these current studies include adult patients and discuss the changing weaponry (i.e., less military grade) as a key factor for the changing paradigm.

The most current recommendations for adult penetrating rectal injuries are from the Eastern Association for the Surgery of Trauma[13]; these recommendations were drawn from pooled data to address the need for proximal diversion, PSD, and rectal washout. With regards to PSD, they recommend no drain placement and cite a higher mortality rate and infection rate. However, they mention that it is unclear as to whether there is a difference in severity of injury and state that the studies used in the analysis are low quality due to imprecision and bias.

Less is known about the management of penetrating rectal injuries in children, which are often reported in conjunction with blunt injuries or colon injuries. Currently, there are no studies that directly address pediatric specific management of penetrating rectal injuries. Instead, the management principles for adult patients have often been applied to children although their injuries are low-velocity injuries, rather than the typical high-velocity injuries seen in adults.[14]

Given the lack of clinical consensus that exists in the current management of adult penetrating rectal injuries and the little data with regard to the pediatric population, we sought to evaluate the utility of presacral drains in both cohorts. We hypothesized that placement of presacral drains in extraperitoneal penetrating rectal injuries would decrease the rate of pelvic sepsis and abscess formation in both pediatric and adult patients due to the increasingly militaristic weapons used in civilian trauma and the concern for increasing high-velocity injuries in the pediatric cohort.

Methods

After institutional review board approval was obtained at two large adult trauma centers and two free-standing, tertiary pediatric hospitals, a retrospective study of all patients presenting with penetrating rectal injuries was performed. Patients were identified from institutionally maintained trauma databases by *International Classification of Disease, ninth edition* (ICD-9) codes 863.45-46 and 863.55-56 presenting between July 2004 and June 2014. Extensive review of the medical record was performed to identify demographic, injury, operative, and postoperative data.

Patients were included if they sustained full-thickness penetrating rectal injuries at the time of their primary admission. Patients were excluded if they sustained partial-thickness (grade I) injuries, blunt rectal injuries, or if they had sustained an isolated colon injury (blunt or penetrating). Patients were categorized as pediatric patients if they were less than 16 years of age; otherwise, they were considered to be adult patients. All study data were collected and managed using the REDCap (Research Electronic Data Capture)[15] tool, hosted at the University of Tennessee Health Science Center.

Definitions

Intraperitoneal injuries were defined as injuries above the peritoneal reflection, which could be accessed through abdominal exploration. Extraperitoneal injuries were injuries below the peritoneal reflection that could not be accessed with abdominal exploration. The most distal level of injury determined the type of injury (i.e., for patients with intraperitoneal and extraperitoneal injuries, they were considered to have extraperitoneal injuries during analysis).

The a priori adverse outcomes were mortality, presacral/pelvic abscess, wound infection, intraabdominal abscess, bacteremia, drain site infection, or wound tract infection, necrotizing infection, urinary tract infection, and pneumonia. Specific adverse outcomes and overall occurrence of adverse outcomes were assessed. A positive digital rectal examination was defined as gross blood on examination.

The American Association of Surgery for Trauma classification of injury grade was utilized. A grade I laceration is a partial-thickness injury, and therefore excluded (Table 1).

Statistical analysis

Frequencies were assessed for categorical variables and then compared using chi-square analysis. Continuous variables were checked for normality and were normally distributed, compared using parametric tests (i.e., Student's *t*-test and analysis of variance). Where data were nonnormally distributed, nonparametric analysis was performed (i.e., Wilcoxon rank-sum test). Owing to significant differences between adult and pediatric patients in the initial analysis, data were stratified by age to adjust for differences. A P value of <0.05 was considered statistically significant. All data analysis was performed using SAS 9.4 (Cary, NC).

Table 1 – AAST rectal injury classification.

Grade of injury	Description of injury
I	Contusion or hematoma without devascularization or partial-thickness injury of the rectum
II	Full-thickness laceration involving <50% of the circumference of the rectum
III	Full-thickness laceration involving >50% of the circumference of the rectum
IV	Full-thickness laceration that extends into perineum
V	Devascularized segment of rectum