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Review Article

Rectal Trauma: Uncommon, Challenging, And A Critical Injury to Recognize

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Abstract

Although rectal injury is uncommon, it can lead to a diagnostic conundrum. One must keep a high index of suspicion based on the mechanism of injury. The rectal injury can result from blunt or penetrating trauma. In order to prevent morbidity and mortality an early diagnosis is essential. A high index of suspicion and appropriate diagnostic modality help to make the diagnosis.

Keywords: rectal injury; rectal injury classification; epidemiology; management of rectal injury; complications

Introduction

Although uncommon rectal trauma is an important injury to recognize. Its unique peritoneal reflection leads to an intra-peritoneal and extra-peritoneal parts and as a result the management priorities differ. Rectal injury can result from blunt or penetrating trauma. These injuries can lead to hematoma, laceration with or without vascular disruption leading to life threatening situation. Early recognition and treatment results in low morbidity and mortality. This mini review will focus on embryology, anatomy, physiology, clinical features, diagnosis, and treatment of trauma to the rectum.

Embryology:

The gastrointestinal tract (GI) develops during the fourth-week of gestation. The GI tract initially originates from the endoderm, divides into three segments consisting of foregut, midgut, and the hind gut. The hindgut contributes to the development of the rectum.

Anatomy:

Peritoneal reflection of the rectum (Figures 1 and 2):

The upper third of the rectum is covered by the peritoneum anteriorly and laterally, the middle third of the rectum on the other hand is covered by the peritoneum only anteriorly, while the lower third of the rectum is extraperitoneal including most of the posterior aspect. Therefore, after an extraperitoneal rectal injury there is no fecal spillage into the peritoneum. The peritoneal reflection occurs 6-8 cm. from the anal verge.

The rectum is 12-15 cm in length. The rectum is surrounded by mesorectum which consists of fibrofatty tissue for most of its length. It contains vessels, nerves, and lymph nodes of the rectum. The rectum consists of three curvatures with two of them having convexity on the right and one having convexity on the left side (Figure 1). The valve of Houston involving three distinct submucosal fold, extend into the lumen of the rectum. Presacral facia separates the rectum from the presacral venous plexus and pelvic nerves. The Waldeyer's facia (retroscaral facia) extends in front and distally at S4 and attaches to the facia propria at the anorectal junction. Denonvillier's facia separates the rectum from the prostate and seminal vesicles in men and the vagina in women. The lower rectum is supported by the lateral ligaments.

The rectal wall consists of four distinct layers, namely, an inner mucosa, submucosa, muscle layer comprised of an inner circular and an outer longitudinal layer, and an outer serosa. The outer longitudinal layer divides into three teniae coli which converge distally at the rectum forming a circumferential coating. The inner muscle layer merge at the distal rectum forming the internal sphincter. The proximal third of the rectum is enclosed by serosa whereas mid and lower third lack a serosal layer.

Blood supply:

Arterial supply:

The rectum is supplied by the superior rectal artery arising from the inferior mesenteric artery that supplies the upper rectum. In addition, the middle rectal artery arising from the internal iliac, the inferior rectal artery arising from the internal pudental artery, a branch of internal iliac artery also supplies the rectum. Therefore, the rectum receives more than adequate blood supply making it impervious to ischemia.

Venous drainage:

The venous drainage of the rectum matches the arterial supply. The superior rectal vein drains into the inferior mesenteric vein carrying the blood into the portal system. The middle rectal vein drains into the internal iliac vein. The inferior rectal vein carries blood into internal pudental vein finally joining the internal iliac vein. Hemorrhoidal plexus of the submucosal plexus drains into all three veins.

Lymphatic drainage:

Lymphatics from upper and middle rectum drain into the inferior mesenteric lymph nodes. Lymphatic vessels from the lower rectum drain into the inferior mesenteric lymph node and the internal iliac lymph nodes.

Innervation:

The rectum is innervated by sympathetic as well as parasympathetic nerves. L1 to L3 supply sympathetic nerve fibers that join preaortic plexus. The preaortic nerve fibers form hypogastric plexus below the aorta and afterwards join the parasympathetic to form the pelvic plexus. The parasympathetic fibers that originate from S2 to S4 are also named as nervi erigentes join sympathetic fibers to form pelvic plexus. The rectum is relatively numb. [1, 2]

Histology:

The distal rectal mucosa contains crypts that are shorter, a little wide spread, and do not extend into the muscularis mucosae. The crypts are less in number and dilated or twisted. The surface epithelium is cuboidal. The lamina propria contains lymphocytes, plasma cells, macrophage in moderate numbers, and a few neutrophils. [3]

Physiology:

The rectum serves as a reservoir for the fecal matter. Reservoir function depends upon the compliance of the rectum, pressure differences, and angulation between the rectum and the anal canal which in turn depends upon the tonic contraction of the puborectalis muscle. Anal continence depends on the anorectum to differentiate solid, liquid, gas phase of the fecal matter as well as voluntary and involuntary control. The internal and external sphincters of the anus also contribute to the anal continence. Increase in intra-abdominal pressure such as coughing, sneezing, Valsalva maneuver, and postural change elevate the resting tone of the external sphincter via anal reflex. [4] Afferents in the sacral dorsal roots consists of mechanoreceptors situated in the wall of the rectum monitor filling state of the rectum and its contraction level. [5] The previously mentioned factors help to store fecal matter in the rectum at rest. The distension of the rectum sends signal to initiate defecation. Peristalsis in the colon propels fecal matter down into the rectum several times a day. [6] Distension of the rectum results in relaxation of the internal sphincter (recto-anal inhibitory reflex) and the contraction of the external sphincter maintains continence. The angulation between rectum and anal straightens during crouching. The pressure generated from Valsalva maneuver overcomes the resistance offered by the external sphincter and the pelvic floor descends. Inhibitory signals to the external sphincter results in its relaxation expelling the fecal material. Basic reflexes of anorectum as well as environmental factors via cortical inhibition plays a role in the process. [7]

Grade	Type	Description	Treatment
I	Hematoma	Contusion or hematoma without devascularization	No intervention
	Laceration	Partial thickness	No intervention
II	Laceration	<50% of circumference	
III	Laceration	>50% of circumference	
IV	Laceration	Full thickness with extension into the peritoneum	
V	Vascular	Devascularized segment	

Table 1: Rectal Organ Injury Scale [8]:

This injury scale is more theoretical than practical as management decisions are based on whether the rectal injury is intra or extraperitoneal.

Classification of injury to the rectum

1. Intra or extra peritoneal

2. Non-destructive defined as injury involving <50% of the rectal circumference or destructive involving more than 50% of the rectal circumference with malperfusion,

3. Multiple rectal injuries in close proximity. [9]

Epidemiology:

The incidence of the rectal injury constitutes about 0.1%. Although both blunt and penetrating trauma involve the rectum, penetrating trauma is more common occurring in 85% of the reported cases. [10] Gun shot injuries are the most common form of penetrating trauma [11]. Blunt trauma follows from avulsion type of injuries secondary to high energy process. Foreign bodies lead to grade 1 injury and rarely full-thickness trauma. [12] Injury to the intraperitoneal rectum occurs 30% of the time, 60% of time the extraperitoneal rectum is involved, and with both involved in 10% of the cases. [11]

Diagnosis:

The diagnosis is undertaken during secondary survey of a trauma victim unless there are other life-threatening injuries which need attention. A high degree of suspicion is essential in order not to miss the diagnosis of an injured rectum which otherwise can lead to a poor outcome.

History and physical examination:

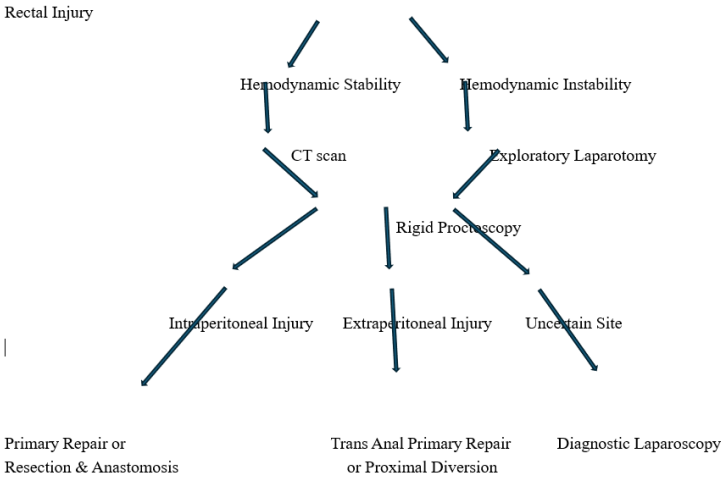
A good history including the mechanism of injury helps to suspect rectal injury. Any penetrating injury to the groin, perineum, buttocks, sacrum, and upper thigh must lead to suspicion of injury to the rectum. Major pelvic and perineal injuries involving fracture to the pelvic bones following blunt trauma must also raise suspicion for rectal injury. Hematuria must increase suspicion of injury to the rectum, since a third of the patients may also have concomitant injury to the bladder. (13) Although rectal examination is an important aspect of physical exam, it has a very low diagnostic yield and must be avoided under certain circumstances such as pelvic gunshot wounds. [14] However, the presence of blood, evident defect has 100% specificity for the rectal injury. [14] The palpation of bony fragment on rectal exam indicates pelvic fracture. A normal rectal exam does not rule out injury to the rectum.

The best studies for diagnosing trauma to the rectum includes a combination of Computerized Tomography scan (CT) of the abdomen and pelvis, and a rigid proctoscopy which has a sensitivity of 97%. CT

examination is undertaken only in hemodynamically stable patients. A contrast enhance CT is of no value and is not indicated because catheter balloon may obscure extraperitoneal rectum, additional time involved in administration of the contrast media, and the risk of pelvic infection from contamination. [15] Findings on the CT for the rectal injury includes rectal wall thickness, rectal wall defect , and perirectal cutoff. However, CT cannot differentiate intraperitoneal versus extraperitoneal injury which is critical in making a therapeutic judgement. When one is faced with such a predicament, then a rigid proctoscopy is recommended. (16] In injuries involving the mid rectum, it may be difficult or if not impossible to differentiate intraperitoneal versus extraperitoneal location of trauma and in such instances a diagnostic laparoscopy or laparotomy is undertaken. [17]

Treatment:

Treatment is dictated by intraperitoneal versus extraperitoneal rectal injury. In hemodynamically unstable patients hemostasis takes precedence if there is suspected or obvious bleeding. The following flow chart summarizes the treatment options (Flow diagram 1):



Flow Diagram 1:

Presacral drainage:

Presacral drainage although not favored in most patients is applicable in a highly selective group of patients such as those that are elderly with comorbid conditions and greater amount of fecal spillage into the presacral area due to a large rectal defect. [18]

Complications:

Complications involve infection, stenosis, and fistulae. Infective complications include abscess formation, soft tissue infection, and sepsis. Those that suffer from pelvic fracture are at elevated risk for infection. A short postoperative antibiotic may be helpful to reduce infection. It is suggested that a 24-hour course of antibiotic for intraperitoneal injury and 3-5 days of antibiotic use in those with extraperitoneal injury. Antibiotics that treat both gram negatives and anaerobes are used. Stenosis is minimized by making sure that the lumen of the gut is widely patent after repair as well as making sure that the opposing surfaces of the gut are healthy prior to anastomosis. Some individuals may need dilatation or surgical correction if they experience severe symptoms of stenosis. Fistula formation may involve retro-vesical and retro-urethral parts and is prevented by using omental patch between the anatomical parts. [19]

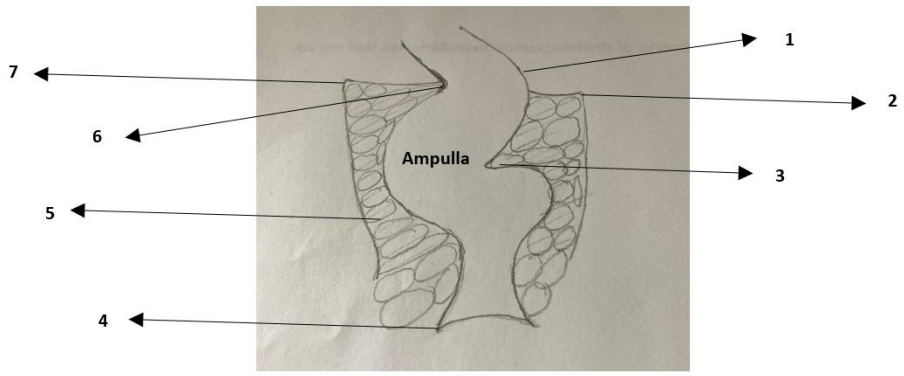


Figure 1: Anatomy of the Rectum

1. Left upper valve of Houston4, 2. Left Peritoneum, 3. Left lower vale of Houston, 4. Anal verge,

5. Lateral ligament, 6. Right upper valve of Houston, 7. Right peritoneum.

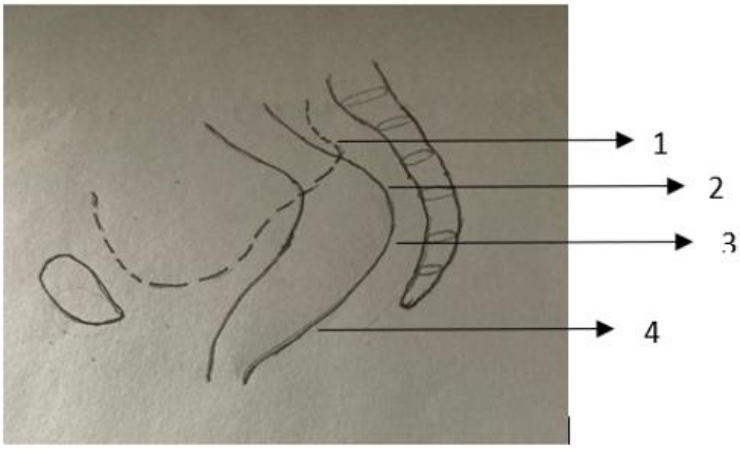


Figure 2: Parts of the Rectum

Peritoneal reflection, 2. upper third, 3. Middle third, 3. lower third of the rectum.

Conclusion:

Although rectal injury is uncommon, the consequences of missing the diagnosis are profound. A high degree of suspicion is essential to make a diagnosis. A CT scan with proctoscopy is valuable in establishing the diagnosis. An intraperitoneal injury requires laparotomy and anastomosis with or without resection whereas an extraperitoneal injury requires a diversion procedure. In case if the site of the rectal injury is unknown then a laparoscopy helps to establish the site of injury. A timely approach and treatment minimize the morbidity and mortality associated with rectal injuries.

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Conflict of Interest:

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