

# Anorectal injuries in children: a 20-year experience in two centers

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## Abstract

**Introduction** Anorectal injuries in children are not frequently reported and their management is challenging. This report reviews the experience in managing this type of injuries in two medical centers over 20 years.

**Methods** An institutional database search for patients who were treated for anorectal injuries between 1994 and 2015 was undertaken. Twenty cases were located and medical records reviewed. This study was conducted with institutional review board approval (#572-14).

**Results** There were 6 girls and 14 boys with ages ranging between 1 and 15 years (mean 7 years). Eleven patients sustained penetrating trauma, while nine sustained blunt trauma. The mechanism of injury was variable and associated injuries were more common in blunt trauma. Most common presenting symptoms were rectal bleeding ( $n = 12$ ) and anal pain ( $n = 11$ ), followed by abdominal pain in six patients. Eighteen anorectal injuries were extraperitoneal and two intraperitoneal. Among patients with extraperitoneal injuries, 12/18 were managed by primary repair with (6) or without (6) fecal diversion and 2/18 by wound irrigation and drainage with fecal diversion and delayed repair. Four patients had superficial anal and

perineal injuries that were irrigated and left to heal by secondary intention. Two patients with intraperitoneal rectal injuries underwent primary repair with fecal diversion. Follow-up period ranged from 2 weeks to 8 years (mean 2 years). There were three cases of wound infection, one case of suture line leak requiring reoperation and one case of vesicorectal fistula in a patient with combined trauma of the rectum and urinary bladder. There was no mortality. Fecal continence was preserved in all patients available for follow-up evaluation.

**Conclusions** Primary repair of the perineal wound and anal sphincters can be performed safely in most cases given hemodynamic stability. Fecal diversion should be saved for cases with severe perineal involvement or cases with substantial associated injuries and concern of gross contamination.

**Keywords** Anorectal injury · Anal sphincter repair · Perineal injury · Impalement

## Introduction

Injuries involving the anus and rectum in children are not frequently reported and their management is challenging. Rectal injuries encompass a broad spectrum of injuries, ranging from minimal laceration to avulsion and may be extra- and intraperitoneal. Treatment is dictated by the extent and location of injury. While traditional therapeutic strategies supported fecal diversion in all cases, in recent years there have been increased data supporting selective diversion. This report reviews the experience in managing these types of injuries in two medical centers over 20 years and provides recommendations on management, fecal diversion, and timing for anal sphincter repair.

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The paper is dedicated to the memory of Dr. Elad Feigin.

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## Patients and methods

An institutional database search for patients who were treated for anorectal injuries at Schneider's Children Medical center and Hillel Yaffe Medical center between 1994 and 2015 was undertaken. Twenty cases were located and medical records reviewed. Data were collected regarding patient demographics, mechanism and location of injury, associated injuries, presenting symptoms, treatment and complications, and post-trauma fecal continence. This study was conducted with institutional review board approval (#572-14).

## Results

There were 6 girls and 14 boys with ages ranging between 1 and 15 years (mean 7 years). Eleven patients sustained penetrating trauma, while nine sustained blunt trauma. The mechanism of injury was variable and included fall ( $n = 9$ ), motor vehicle accident ( $n = 6$ ), impalement ( $n = 4$ ), and broken thermometer ( $n = 1$ ). Among patients who suffered an impalement injury, two were as a result of fall on a toilet brush, one fell on a bush branch and another one on a broomstick. All four cases were accidents and all resulted in a full thickness extraperitoneal rectal injury that was primarily repaired. In addition, two patients underwent fecal diversion by a sigmoid colostomy. Among them, one patient had a perirectal intraperitoneal involvement as result of the trajectory of the penetrating object and another patient suffered a bladder rupture. The later presented with anal pain, rectal bleeding, and hematuria. On rectoscopy, a fluid drainage was observed through an anterior rectal wall laceration and cystography demonstrated an extraperitoneal leak of contrast material. Urinary bladder was decompressed using a urinary catheter that was removed 2 weeks later after a repeat confirmatory cystography. In one of the patients injured by a toilet brush, the object was brought to the emergency room and was found to have a sharp handle tip. This affected initial assessment and decision to proceed to advance imaging studies despite the minimal findings on physical examination.

Associated injuries were more common in blunt trauma with pelvic fracture being the most common ( $n = 5$ ) followed by extremity fractures ( $n = 3$ ), bladder injury, vaginal and urethra laceration (two patients each), degloving injury with gluteal detachment ( $n = 2$ ), and lung contusion ( $n = 1$ ). Two of five patients with pelvic fracture had an open book fracture with widening of symphysis pubis.

Most common presenting symptoms were rectal bleeding ( $n = 12$ ) and anal pain ( $n = 11$ ), followed by abdominal pain in six patients. Eighteen anorectal injuries

were extraperitoneal and two intraperitoneal. Among patients with extraperitoneal injuries, 12/18 were managed by primary repair with ( $n = 6$ ) or without ( $n = 6$ ) fecal diversion and 2/18 by wound irrigation and drainage with fecal diversion and 1 week delay in repair.

Diverting colostomy among patients with extraperitoneal injuries was performed based on avulsive nature of rectal and perineal injuries ( $n = 5$ ) and complexity of associated injuries ( $n = 7$ ). All patients with severe rectal and perineal injury had pelvic ring disruption ( $n = 5$ ). Four multi-trauma patients with extraperitoneal rectal injury, who were hemodynamically unstable upon arrival, were taken from the trauma bay directly to the operating room, for abdominal exploration and evaluation of severity of perineal injuries, after initial resuscitation. Two of them underwent fecal diversion, wound irrigation, and delayed repair after managing life-threatening conditions. Anal sphincter and perineal reconstruction were performed following stabilization and delayed by 1 week.

The other two patients were stabilized prior to laparotomy by angiographic embolization of retroperitoneal bleeding and initial fluid resuscitation measures. They had severe perineal injury that was managed with reconstructive surgery and fecal diversion. Muscle stimulator was used in six cases during anal sphincter repair to facilitate recognition of the sphincter mechanism limits.

Perineal examination under anesthesia was conducted to evaluate the extent of injury, involvement of anal sphincters as well as vagina and urethra, and degree of soft tissue loss.

Four of eighteen patients with extraperitoneal injuries had superficial anal and perineal injuries that were irrigated with antiseptics and saline and left to heal by secondary intention (without colostomy). Two patients with intraperitoneal rectal injuries and suspected perirectal contamination underwent primary repair and fecal diversion. Both presented with abdominal pain in addition to anal pain.

Diagnostic laparoscopy was used in two cases to evaluate imaging findings which raised suspicion of intraabdominal visceral injury. Such injury was excluded by laparoscopy in one case and validated in the other case.

Follow-up period ranged from 2 weeks to 8 years (mean 2 years). One patient was lost to follow-up. There were three cases of wound infection two of which were managed conservatively and one case of suture line leak requiring reoperation in a patient with loop colostomy and no complete fecal diversion. In addition, there was one case of vesicorectal fistula in a patient who was a referral with severe pelvic injury including rectal and urinary bladder injury. The same patient also underwent femoral thrombectomy post angiography with coiling of internal iliac arteries as well as drainage of infected hematoma of

thigh. One patient presented with small bowel obstruction, 8 years post intraperitoneal rectal injury that was managed conservatively. There was no mortality. Bowel control was preserved in all 18 patients available for follow-up evaluation without soiling and good urge. One patient was 1 year old at the time of follow-up and was excluded from continence evaluation and another patient was lost to follow-up. Bowel control data were collected in one case by telephone as the patient had immigrated to another country.

In order to illustrate our experience, below we further elaborate on two cases.

### Case 1

A 2-year-old toddler was admitted to the ER after a motor vehicle crash injury to his lower pelvis. On admission, vital signs were recorded with a pulse of 182 beats/min and a blood pressure of 80/56 mmHg, GCS 15, lungs clear. The abdomen was diffusely tender, and the pelvis was unstable with separated symphysis pubis. Rectal examination revealed fresh blood and a large anterior rectal tear 2 cm above the dentate line. Abdominopelvic CT after fluid resuscitation revealed large retroperitoneal hematoma with extraperitoneal pelvic air bubbles and severe deformation of the pelvis: 34 mm diastasis of pubic bones, diastasis of left sacroiliac joint, fractures of left iliac, right pubic and right ischial bones. A limited laparotomy revealed a large retroperitoneal contained hematoma, without other intraabdominal injuries, and a loop colostomy was constructed. On examination under anesthesia, a 2.5-cm-wide anterior rectal tear was found. As the child became hemodynamically unstable, the operation was terminated without repairing the rectal damage. One week later, the child was reoperated. The rectal tear was repaired, anal sphincter reconstructed, pararectal space drained and symphysis pubis reapproximated. Despite the drainage, a left groin abscess developed. It was drained, and the wound seemed to settle. Two weeks later bone scan revealed pubic osteomyelitis which was treated for 3 weeks with amikacin, imipenem, and vancomycin until complete resolution. Two months following injury, mobilization begun. Rectal examination before discharge revealed good sphincter tone and squeeze. He had normal toilet training, and his continence was good without soiling 3 years later.

Using separated stoma instead of a loop colostomy may have prevented the septic complication.

### Case 2

A previously healthy 15-year-old boy presented to the emergency room and reported he had accidentally fallen on a broomstick and injured his perineum. He complaint of anal pain. On physical examination he had no acute distress.

Fresh blood was found on rectal examination. As the patient was stable without signs of peritonitis, an abdominal triple-contrast computed tomography was performed. Findings on imaging were suspicious for intraperitoneal rectal injury. The patient received broad spectrum antibiotics and was taken to the operation room for examination under anesthesia and diagnostic laparoscopy. On rectal examination and rectoscopy, an anterior perforation was observed 5 cm proximal to the dentate line. The rectal wall wound was cleaned and was repaired primarily. A diagnostic laparoscopy was then performed and the rectosigmoid colon was found to be intact.

The patient had an uncomplicated postoperative course. He had full fecal continence.

### Discussion

Anorectal injuries in children are not frequently reported. Obtaining a careful history with emphasis on mechanism of injury is imperative during initial assessment, since the absence of external physical findings does not exclude either intra- or extraperitoneal injuries [1]. In the case of impalement, location of entry wound as well as angle and intensity of penetration affects the trajectory of the object and impacts adjacent organs involvement. Inspecting the penetrating object is advisable as its characteristics may influence the work-up approach.

A low threshold should be kept for a comprehensive anal and rectal examination under anesthesia, even more so when the patient presents with anal pain and rectal bleeding.

The most frequently reported mechanisms of injury vary in different parts of the world and include motor vehicle accidents, falls, sexual insult, firearm injuries, and rectal impalement [2–5]. In our series, falls account for 45 % of injuries and the remaining injuries result from motor vehicle accidents, impalement, and injury as result of a broken thermometer in 30, 20, and 5 % respectively. In the case of impalement, the instrument may protrude the anal canal directly, either deliberately or accidentally, resulting in injury without obvious external signs, or might injure the perineum first causing damage that is readily noticed [5–7]. Four cases of impalement presented in this series, resulting in a full thickness extraperitoneal rectal wall injury, amenable for primary repair. Fecal diversion was performed in two cases where the rectal wall injury was anterior with intraperitoneal, perirectal involvement in one case and involvement of the urinary bladder in the other.

Combined rectal and bladder injuries after rectal impalement is a rare condition that constitutes a diagnostic and therapeutic challenge. While up to 95 % of extraperitoneal bladder trauma is associated with pelvic fracture,

perforation of the bladder after rectal impalement is rare [8]. Blood at the urinary meatus or gross hematuria strongly suggests an associated lower urinary tract injury but evident urologic symptoms may be absent [8, 9]. Injury to the bladder should be evaluated with retrograde urethrography or cystoscopy [1]. In cases of combined extraperitoneal rectal and bladder injuries, the rectal injury is repaired transanally, while bladder decompression using a urethral catheter and fecal diversion are the mainstay of therapy. This approach is advocated to decrease probability of traumatic rectovesical fistula [10].

The most common associated injury was pelvic fracture. This type of injury indicates that high impact mechanism [11] and fracture with widening symphysis are associated with increased likelihood of sustaining injury to the rectum [12]. Recognizing this association on presentation may enhance prompt diagnosis and lower the threshold for proper diagnostic measures.

While the historical dictum of management of rectal injuries advocated fecal diversion for all cases, it is now accepted that isolated extraperitoneal rectal injury may be managed with rectal repair with or without drainage [13].

The authors of the present study concluded a policy of selective management concerning fecal diversion, but the decision was individualized by the attending consultant. As a rule, fecal diversion was saved for cases with potential life-threatening trauma, severe perineal involvement or cases with substantial associated injuries, and concern of gross contamination. When contemplating nondiversion of rectal injuries, one must question whether the rectal defect serves as an avenue for fecal contamination of the perirectal space. There were no gunshot wounds, and the severity of tissue destruction in most of our cases was mild to moderate and only in 25 % severe. All nondiverted cases could have been primarily repaired within 6 h after injury. A nondiversion approach in selected cases was contemplated by others, especially if operated within 6 h from injury [2, 4, 13]. Hashish suggested no colostomy in 16 cases of perineal trauma in children when the perineal wound was isolated  $\pm$  anal sphincter injury without or with minimal contamination [5]. Russell et al. reported that all patients with injury involving the anal sphincters underwent immediate repair. None of the nine patients with an isolated, nondestructive anal injury underwent fecal diversion. Eight patients with a rectal injury, as well as four patients with destructive injuries to both anus and rectum were managed with fecal diversion [14].

Intraperitoneal rectal perforations were managed by suture of rectal wound with diverting colostomy. In a retrospective review of pediatric patients with colorectal injuries, all patients with rectal injuries underwent fecal diversion [3].

When in doubt regarding an intraperitoneal involvement based on clinical or imaging grounds, diagnostic laparoscopy is a reliable approach to rule out or confirm such injuries [2]. This approach was employed in two of our cases when findings on triple-contrast abdominal computed tomography scan were suspicious for intraabdominal visceral injury.

There is controversy regarding the proper timing for sphincter reconstruction in complex anorectal injuries [5]. We adopted the primary repair approach in 12 children with injured sphincters. There was no fibrosis, the anatomy was relatively intact, and the sphincter edges were rather easily located, especially with muscle stimulator. Two patients underwent repair 1 week following trauma because of hemodynamic instability. Once stabilized, a repair (with the necessary delay) was performed. The continence was completely restored in all children available for follow-up, without soiling, including these two children with 1 week delay.

Therefore, our impression is that in cases of anal sphincter disruption, a primary rather than delayed reconstruction is advantageous. A short reconstruction delay may be necessary in hemodynamically unstable children. Clearly delayed reconstruction, undertaken a few weeks following the trauma, might result in fibrosis, uneasy defined anatomy, and retracted structures which might jeopardize the quality of reconstruction, and hence anal sphincters function, especially in major cases with some sphincter tissue loss.

Our experience shows that using muscle stimulator during the anal repair enhances the definition of anal sphincter limits and promotes perineal reconstruction.

Fecal continence was preserved in all patients available for evaluation. Following complex anorectal trauma, most patients will experience long-term continence [14]. Continence depends on three major elements which are voluntary sphincter muscles, anal canal sensation, and colonic motility [15]. In most cases of anorectal injuries, unless full anal evulsions occur, these continent essential elements are preserved, once the continuity of sphincter muscles is repaired. We believe that the best chance to restore the continuity of the damaged sphincter is a repair without delay.

In summary, primary repair for anorectal and perineal injuries can be performed safely in most cases, given hemodynamic stability, and facilitates anatomic reconstruction. Most patients will experience fecal continence. Fecal diversion should be used selectively in cases with life-threatening injuries, severe perineal involvement or complex associated injuries, and concern of gross contamination.

**Conflict of interest** The authors have no conflicts to disclose relative to this article.

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