No Evidence Supporting the Routine Use of Digital Rectal Examinations in Trauma Patients

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Abstract Digital rectal exams (DRE) are routinely used on trauma patients during the secondary survey as recommended by current Advanced Trauma Life Support (ATLS) protocols. However, recent literature has called the blanket use of the DRE on each trauma patient into question. The purpose of this study was to evaluate the efficacy of the DRE as a diagnostic tool in the setting of urethral, spinal cord, small bowel, colon, and rectal injuries and determine if it can be eliminated from routine use in the trauma setting. Trauma patients with small bowel, colon, rectal, urethral, and spinal cord injuries, age of 18 years or older,

and a noted DRE were included. Exclusion criteria included an age less than 18, patients who received paralytics, a Glasgow Coma Scale (GCS) of 3, and a history of paraplegia or quadriplegia. One-hundred eleven patient records were retrospectively reviewed. Ninety-two male (82.9 %) and 19 (17.1 %) females with a GCS of 13.7 were evaluated. Sixty-two (55.9 %) injuries were penetrating with 49 (44.1) being blunt. The DRE missed 100 % of urethral, 91.7 % of spinal cord, 93.1 % of small bowel, 100 % of colon, and 66.7 % of rectal injuries. For injuries confirmed with radiologic modalities, the DRE missed 93.3 %. For injuries confirmed on exploratory laparotomy, the DRE missed 94.9 %. The DRE has poor sensitivity for the diagnosis of urethral, spinal cord, small bowel, and large bowel injury. The DRE was found to be the most sensitive in the setting of rectal injuries. The DRE offers no benefit or predictive value when compared to other imaging modalities.

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Keywords Digital rectal exam in trauma · Trauma protocol · Trauma diagnostics · Rectal exam and bowel injury · Rectal exam and urethral injury · Rectal exam and spinal cord injury

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Introduction

The digital rectal exam (DRE) is a common practice throughout the trauma bays of the USA. Current Advanced Trauma Life Support® (ATLS®) protocols recommend a DRE be performed during the secondary survey to assess for abdominal, pelvic, and neurological injury [1]. Rectal blood, decreased or absent sphincter tone, the presence of pelvic fractures, and the position of the prostate [1, 2] are a few of the findings we search for when performing a DRE in order to rule out or confirm gastrointestinal injuries (GI), spinal cord injuries (SCI), and urethral injuries (UI). Recent literature has called the blanket use of the DRE on each trauma patient into question, however.

A 2005 study by Esposito et al. [2] examined 512 cases and determined the DRE rarely provided additional or accurate information that changed management and that the omission of the DRE appears safe and permissible. Other studies examining the use of the DRE in pediatric trauma patients [3], urethral injuries [4], and also spinal cord injuries [5] have each called into question its routine use in the trauma setting.

The purpose of this study was to evaluate the DRE in the setting of urethral injuries, spinal cord injuries, neurological injuries, small bowel injuries, colon injuries, and rectal injuries and to determine its diagnostic accuracy in comparison to other radiologic and physical findings.

Methods

A retrospective review of trauma patients who received a digital rectal exam during treatment at our level I trauma center was approved by the Institutional Review Board of the medical center. All patients treated by the trauma service for an acute injury and cataloged in our trauma database were eligible for the study. All patient examinations (including DRE) were performed by the trauma team under the direct care of a trauma attending. All findings of the DRE were documented in the medical record.

A review of trauma cases from 2008 to 2012 was performed utilizing International Classification of Diseases, Ninth Revision (ICD-9) coding for small bowel injuries, large bowel injuries, rectal injuries, bladder injuries, and urethral injuries. Inclusion criteria included all trauma patients with the above injuries, age of 18 years or older, and a noted DRE. Exclusion criteria included an age less than 18, patients who received paralytics during intubation, a Glasgow Coma Scale (GCS) of 3, any other previous medical condition that would make a DRE unreliable (a history of paraplegia, or quadriplegia), and any patient without a well-documented DRE.

Once patients with definitive injuries and a DRE were confirmed, a review of the medical record was performed. Definitive diagnosis was made through exploratory laparotomy, urethrogram, CT scan, MRI, or endoscopy. While the study was not formally blinded because it was retrospective, radiologists making definitive diagnoses did not review the results of the DRE or patient history.

Radiologic findings, laboratory work, and the clinical course of the patient were retrospectively reviewed. The DRE findings were compared to the final diagnosis for each patient. Negative (NPV) and positive (PPV) predictive value for both the DRE and imaging/surgical evaluation were calculated. Also, we determined if the digital rectal exam changed the management of the patient during his or her clinical course.

Results

A total of 111 patients were evaluated. Mean age was 37.7 years. Ninety-two (82.8 %) of patients were male and 19 (17.2 %) were female. The majority of cases were level I trauma activations (60.4 %) with level II and level III (36.9 %; 2.7 %) following in decreasing frequency. Table 1 describes the remaining demographics and clinical characteristics of the study patients. Seven urethral injuries, 20 intra-cranial hemorrhages, 24 spinal cord injuries, 4 bladder injuries, 18 small bowel injuries, 11 colon injuries, and 3 rectal injuries were noted. No adverse events were reported as a result of the DRE. Table 2 summarizes the frequency of each injury type. Table 3 summarizes the clinical studies performed and the subsequent outcomes.

A majority of cases, 76 (67.6 %) required further radiological evaluations (CT scan, urethrogram, MRI) in order to confirm the diagnosis prior to any operative intervention. Eleven

Table 1 Demographics and clinical characteristics of study patients

Age	37.69 ^a (18–90) ^b
Sex	
Males	92 (82.8 %)
Females	19 (17.2 %)
Mean GCS	13.74
Mean GCS (GCS 3 removed)	14.26
Trauma type	
Blunt	49 (44.1 %)
Penetrating	62 (55.9 %)
BMI	26.05
Comorbidities	
Hypercholesterolemia	4 (3.6 %)
CAD	2 (1.8 %)
DM	7 (6.3 %)
HTN	18 (16.2 %)
Trauma activation	
Level 1	67 (60.4 %)
Level 2	41 (36.9 %)
Level 3	3 (2.7 %)
Length of stay (days)	10 ^a (1–49) ^b
SICU stay (days)	6 ^a (1–22) ^b
Injuries	
Urethral injury	7
Intra-cranial hemorrhage	20
Spinal cord injury	24
Bladder injury	4
Small bowel injury	18
Colon injury	11
Rectal injury	3

^a Average

^b Range

Table 2 Clinical studies and outcomes of study patients

Further radiology ^a	75 (67.56 %)
Positive fast	11 (9.9 %)
Direct to operating room (no imaging)	34 (30.6 %)
Intra-operative mortality	0
Postoperative mortality ^b	6 (5.4 %)
Overall survival	105 (94.5 %)

^a CT scan, urethrogram, MRI^b 24-h postoperative mortality

(9.9 %) cases noted a positive FAST exam. An overall survival was found to be 94.5 % with 6 (5.4 %) mortalities occurring postoperatively.

Tables 3, 4, and 5 describe disease prevalence and DRE specificity, sensitivity, positive predictive value, and negative predictive value for the following injuries: urethral injuries, spinal cord injuries, small bowel injuries, colon injuries, and rectal injuries. For each injury, the sensitivity and positive predictive value (PPV) were poor. Rectal injuries have the highest sensitivity (33.33 %) and PPV (50.00 %). Urethral and colon injuries were found to have the lowest sensitivity and PPV at 0.00. The specificity and negative predictive value (NPV) for urethral injuries were 100 and 93.69 %, 95.4 and 79.05 % for spinal cord injuries, 98.92 and 84.40 % for small bowel injuries, 99.0 and 90.0 % for colon injuries, and 99.07 and 98.17 % for rectal injuries.

Discussion

This study demonstrates the DRE is of limited value in the initial assessment of trauma patients. As a screening mechanism for possible traumatic injury, the DRE had poor sensitivity and PPV for the majority of traumatic injuries. Other mechanisms of injury detection (physical exam, additional radiology, clinical acumen) all provided a diagnosis without a need for the DRE. In an ideal setting, a perfect predictor of injury would be 100 % sensitive and 100 % specific. The DRE does not come near this level of accuracy and precision in the trauma bay.

For urethral injuries, a “high-riding” prostate on DRE is the commonly sought after finding on the DRE. Others have previously questioned the validity of the DRE’s ability to detect a

Table 4 Digital rectal exam and radiologic findings

Confirmed findings on DRE		Documented injuries per radiology	
Positive DRE findings	Yes	Yes	No
	No	5	2
		70	34
Disease prevalence	67.57 %		
Sensitivity	6.67 %		
Specificity	94.44 %		
Positive predictive value	71.43 %		
Negative predictive value	32.69 %		

“high-riding” prostate in urethral injuries [4, 6]. Ball et al. [4] conducted a retrospective review of 41 blunt injured patients diagnosed with urethral disruption. They found an abnormal prostate on DRE, blood at the meatus, and hematuria prior to catheter insertion in 1 (2 %), 8 (20 %), and 7 (17 %) of patients, respectively. They concluded that meatal blood and hematuria were better screening tests than DRE for urethral injuries ($p < 0.05$). Our study found that in 7 urethral injuries, the DRE failed to discover any “high-riding” prostates (0.0 sensitivity; 0.0 PPV), and no false-positives were recorded.

Spinal cord injuries had the second highest disease prevalence at 21.62 %. A decrease in sphincter tone is the common finding noted on DRE in the setting of spinal cord injury. Twenty-four spinal cord injuries were confirmed. The DRE demonstrated 2 true-positive and 4 false-positive cases (8.3 % sensitivity; 33.3 % PPV; 95.4 % specificity; 79.05 % NPV). Only 2 true-positive findings in the setting of a high level of disease prevalence suggest the DRE is not a worthwhile screening exam for spinal cord injuries. The 4 false-positive findings could expose the patient to unnecessary exams and radiologic procedures. Previous literature has questioned the use of DRE to determine spinal cord injuries. Guldner et al. [5] retrospectively reviewed 1032 patients with 54 (5.2 %) having been diagnosed with a spinal cord injury. Ninety-nine patients had decreased rectal tone on DRE with 27 (true-positives) having confirmed spinal cord injuries. With sensitivity, specificity, PPV, and NPV of 50, 93, 27, and 97 %, the DRE could not be recommended as a screening tool for spinal cord injuries.

Small bowel injuries were the most common with a disease prevalence of 26.13 %. The most common finding noted on

Table 3 Digital rectal exam and urethral, spinal cord, small bowel, colon, and rectal injuries

Injuries	Disease prevalence (%)	Sensitivity (%)	Specificity (%)	Positive predictive value (%)	Negative predictive value (%)
Urethral	6.31	0.00	100	0.00	93.69
Spinal cord	21.62	8.33	95.4	33.33	79.05
Small bowel	26.13	6.90	100.00	100.00	75.23
Colon	17.12	0.00	97.83	0.00	82.57
Rectal	2.70	33.33	99.07	50.00	98.17

Table 5 Digital rectal exam and exploratory laparotomy findings

Confirmed findings on DRE		Documented injuries per ex-lap	
		Yes	No
Positive DRE findings	Yes	2	0
	No	37	54
Disease prevalence		41.94 %	
Sensitivity		5.13 %	
Specificity		100.00 %	
Positive predictive value		100.00 %	
Negative predictive value		59.34 %	

DRE in the setting of small bowel injury is bright red blood per rectum. We estimated the sensitivity of the DRE for the diagnosis of small bowel injury to be 6.9 % with a specificity of 100 % (no false-positives were noted). However, this high specificity should be balanced against the high number of false-negatives (22 patients). This poor sensitivity omits the DRE as a useful tool to rule out small bowel injury due to the likelihood of a missed injury. Our findings support previous conclusions regarding the lack of sensitivity of the DRE in bowel injury. In a 2005 article, Esposito et al. [2] found the presence of gross blood to be only 36 % sensitive for the presence of gastrointestinal injury in adult patients.

The presence of gross blood on DRE can also be significant for a colon injury. Our study found 19 patients with colon injuries (17.1 % prevalence). The DRE missed all 19 of the colon injuries (0.0 sensitivity; 0.0 PPV) and had a specificity of 97.8 % with two false-positive findings. With such poor sensitivity and the fact the DRE missed 19 confirmed colonic injuries, we cannot recommend the DRE as a screening tool for traumatic colon injuries.

Traumatic rectal injuries were found to have the lowest prevalence at 2.7 % (Table 3). Similar to other bowel injuries, the finding of gross blood on the DRE is significant for rectal injury in trauma. Gross disruption of the rectal wall integrity can also be noted in rectal trauma on DRE. Our study demonstrated that the DRE in the setting of rectal trauma discovered one true-positive and one false-positive (33.3 % sensitivity; 99.1 % specificity; 50.0 % PPV). Our findings are supported by a study conducted by Shlamovitz et al. [3] that evaluated 213 patients and found 5 (2 %) rectal injuries. The DRE failed to identify any rectal injuries in their study (0.0 % sensitivity; 100 % specificity). In a study conducted by Leaphart et al. [7] that compared CT scanning to proctoscopy in the diagnosis of traumatic rectal injuries in children, 24 confirmed rectal injuries were noted. The DRE confirmed rectal injuries in 4 (16 %) patients. These findings support our study, which concludes the DRE is a poor screening tool for traumatic rectal injuries.

The sensitivity of the DRE to screen for traumatic injuries can be further described by stratifying the confirmatory method. We evaluated the sensitivity of the DRE performed in injuries

confirmed by radiological findings. Seventy-five injuries (67.6 % disease prevalence) were confirmed by radiology, and only 5 of the injuries were noted on the DRE (6.7 % sensitivity; 71.4 % PPV) and 2 false-positives were noted (94.4 % specificity). These findings demonstrate that the DRE fails to act as an appropriate screening tool and also does not alter the clinical management of the patient, as the majority underwent additional testing regardless of negative DRE findings.

We can also evaluate the sensitivity of the DRE performed in injuries confirmed by exploratory laparotomy. Thirty-nine injuries were confirmed by exploratory laparotomy (41.9 % disease prevalence), only 2 injuries were correctly screened by the DRE (5.1 % sensitivity; 100 % PPV), and no false-positives were noted. These findings demonstrate that the DRE fails to accurately screen for injuries prior to surgery and does not alter clinical management, as the majority of patients went to the operating room regardless of the DRE findings.

There are several limitations to this study. The retrospective nature of our data collection did not provide the benefit of a randomized, controlled study. The small number of injuries, such as rectal injuries and urethral injuries, makes statistical calculation less persuasive. Various trauma team members, ranging from the intern to the attending, performed the DRE, which eliminates a consistent examination for each patient. The most concerning aspect are missed injuries on a DRE if performed by a less-experienced trauma team member [8, 9]. The performance of the DRE in less than ideal conditions often renders a thorough DRE unlikely. The threat of violence to the trauma team and DRE provider should not be understated. The incidence of violence in the emergency department setting is well described [10–14] and often occurs in a situation of “adverse stimulation” of the patient [15], such as a DRE.

Conclusions

The DRE demonstrated poor sensitivity for the diagnosis of spinal cord, urethral, small bowel, colon, and rectal injuries. Our findings suggest the omission of the DRE from the trauma work-up will not alter the patient's clinical care, will eliminate unnecessary clinical risks to the trauma team, and will also remove an unpleasant experience for the patients.

Conflict of Interest The authors have no financial conflicts of interest to disclose.

References

1. American College of Surgeons Committee on Trauma. Abdominal and pelvic trauma. Advanced Trauma Life Support®: ATLS® student course manual. 9th ed. Chicago, IL: American College of Surgeons; 2012: 127–129

2. Esposito TJ, Ingraham A, Luchette FA, Sears BW, Santaniello JM, Davis KA, Poulakidas SJ, Gamelli RL (2005) Reasons to omit digital rectal exam in trauma patients: no fingers, no rectum, no useful additional information. *J Trauma* 59(6):1314–1319
3. Shlamovitz GZ, Mower WR, Bergman J, Crisp J, DeVore HK, Hardy D, Sargent M, Shroff SD, Snyder E, Morgan MT (2007) Lack of evidence to support routine digital rectal examination in pediatric trauma patients. *Ped Em Care* 23(8):537–543
4. Ball CG, Jafri SM, Kirkpatrick AW, Rajani RR, Rozycki GS, Feliciano DV, Wyrzykowski AD (2009) Traumatic urethral injuries: does the digital rectal examination really help us? *Injury* 40(9):984–986
5. Guldner GT, Brzenski AB (2006) The sensitivity and specificity of the digital rectal examination for detecting spinal cord injury in adult patients with blunt trauma. *Am J Emerg Med* 24(1):113–117
6. Johnson MH, Chang A, Brandes SB (2013) The value of digital rectal examination in assessing for pelvic fracture-associated urethral injury: what defines a high-riding or nonpalpable prostate? *J Trauma Acute Care Surg* 75(5):913–915
7. Leaphart CL, Danko M, Cassidy L et al (2006) An analysis of proctoscopy vs computed tomography scanning in the diagnosis of rectal injuries in children: which is better? *J Pediatr Surg* 41(4):700–703
8. Smith D, Catalona W (1995) Inter examiner variability of digital rectal examination in detecting prostate cancer. *Urology* 45:70–74
9. Eckardt V, Kanzler G (1993) How reliable is digital rectal examination for the evaluation of anal sphincter tone? *Int J Colorectal Dis* 8:98–107
10. Blanchard JC, Curtis KM (1999) Violence in the emergency department. *Emerg Med Clin North Am* 17:717–731
11. Lavoie FW, Carter GL, Danzi DF, Berg RL (1988) Emergency department violence in United States teaching hospitals. *Ann Emerg Med* 17:1227–1233
12. Foust D, Rhee KJ (1993) The incidence of battery in an urban emergency department. *Ann Emerg Med* 22:583–585
13. Pane GA, Winarski AM, Salness KA (1991) Aggression directed toward emergency department staff at a university teaching hospital. *Ann Emerg Med* 20:283–286
14. McAneney CM, Shaw KN (1994) Violence in the pediatric emergency department. *Ann Emerg Med* 23:1248–1251
15. Winstanley S, Whittington R (2002) Violence in a general hospital: comparison of assailant and other assault-related factors on accident and emergency and inpatient wards. *Acta Psychiatr Scand* 106:144–147