Traumatic rectal injuries: Is the combination of computed tomography and rigid proctoscopy sufficient?

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BACKGROUND: There are no clear guidelines for the best test or combination of tests to identify traumatic rectal injuries. We hypothesize that computed tomography (CT) and rigid proctoscopy (RP) will identify all injuries.

METHODS: American Association for the Surgery of Trauma multi-institutional retrospective study (2004–2015) of patients who sustained a traumatic rectal injury. Patients with known rectal injuries who underwent both CT and RP as part of their diagnostic workup were included. Only patients with full thickness injuries (American Association for the Surgery of Trauma grade II-V) were included. Computed tomography findings of rectal injury, perirectal stranding, or rectal wall thickening and RP findings of blood, mucosal abnormalities, or laceration were considered positive.

RESULTS: One hundred six patients were identified. Mean age was 32 years, 85(79%) were male, and 67(63%) involved penetrating mechanisms. A total of 36 (34%) and 100 (94%) patients had positive CT and RP findings, respectively. Only 3 (3%) patients had both a negative CT and negative RP. On further review, each of these three patients had intraperitoneal injuries and had indirect evidence of rectal injury on CT scan including pneumoperitoneum or sacral fracture.

CONCLUSION: As stand-alone tests, neither CT nor RP can adequately identify traumatic rectal injuries. However, the combination of both test demonstrates a sensitivity of 97%. Intraperitoneal injuries may be missed by both CT and RP, so patients with a high index of suspicion and/or indirect evidence of rectal injury on CT scan may necessitate laparotomy for definitive diagnosis. (*J Trauma Acute Care Surg.* 2018;85: 1033–1037. Copyright © 2018 Wolters Kluwer Health, Inc. All rights reserved.)

LEVEL OF EVIDENCE: Diagnostic, level IV.
KEY WORDS: Proctoscopy; computed tomography; diagnosis of rectal injuries.

While the management of rectal injuries continues to evolve, there is no clear evidence suggesting the most appropriate diagnostic strategy. Options for investigation include digital rectal examination, computed tomography (CT), proctoscopy, and contrast enema. Digital rectal examination, while an important part of the physical examination in select patients, has low sensitivity for lower gastrointestinal tract injury, and contrast-enhanced enema is not typically readily available the acute setting[1]

Rigid proctoscopy (RP) and CT are both more readily available, and some consider proctoscopy the gold standard for identification of rectal injuries.[2] Rigid proctoscopy allows for direct visualization of the rectal lumen, however stool burden in unprepped bowel can hinder visualization and lead to false negative results, which has been reported to be as high as 31%.[3] There is also the potential for exacerbating an existing injury with the proctoscope, and despite the surgical dogma surrounding the use of RP, evidence supporting its use is weak.

Computed tomography has become essential in the evaluation of hemodynamically stable trauma patients. The technology has greatly improved over the last two decades and has been reported to have a sensitivity and specificity for intra-abdominal injury as high as 95%.[4] Despite this advancement, reported sensitivity of CT for hollow viscous injury is lower, ranging from 53% to 86%.[5–7] Furthermore, data specific to rectal injuries is limited. There is also limited data directly comparing CT and RP in rectal trauma. In one comparison in the pediatric population, the authors concluded that CT was as accurate as RP for the diagnosis of rectal injuries, however this study is limited by a small sample size.[8]

Despite the routine use of both RP and CT for the evaluation of possible rectal injuries, there is no clear evidence supporting a diagnostic strategy. The purpose of our study is to evaluate the diagnostic accuracy of these two tests. We hypothesize that the combination of both RP and CT will identify all rectal injuries.

METHODS

This is a descriptive report of a subset of patients identified in a recently published American Association for the Surgery of Trauma (AAST)-sponsored multicenter study.[9] The purpose of this main study was to perform a multicenter study with a large enough sample size to draw meaningful conclusions regarding the management of traumatic rectal injuries. A total of 785 patients were included in the analysis after exclusions. Data regarding patients who sustained traumatic rectal injuries between 2004 and 2015 were gathered from 22 Level I trauma centers across the United States. Each participating center submitted retrospectively collected data from their registry and chart review regarding demographics, mechanism of injury, admission physiology, Injury Severity Scores (ISS), location and grade of rectal injury, associated injuries, diagnostic tests performed, and the management of rectal injury. Patients were included if they had a reported rectal injury and were excluded if they died prior to management of their rectal injury or within 48 hours of admission.

For the current study, we identified patients from the main data set who underwent both CT and RP as part of their evaluation with a full thickness rectal injury (AAST grade II–V,

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Table 1).[10] Data regarding patient demographics, mechanism of injury, ISS, location of rectal injury (intraperitoneal [IP] or extraperitoneal) was abstracted from the data set. The grade, location, and management of injures was determined by the original institution. We chose to study these two diagnostic tests as CT and RP are two of the most commonly obtained studies in the early workup of potential rectal injuries. Patients were excluded if they died prior to management of their rectal injury or within 48 hours of admission.

All patients in the data set had known rectal injuries based on operative findings, and the accuracy of their CT and RP results was evaluated. Computed tomography findings considered positive were rectal injuries, perirectal stranding, and rectal wall thickening. Rigid proctoscopy findings considered positive were blood, mucosal abnormalities, and laceration. Primary outcomes included the accuracy of each diagnostic study, and as all patients within our data set had known rectal injuries, sensitivity was calculated using true positives and false negatives. This study was approved by each participating institution's institutional review board.

RESULTS

There were 106 patients who sustained a full thickness rectal injury and underwent both CT and RP. The population was 32 ± 11 years old, 79% male, 34% white, and 63% sustained penetrating trauma. The study population had an average ISS of 19 ± 12 and abdominal Abbreviated Injury Score of 3 ± 1. Severity of rectal injury included 49% grade II, 23% grade III, 25% grade IV, and 3% grade V. Overall, 15% of patients sustained an IP injury and 85% sustained an extraperitoneal injury (Table 2). Fourteen (13%) patients were managed with primary repair alone, no patients received resection with primary anastomosis, 68 (64%) patients were managed with proximal diversion alone, and 24 (23%) patients were managed with a combination of primary repair and proximal diversion.

A total of 36 (34%) and 100 (94%) patients had positive CT and RP findings, respectively. As all patients had a known rectal injury, this yields a sensitivity of 34% for CT and 94% for RP. The combination of both tests demonstrated a sensitivity of 97%. When stratified by injury location, RP was more sensitive than CT for both IP and extraperitoneal injuries, and in both blunt and penetrating mechanisms (Table 3). The most common findings on RP were a rectal laceration (68%), gross blood (34%), and mucosal contusion (2%), while CT scan findings included an obvious rectal injury (25%), rectal wall thickening (8%), and perirectal stranding (2%)(Table 4).

TABLE 1. AAST Rectal Injury Scale

Grade	Type of Injury	Description of Injury
I	Hematoma	Contusion or hematoma without devascularization
	Laceration	Partial-thickness laceration
II	Laceration	Laceration <50% of circumference
III	Laceration	Laceration ≥50% of circumference
IV	Laceration	Full-thickness laceration with extension into perineum
V	Vascular	Devascularized segment

TABLE 2. Demographics and Injury Patterns

Age (yr)	31.5 ± 10.8
Male sex	85 (79%)
White race	36 (34%)
Mechanism	
Penetrating	67 (63%)
Blunt	39 (37%)
Admission pulse (beats per minute)	98.0 ± 24.8
Admission systolic blood pressure (mm Hg)	121.4 ± 26.9
Admission Glasgow Coma Scale	14 ± 2.9
ISS	19.3 ± 11.6
Head Abbreviated Injury Score	0.15 ± 0.56
Face Abbreviated Injury Score	0.15 ± 0.53
Neck Abbreviated Injury Score	0.04 ± 0.19
Thoracic Abbreviated Injury Score	0.58 ± 1.26
Abdominal Abbreviated Injury Score	3.24 ± 1
Spine Abbreviated Injury Score	0.38 ± 0.80
AAST injury grade	
II	52 (49%)
III	24 (23%)
IV	27 (25%)
V	3 (3%)
Location of injury	
Intraperitoneal	16 (15%)
Extraperitoneal	79 (75%)
Both	11 (10%)

Only 33 (31%) patients had both a positive CT and positive RP and in three (3%) patients both diagnostic tests were negative (Fig. 1). Two patients with false-negative results on both studies had high grade (≥III) IP injuries resulting from penetrating trauma that were identified on laparotomy and received a proximal diversion for treatment. Although neither of these patients had a direct CT finding of rectal injury, they both had pneumoperitoneum on CT. The third patient with dual false

TABLE 3. Diagnostic Study Sensitivity by Rectal Injury Location and Mechanism

Location	Sensitivity
Intraperitoneal (n = 16)	
CT	50%
RP	75%
Extraperitoneal (n = 79)	
CT	32%
RP	99%
Combined (n = 11)	
CT	27%
RP	91%
Mechanism	Sensitivity
Blunt (n = 39)	
CT	31%
RP	97%
Penetrating (n = 67)	
CT	36%
RP	93%

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TABLE 4. Diagnostic Study Findings. Some Patients Had Multiple Findings on each Diagnostic Study

RP Findings	n
Blood	36
Mucosal contusion	2
Laceration	72
Multiple findings	10
CT findings	
Rectal injury	26
Rectal wall thickening	9
Perirectal stranding	2
Multiple findings	1

negative studies had a grade II IP injury after a blunt trauma mechanism and received a proximal diversion. Unlike the previous two described patients, the only other CT findings were pelvic fractures and a perineal soft tissue injury.

DISCUSSION

Despite the frequent use of both RP and CT for the evaluation of possible rectal injuries, there is no clear evidence supporting a diagnostic strategy. We sought to evaluate a multicenter retrospectively collected data set to evaluate the utility of these diagnostic studies. Our data show that the combination of both RP and CT will identify 97% of rectal injuries.

In one of the few existing comparisons between RP and CT, Leaphart et al.[11] retrospectively identified 24 pediatric patients with a rectal injury. Of 18 patients who underwent either CT or RP (nine in each group), three patients had a missed injury. Two were missed by initial evaluation with RP, and the other by CT without contrast. Based on these results, the authors concluded that CT was at least as accurate at RP, and recommended selective use of RP, specifically in combination with CT when a high suspicion for injury exists. In contrast, our results show that the sensitivity of RP (94%) far exceeds that of CT (34%) for rectal injury. However, when used in combination, CT does add diagnostic value, raising the diagnostic accuracy to 97%.

The majority of injuries were identified on RP, with false-negative CT results in approximately two thirds of patients. This is interesting, as the reported sensitivity of CT for hollow viscous injuries this is 53% to 86% in recent studies.[5–7] One previously published study in a military population including 10 patients with rectal injuries, the authors reported a 100% sensitivity of CT.[12] Unlike our study design, this study included perirectal air as a positive radiographic finding, and this was seen in all 10 patients with a rectal injury. Findings we considered as indicative of a rectal injury, such as rectal wall thickening and fat stranding, were seen in only half of their study population. Although findings such as pneumoperitoneum and free fluid are suggestive of hollow viscous injury, they are not specific to rectal injures, and we chose to only consider direct CT findings of rectal injury as having positive results. While perirectal air may arguably be a convincing sign of a rectal injury, our data set was inconsistent in distinguishing this finding from pneumoperitoneum. Therefore, we were unable to include this radiographic finding in our evaluation. Future studies evaluating these diagnostic tests should aim to investigate its value in the CT diagnosis of rectal injuries.

Furthermore, CT was especially poor at identifying extraperitoneal (EP) injuries. One potential explanation for this finding may be a lack of rectal contrast administration. Our data set did not specifically require the details of CT scanning protocols, and therefore we are unable to account for the effect of contrast in our analysis. On the other hand, RP identified 94% of all injures, 75% of intraperitoneal (IP) injuries, and 98% of the EP injuries. While more recent literature detailing the sensitivity and specificity of RP for rectal injuries is lacking, this is consistent with previously reported diagnostic accuracy rates of 80% to 100%.[13–15]

As mentioned above, one the limitations of our study is secondary to the retrospective design and inability to account for specific variables outside of those collected within our data set. Moreover, the variables we were able to collect are also subject to data recording and entry errors. While the complete AAST multicenter data set includes a large number of patients with rectal injuries, we were only able to identify a small percentage that met our inclusion criteria, and therefore our study is further limited by a small sample size. Additionally, our entire cohort includes patients with known rectal injuries, and therefore we are unable to calculate specificity, and positive and negative predictive values. Future studies should be designed with a patient population that would allow determination of these values, as this would better add to our understanding of our diagnostic options.

In conclusion, our findings show that, although standard in the workup of hemodynamically stable trauma patients, CT has a poor sensitivity for rectal injuries. Practitioners should perform RP when there is a concern for rectal trauma, as the

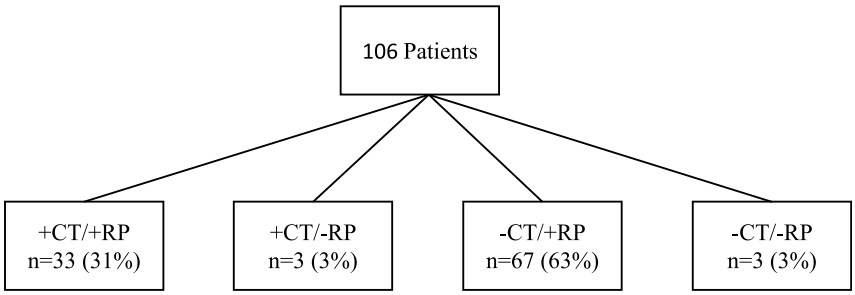

Figure 1. Combinations of CT and RP results.

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combination of these two tests will identify 97% of injuries. When a high index of suspicion remains, a low threshold to perform a laparotomy is necessary to avoid morbidity from a delayed diagnosis, as there is a small subset of intraperitoneal injuries that will be missed.

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AUTHORSHIP

M.D.T., J.V., C.V.R.B. participated in the literature search. M.D.T., J.V., C.V.R.B. participated in the study design. M.D.T., J.V., C.V.R.B., J.P.S., T.M., J.H., E.B., B.B., H.A.H., M.T., C.B., M.S., J.S., J.V., B.E., A.C., R.V., G.V., E.C., J.H., R.C., P.B., S.G., P.G.B. participated in the data collection. M.D.T., J.V., C.V.R.B. participated in the data analysis. M.D.T., J.V., C.V.R.B. participated in the data interpretation. M.D.T., J.V., C.V.R.B. participated in the writing. M.D.T., C.V.R.B. participated in the critical revisions.

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