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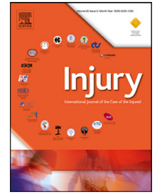

Contemporary management of rectal trauma - A South African experience ☆

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A B S T R A C T

Introduction: The management of rectal trauma remains controversial. There are three modalities which have been used to manage these injuries; proximal diversion (PD), washout of the distal rectum (DRW) and presacral drainage (PSD). The EAST group tentatively advocate mandatory proximal diversion for extraperitoneal rectal injuries and omitting DRW or PSD. Other authors have suggested that diversion can be eschewed in patients with an intraperitoneal injury which can be primarily repaired. In light of all these controversies, this project set out to review our experience with rectal injuries over the last seven years with the objective of reviewing our use of PD, PSD and DRW.

Methods: Patients aged greater than or equal to 15 years with rectal injuries during December 2012 to July 2019 were included. Patient demographics, mechanism of injury, management strategy (operative or non-operative), complications, patient residential status (urban or rural), hospital and intensive care duration of stay, and 30-day mortality rates were assessed.

Results: During the study period, a total of 51 patients with a rectal injury were treated. There were 45 (88%) males and the median age was 29 (22-39) years. There were 7 (14%) blunt mechanisms, 41 (80%) penetrating mechanisms and 3 (6%) combined blunt and penetrating mechanisms. The median ISS was 13 (9-18). Of the 50 rectal injuries ultimately treated at our institution, there were 31 extraperitoneal and 14 intraperitoneal injuries. There were five combined intra and extraperitoneal injuries. A total of 21 rigid sigmoidoscopies and a single flexible sigmoidoscopy were performed. A total of 24 patients underwent a CT scan. There were 13 primary repairs and 45 PD. A single patient required a PSD. Of the 34 documented complications, 15 (44%) were related to sepsis and can be attributed to the rectal injury. The overall mortality rate was 11.8%.

Conclusions: Rectal injuries are associated with significant septic related morbidity and mortality. Although we have begun to avoid diversion in a small subset of patients with an intraperitoneal injury, we continue to perform PD for the vast majority of patients with a rectal injury. We do not perform DRW and PSD is used in highly selective cases.

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Introduction

Paradigms in the management of rectal trauma have shifted dramatically since the early reports from the Vietnam war five decades ago. [1,2] At the time these pioneering surgeons established a number of principles which have guided the management of rectal trauma ever since. These are proximal diversion (PD), washout of the distal rectum (DRW) and presacral drainage (PSD) [2,3]. There have been a number of attempts recently by learned

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societies to review and categorize the available literature on the topic and to standardize current management algorithms [4]. The most extensive and recent consensus review of this type emanates from the Eastern Association for the Surgery of Trauma (EAST) group. These authors collated the literature and attempted to address the role of each the three management modalities listed above. The available literature was subject to rigorous review and recommendations were made based on the quality of the available data. Based on this process the EAST group advocate mandatory proximal diversion and omitting DRW or PSD for extraperitoneal rectal injuries. [5] Another area where the traditional Vietnam war era dogma has been challenged is in the management of intraperitoneal rectal injuries and there is evidence now that in certain situations primary repair of an intraperitoneal rectal injury without proximal diversion is safe. [4]

It is difficult to subject these relatively infrequent injuries to a randomized trial and clinical audits will continue to provide evidence and guidance. The development of large nation-wide and institutional databases over the last two decades means that big sets of clinical data are being accumulated and this allows for ongoing clinical audits of injuries. In the United States the North American Trauma Data Bank (NATDB) is accruing significant numbers of patients and this has allowed for a number of excellent large retrospective multi center reviews. Recently there has been a major publication from this source on rectal trauma which has provided an overview of the current management strategies across North America. [4] With so many diverse centers contributing patients to this database, it is difficult to standardize for variations in practice and clinical bias. The Pietermaritzburg Metropolitan Trauma Service (PMTS) has developed a digital record system known as the Hybrid Electronic Medical Registry (HEMR) which has accumulated data on trauma patients at our institution for just under seven years [6]. The fact that all these patients are managed by a single trauma center means that there is less clinical variation in management strategies and that care is more standardized. Hopefully this data will complement the data in the NATDB and contribute to a more nuanced global over-view of the current management of rectal trauma.

This study set out to review our experience with the management of rectal injuries over the last seven years with the objective of reviewing our use of PD, PSD and DRW as well as our experience with intraperitoneal and extraperitoneal injuries. It was hoped that this would help us refine our clinical algorithms for the management of these rare but potentially serious injuries.

Clinical setting

The Pietermaritzburg Metropolitan Trauma Service (PMTS), a division within the Department of Surgery at Grey's Hospital, is based in the city of Pietermaritzburg, South Africa. It provides definitive trauma care to the city of Pietermaritzburg and the surrounding catchment area with a total population of over 4 million. It is the largest academic trauma center in western KwaZulu Natal (KZN) Province and is a major teaching hospital of the University of KwaZulu Natal. It is responsible for undergraduate, postgraduate, and sub-specialty fellowship training in trauma surgery for both local and international doctors. The PMTS maintains the regional electronic trauma database called the Hybrid Electronic Medical Registry (HEMR), which captures data on all admissions to our trauma center [6]. Ethics approval for the maintenance of our registry and for this study was formally approved by the Biomedical Research Ethics Committee of the University of Kwa Zulu Natal (Reference number: BCA 207/09 and BCA 221/13).

The study

All patients with rectal trauma were identified from the HEMR. Patients aged greater than or equal to 15 years with rectal injuries (Organ Injury Scale I-V) from December 2012 to July 2019 were queried from the database and included in the study. Patients who were less than 15 years were excluded from the study. Patient demographics, mechanism of injury, management strategy (operative or non-operative), complications, patient residential status (urban or rural), hospital and intensive care duration of stay, and 30-day mortality rates were extracted. A patient was considered rural if he/she lived more than 100km from the nearest appropriate surgical service. All descriptions of the level of rectal injury were made intra-operatively by the senior trauma surgeon involved. All gradings were made combining intra-operative findings as well as available imaging by the database administrator. All normally distributed continuous variables were described using means with standard deviation (SD). Continuous variables with gross skewness were reported using a median with interquartile range (IQR).

Results

During the period from December 2012 to July 2019, a total of 51 patients with a rectal injury were treated at Grey's Hospital in Pietermaritzburg. There were 45 (88%) males and 6 females (12%). The median age was 29 (22-39) years. There were 21 urban and 30 rural patients. There were 7 (14%) blunt mechanisms, 41 (80%) penetrating mechanisms and 3 (6%) combined blunt and penetrating mechanisms. Of the blunt mechanisms, there were 1 assault, 1 fall from a height, 3 motor vehicle collisions, 4 pedestrian vehicle collisions and one animal stamping injury. Of the penetrating mechanisms, there were 36 (71%) gunshot wounds, 6 impalements, 1 stab and one animal bite. (Table 1) A single patient was referred to a private hospital for management and was excluded from further analysis. A total of 15 patients (29%) had documented blood on digital rectal examination. A total of 24 patients underwent a CT scan.

There were the following associated injuries to other remote body regions: Head: 1 Face: 2 Neck: 0 Thorax: 6 Upper Limb: 8 Lower Limb: 22. (Table 2) There were 27 urogenital injuries which included; isolated bladder: 16, bladder and ureter: 3, bladder and urethra: 2, bladder and uterus: 1, bladder, ureter and uterus: 1, ureter: 2, urethra: 1, ureter and spermatic cord: 1. The following associated intra-abdominal injuries which included; diaphragm: 2, stomach: 1, small bowel: 16, large bowel: 11, liver: 3, pancreas: 1. (Table 3) The median ISS was 13 (9-18).

Of the 50 rectal injuries ultimately treated at our institution, there were 31 extraperitoneal and 14 intraperitoneal injuries. There were five combined intra and extraperitoneal injuries. There were 3 destructive injuries. (Table 4) The AAST grading was as follows, AAST 1: 14, AAST 2: 31, AAST 3: 4 and AAST 4: 1. (Table 5) A total of 21 rigid sigmoidoscopies and a single flexible sigmoidoscopy were performed. The injury sites were detected only in 9 cases and the rest only found blood or hematoma in the rectum. There were 13 primary repairs and 45 PD. All the primary repairs were per-

Table 1
Mechanism of injury.

Blunt		Penetrating	
PVC	4	GSW	36
MVC	3	Impalement	6
Assault	1	Impalement + Stab	1
Fall from height	1	Animal bite	1
Animal injury	1		
Total	10		44

Table 2
Associated injuries

	Extraperitoneal	Intraperitoneal	Combined intra and extraperitoneal	Total
Head	0	0	1	1
Face	0	1	1	2
Neck	0	0	0	0
Thorax	1	3	2	6
Other abdominal injuries	12	19	3	34
Urogenital	13	9	5	27
Extremity	15	10	5	30

Table 3
Associated intra-abdominal injuries.

	Extraperitoneal	Intraperitoneal	Combined intra and extraperitoneal	Total
Diaphragm	0	2	0	2
Stomach	0	1	0	1
Small bowel	9	5	2	16
Large bowel	2	8	1	11
Liver	1	2	0	3
Pancreas	0	1	0	1

Table 4
Overview of rectal injuries.

	Extraperitoneal	Intraperitoneal	Combined intra and extraperitoneal	Total
Numbers	31	14	5	50
Mortality (%)	1 (3.2%)	2 (14.3%)	3 (60%)	6 (12%)
Destructive	1	1	1	3
Primary repair	0	10	3	13
Proximal diversion	30	10	5	45

Table 5
AAST Rectal Organ Injury Scale.

	Extraperitoneal	Intraperitoneal	Combined intra and extraperitoneal	Total
Grade 1	8	6	0	14
2	22	7	2	31
3	1	1	2	4
4	0	0	1	1

formed in intraperitoneal injury group. Almost all the extraperitoneal injuries (30/31) were managed with PD. Of the 14 intraperitoneal injuries, 10 underwent PD and 4 (28%) did not. A single patient required a PSD. He had a combined destructive rectal and bladder neck injury and underwent a repeat laparotomy within 48 hours. A single patient required multiple operations for perineal debridement for ischiorectal sepsis despite having undergone a PD. He had a combined bladder neck and rectal injury. He was discharged with an indwelling urinary catheter. At 18 months follow up, he was continent for urine and had undergone a reversal of his stoma. A total of 18 patients were admitted to ICU. The mean hospital stay was 15.3 days. Half of the patients developed one or more complications. These included cardiac: 2, respiratory: 4, renal: 7, neurological: 2, abdominal sepsis: 5, wound-related complications: 9, bed sores: 2, depression: 1, and bladder leakage: 2. Of the 34 documented complications, 15 (44%) were related to sepsis. The overall mortality rate was 11.8%. The mortality rate in the extraperitoneal injury group was 3% (1/31), in the intraperitoneal injury group it was 14.2 % (2/14) and in the combined intra and extraperitoneal injury group it was 60% (3/5). (Tables 4–5)

Discussion

The diagnosis of a rectal injury is relatively difficult due to the anatomy of the rectum and it must be considered based on the mechanism of injury and the presence of injuries to adjacent structures. Trans-pelvic gunshot wounds, high-velocity blunt trauma, and impalements are the most common cause of rectal injuries and our review confirms this with gunshots accounting for 71% of injuries followed by high-velocity blunt trauma and impalements. [1,4] When suspected, aggressive investigation is necessary to actively confirm or exclude the presence of an injury.

The current workup is a combination of clinical and diagnostic studies and includes digital per rectal examination (DRE), computed tomography (CT), and endoscopy. It is reported that DRE has a sensitivity of 33 to 52% but has high false-negative rate of 63 to 67% [7–9]. Only 29% of our patients had blood on DRE and it is difficult to detect the injury using DRE exclusively. It is reported that the non-selective use of a DRE has been shown to alter management in only 1.2 % of trauma assessments [7,9]. Rectal trauma is often associated with injuries to adjacent structures, such as the urogenital system, pelvic vasculature, and the pelvis [12,13]. There is a high incidence of associated urogenital trauma (54%) in our review, as would be expected by the close proximity of the urogenital tract and rectum. Trans-pelvic injuries must be imaged appropriately [14] if the patient is stable enough to undergo a CT scan. In our series half (47%) of the patient cohort underwent a CT scan. Combined rectal and urogenital injury complicates management and it is imperative that associated urogenital injuries are aggressively identified and managed. The single patient who developed a large perirectal collection and who required multiple debridement of his perineum had a combined bladder neck and extraperitoneal rectal injury. Sigmoidoscopy and proctoscopy allow direct visualization of the rectum and are important adjuncts. Proctoscopy has

a sensitivity of 71% for rectal injury and is most sensitive for extraperitoneal injuries (88%) [10]. Sigmoidoscopy may be compromised by lack of bowel preparation, patient positioning, and blood from associated injuries [11]. In our review, only 9 out of 21 rectal injuries were identified with sigmoidoscopy.

The primary repair of a rectal injury is difficult [15]. Access in the pelvis is limited and as the rectum becomes retroperitoneal and ultimately extraperitoneal, repairing a posterior wound becomes challenging. Repairing an injury in close proximity to the peritoneal reflection, necessitates extensive dissection. If the injury cannot be repaired, rectal content may track down into the ischiorectal plane and up into retroperitoneum. In addition, injuries to the adjacent bladder neck mean that urinary leakage may complicate a repair. In response to this, PD has become the mainstay of the treatment of these injuries. This was adopted during and after the second world war and is credited with dramatically reducing the mortality rate associated with rectal trauma. In addition, most authors at the time advocated PSD [16]. During the Vietnam war the concept of DRW was widely adopted [16], in response to the increased destructive power of the weapons in use. All three modalities have increasingly come under review by civilian trauma surgeons [5,17].

Most authors still advocate PD for extraperitoneal rectal injuries, especially if it is not technically feasible to repair the extraperitoneal injury. However, there has been a move towards primary repair without PD for selected intraperitoneal injuries. (4,5) Civilian authors are skeptical about PSD. Establishing PSD requires extra surgical incisions, the opening up of closed anatomical spaces, as well as special positioning of the patient. The extra dissection may damage pelvic nerves resulting in erectile and bladder dysfunction. The drains themselves may be changed the position and block and be a cause of pain and discomfort for the patient. The initial support for DRW came from military surgeons in the Vietnam war who showed that the technique was associated with a decreased incidence of septic morbidity [2,18]. However civilian authors have shown no benefit and others have raised concerns about whether DRW is associated with an elevated risk of infection caused by forcing faecale matter out of unrepaired rectal perforations into the extrapertoneal spaces [3,19]. Most trauma surgeons have moved away from DRW.

The development of the HEMR in our center has allowed us to accrue a sizable temporal data set. We still advocate PD for extraperitoneal rectal injuries, especially those which it is technically difficult to repair. In the case of intraperitoneal injuries, we are more selective in the use of PD. Even though we attempted a primary repair in 26% of our patients, we performed a PD in about 90%. Of the 14 intraperitoneal injuries, 10 (71%) underwent PD and 4 (29%) did not. This means just under a third did not undergo PD. In the large nation-wide overview of rectal injury by Brown, 154 patients (62%) with an intraperitoneal injury received PD, while 94 patients (38%) did not. [4] It would appear that there is still no consensus amongst American surgeons, although there is a trend towards eschewing PD for these patients. Our more limited adoption of this approach probably reflects a degree of caution stemming from an environment with lots of delays and resource constraints. We do not use PSD routinely and reserve it for complex combined injuries where there is disruption of the pelvic musculature. We do not perform DRW

The overall mortality rate associated with these injuries is high although this may not always be directly attributable to the rectal injury itself. The mortality rate for extraperitoneal injuries was low (3.2%). It climbed significantly with intraperitoneal injuries (14,3%) and combined intraperitoneal and extraperitoneal injuries (60%). The high number of associated injuries and high ISS seen in the intraperitoneal and combined intraperitoneal and extraperitoneal group means that injuries remote from the rectum may account for this increase in mortality. Patients with combined intraperitoneal and extraperitoneal injuries were more likely to have associated injuries and this may also contributed to the high mortality rate (60%). Rectal trauma is associated with a high rate of wound related complications and despite our liberal use of PD there is still a high incidence of these septic complications.

Conclusion

Rectal injuries are associated with significant morbidity and mortality. Although we have begun to avoid diversion in a small subset of patients with an intraperitoneal injury, we continue to perform PD for the vast majority of patients with a rectal injury. We do not perform DRW and we do not use PSD routinely. Despite a low mortality rate there is still a high rate of septic related complications.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.injury.2020.02.121.

References

[1] Steele SR, Maykel JA, Johnson EK. Traumatic injury of the colon and rectum: the evidence vs dogma. Dis Colon Rectum 2011;54(09):1184–201.
[2] Lavenson GS, Cohen A. Management of rectal injuries. Am J Surg 1971;122(02):226–30.
[3] Burch JM, Feliciano DV, Mattox KL. Colostomy and drainage for civilian rectal injuries: is that all? Ann Surg 1989;209(5):600–10 discussion 610–611.
[4] Brown CVR, Teixeira PG, Furay E, Sharpe JP, Musonza T, Bendix PG, et al. AAST contemporary management of rectal injuries study group. contemporary management of rectal injuries at level I trauma centers: The results of an American Association for the surgery of trauma multi-institutional study. J Trauma Acute Care Surg 2018;84(2):225–33.
[5] Bosarge PL, Como JJ, Fox N, Falck-Ytter Y, Haut ER, Gonzalez RP. Management of penetrating extraperitoneal rectal injuries: an eastern association for the surgery of trauma practice management guideline. J Trauma Acute Care Surg 2016;80(3):546–51.
[6] Laing GL, Bruce JL, Aldous C, Clarke DL. The design, construction and implementation of a computarized trauma registry in developing South African metropolitan trauma service. Injury 2014;45(1):3–8.
[7] Esposito TJ, Ingraham A, Luchette FA, et al. Reasons to omit digital rectal exam in trauma patients: no fingers, no rectum, no useful additional information. J Trauma 2005;59(06):1314–19.
[8] Shlamovitz GZ, Mower WR, Bergman J, et al. Poor test characteristics for the digital rectal examination in trauma patients. Ann Emerg Med 2007;50(01):25–33 33.e1.
[9] Porter JM, Ursic CM. Digital rectal examination for trauma: does every patient need one? Am Surg 2001;67(5):438–41.
[10] Hargraves MB, Magnotti LJ, Fischer PE, et al. Injury location dictates utility of digital rectal examination and rigid sigmoidoscopy in the evaluation of penetrating rectal trauma. Am Surg 2009;75(11):1069–72.
[11] Ferraro FJ, Livingston DH, Odom J, Swan KG, McCormack M, Jr RBF. The role of sigmoidoscopy in the management of gunshot wounds to the buttocks. Am Surg 1993;59(6):350–2.
[12] Aihara R, Blansfield JS, Millham FH, et al. Fracture locations influence the likelihood of rectal and lower urinary tract injuries in patients sustaining pelvic fractures. J Trauma 2002;52(02):205–8.
[13] Arthurs Z, Kjorstad R, Mullenix P, et al. The use of damage-control principles for penetrating pelvic battlefield trauma. Am J Surg 2006;191(05):604–9.
[14] Anderson SW, Soto JA. Anorectal trauma: the use of computed tomography scan in diagnosis. Semin Ultrasound CT MR 2008;29(6):472–82.
[15] Levine JH, Longo WE, Pruitt C, et al. Management of selected rectal injuries by primary repair. Am J Surg 1996;172(05):575–8.
[16] Gonzalez RP, Falimirski ME, Holevar MR. The role of presacral drainage in the management of penetrating rectal injuries. J Trauma 1998;45(04):656–61.
[17] Shannon FL, Moore EE, Moore FA, et al. Value of distal colon washout in civilian rectal trauma-reducing gut bacterial translocation. J Trauma 1988;28(07):989–94.
[18] Ivatury RR, Licata J, Gunduz Y, et al. Management options in penetrating rectal injuries. Am Surg 1991;57(01):50–5.
[19] Cleary RK, Pomerantz RA, Lampman RM. Colon and rectal injuries. Dis Colon Rectum 2006;49(08):1203–22.