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Fecal continence following complex anorectal trauma in children

Katie W. Russell *, Elizabeth S. Soukup, Ryan R. Metzger, Sarah Zobell, Eric R. Scaife, Douglas C. Barnhart, Michael D. Rollins

Division of Pediatric Surgery, Primary Children's Medical Center, University of Utah, Salt Lake City, UT

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ABSTRACT

Background: Complex injuries involving the anus and rectum are uncommon in children. We sought to examine long-term fecal continence following repair of these injuries.
Methods: We conducted a retrospective review using our trauma registry from 2003 to 2012 of children with traumatic injuries to the anus or rectum at a level I pediatric trauma center. Patients with an injury requiring surgical repair that involved the anal sphincters and/or rectum were selected for a detailed review.
Results: Twenty-one patients (21/13,149 activations, 0.2%) who had an injury to the anus ($n = 9$), rectum ($n = 8$), or destructive injury to both the anus and rectum ($n = 4$) were identified. Eleven (52%) patients were male, and the median age at time of injury was 9 (range 1–14) years. Penetrating trauma accounted for 48% of injuries. Three (14%) patients had accompanying injury to the urinary tract, and 6 (60%) females had vaginal injuries. All patients with an injury involving the rectum and destructive anal injuries were managed with fecal diversion. No patient with an isolated anal injury underwent fecal diversion. Four (19%) patients developed wound infections. The majority (90%) of patients were continent at last follow-up. One patient who sustained a gunshot injury to the pelvis with sacral nerve involvement is incontinent, but remains artificially clean on an intense bowel management program with enemas, and one patient with a destructive crush injury still has a colostomy.
Conclusions: With anatomic reconstruction of the anal sphincter mechanism, most patients with traumatic anorectal injuries will experience long-term fecal continence. Follow-up is needed as occasionally these patients, specifically those with nerve or crush injury, may require a formal bowel management program.

Injuries involving the anus and rectum in children are rare and are often associated with injuries to the bony pelvis and genitourinary system. Limited data exist regarding the long-term fecal continence following management of these injuries. Much of the literature to date relates to selective fecal diversion and immediate postoperative complications. We reviewed our experience specifically examining long-term fecal continence.

1. Methods

After obtaining approval from the institutional review board, we conducted a retrospective review of all children with injury to the anus or rectum treated at our level 1 pediatric trauma center from January 2003 through December 2012. Patients were identified using our trauma registry and the electronic charts were reviewed to select only patients who required operative repair of the injury. Injuries to the anus not involving the anal sphincters were excluded. Patient information including demographics, mechanism of injury, associated injuries, Injury Severity Score (ISS), diagnostic studies, surgical treatment, postoperative complications and long-term bowel function were collected from inpatient records and outpatient follow-up charts.

2. Results

The prevalence of anorectal injury at our center during the 10-year period was 0.2% (21/13,149). The median age at the time of injury of was 9 years (range 1–14 years), and 11 patients (52%) were male. Nine (43%) patients had an injury involving the anus, 8 (38%) had rectal injuries and 4 (19%) had destructive injuries to both the anus and rectum (Table 1). Ten (83%) patients with a rectal injury had an extraperitoneal component and only two (17%) were isolated intraperitoneal injuries. Forty-eight percent of the injuries were the result of penetrating mechanisms. The blunt mechanisms were separated into blunt trauma (33%) and straddle injury (19%). The straddle injuries all had sphincter involvement by blunt force but were isolated and thus considered separately from high-force blunt mechanisms (motor vehicle crash, pedestrian rollover, all-terrain vehicle crash) that resulted in more destructive anorectal injuries and accompanying injury to other organ systems. The median ISS was 13 (range 1–42), and was generally higher in patients who had blunt trauma (median 26), in contrast to those with straddle injuries (median 3) and penetrating trauma (median 13). Common associated

* Corresponding author. Tel.: +1 801 662 2950; fax: +1 801 662 2980.
E-mail address: Katie.Russell@hsc.utah.edu (K.W. Russell).

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Table 1
Summary of patient characteristics, management and outcomes.

Injury location	ISS median (range)	Mechanisms	Penetrating	Associated injuries	Fecal diversion	Fecal continence
Anus ($n = 9$)	4 (1–34)	Straddle ($n = 4$) AVP ($n = 2$) Rope burn ($n = 1$) Impalement ($n = 1$) Sexual abuse ($n = 1$)	22%	Vagina ($n = 4$) Pelvis fx ($n = 2$) Tibia fx ($n = 1$) Pulmonary contusion ($n = 1$)	None	100%
Rectum ($n = 8$) Intraperitoneal ($n = 2$) Extraperitoneal ($n = 5$) intra/extra ($n = 1$)	15 (4–42)	Impalement ($n = 3$) MVC ($n = 2$) Sexual abuse ($n = 1$) ATV crash ($n = 1$) Stab wound ($n = 1$)	63%	Bladder ($n = 3$) Vagina ($n = 2$) Pelvis fx ($n = 2$) Leg laceration ($n = 1$) Small Bowel ($n = 1$) Pulmonary contusion ($n = 1$)	All	100%
Anus + rectum ($n = 4$) Intraperitoneal ($n = 0$) Extraperitoneal ($n = 2$) Intra/extra ($n = 2$)	15 (9–22)	Gunshot ($n = 1$) Impalement ($n = 1$) Boat propeller ($n = 1$) AVP ($n = 1$)	75%	Pelvis fx ($n = 1$) Sacrum fx ($n = 1$) Leg laceration ($n = 1$) Cecum ($n = 1$)	All	50%[a]

AVP: automobile versus pedestrian, MVC: motor vehicle crash, ATV: all-terrain vehicle, fx: fracture.
[a] One is artificially clean with enemas and one still has a colostomy.

injuries included vaginal injury in 6 females (60%), injury to the urinary tract in 3 patients (14%) and pelvic fracture in 5 patients (24%). In the patients with urinary tract injury, all had an injury to the bladder (2 intraperitoneal, 1 extraperitoneal). One patient also had a urethral injury and 1 suffered a ureteral injury.

A preoperative CT scan of the abdomen and pelvis was performed in 83% ($n = 10$) of patients with rectal injury, and 22% ($n = 2$) of patients with an isolated anal injury. At our facility all patients with suspected anorectal injury receive rectal contrast, but given the large geographic area that we serve, patients are often transferred with imaging from other facilities (40%) and these scans commonly do not have rectal contrast. Two patients with an injury involving both the anus and rectum underwent a damage control operation at the referring facility prior to transfer. Rigid proctoscopy was used to evaluate the extent of the injury in five patients with rectal involvement, and one patient with an isolated injury to the anus. There were no missed injuries.

All patients with injury involving the anal sphincters underwent immediate repair. No patient with an isolated, nondestructive anal injury underwent fecal diversion. The four patients that had combined anal and rectal injuries all had destructive injury to the sphincters and were diverted at the time of primary repair. A muscle stimulator was used to facilitate an anatomical repair in patients with destructive injury to the anal sphincters. One patient who was impaled while climbing a fence had good sphincter muscle contraction in three of four quadrants following repair. Anorectal manometry performed prior to colostomy closure was normal and he is now continent of stool and flatus.

All patients with an injury to the rectum were managed with fecal diversion. Ten (83%) of these patients underwent primary repair of the rectal injury and two patients with an extraperitoneal injury were managed by drain placement and distal irrigation of the defunctionalized rectum. One patient was managed with an endorectal pull-through (Swenson type) and a protective loop ileostomy after suffering a destructive pelvic and spinal injury secondary to a gunshot wound. The endorectal pull-through was performed several days after a damage control laparotomy when the patient was physiologically stable. Three (25%) patients underwent diagnostic laparoscopy for evaluation of an intraperitoneal rectal injury. Two of these patients had the rectal injury repaired laparoscopically followed by a laparoscopic assisted loop sigmoidostomy. The third patient was diagnosed with a complex genitourinary injury on laparoscopy that required open repair.

The median length of stay for patients with a rectal injury was 11 days (range 4–52 days), and 2 days (range <1–10 days) in patients with an isolated anal injury. Four patients (19%) developed wound infections. Three of these were superficial perineal infections treated with local wound care and antibiotics. One patient, who had extensive perineal soft tissue loss after being crushed by a dump truck developed a deep infection that required a prolonged hospitalization, which included multiple operative debridements and eventual wound coverage with a muscle flap and skin graft.

Eleven of the 12 patients that had fecal diversion have undergone stoma closure. Median time to stoma closure was 103 days (range 46 days to 8.1 years). Median follow-up for patients with rectal or combined injuries was 134 days (69 days to 8.3 years) and 12 days (0-43 days) for patients with an isolated injury to the anus. The patient who underwent an endorectal pull-through after a gunshot injury to the pelvis with sacral nerve involvement has had her ileostomy closed and is incontinent of stool but is accident free with an intense bowel management program using large-volume enemas. The patient who suffered a crush injury from a garbage truck has not had his stoma reversed because of absent rectal tone and a fragile, skin grafted perineum. All other patients (90%) were continent of stool at the last follow-up visit.

3. Discussion

Pediatric anorectal injuries are uncommon and preservation of fecal continence is an important component of management in these patients. This is one of the largest series in children with anorectal injuries examining long-term fecal continence. With appropriate management continence should be expected. It is also important to recognize that there are frequently associated injuries to the genitourinary tract [1–4].

Anorectal injuries should be evaluated with priorities focusing on the location and extent of the injury (intraperitoneal vs. extraperitoneal) and identification of associated genitourinary injuries as delay in diagnosis has been shown to lead to an increase in morbidity and mortality [3,5]. Patients most commonly present with rectal bleeding [1,3]. While proctoscopy has been advocated in the past, a recent series suggests that triple-contrast CT (IV, oral, rectal) is highly accurate in diagnosing rectal injuries in children [6]. In addition, laparoscopy should be considered in the management of these injuries as both a diagnostic and therapeutic tool [7–9]. Injury to the urinary tract has been reported in up to 44% of children [10], and vaginal injury in 54% to 100% of females [3,4]. In our series, 14% had urinary tract injuries and 60% of female patients had vaginal injuries. Evaluation of the urethra and bladder with either cystography or cystoscopy is indicated in cases of high clinical suspicion [2,11,12], and vaginoscopy should be performed in female patients [11].