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ORIGINAL ARTICLE

Outcomes and management of rectal injuries in children

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Abstract In the pediatric population, rectal injuries usually occur as a result of motor vehicle collisions. There has been an increased interest in selective diversion of rectal injuries in adults and increased utilization of laparoscopy both as a diagnostic and therapeutic adjunct. The aim of the study was to review our institutional experience with rectal injuries to determine if there was a subset of patients who could be managed with selective diversion. The medical records of children admitted with a rectal injury to Hospital for Sick Children, Toronto, over the last 20 years (1984–2004) were retrospectively reviewed. Data abstraction included patient demographics, mechanism of injury, injury severity score, associated injuries, presenting symptoms, methods of diagnosis, treatment and resultant complications. Nine patients with rectal injuries were identified. The average injury severity score (ISS) was 19.3. Two patients with penetrating injuries underwent laparoscopy. Laparoscopy was able to define the intraperitoneal extension of injuries and guide the colostomy. Primary repair without a diverting colostomy was performed in 3 patients (2 intraperitoneal and 1 extraperitoneal injury) without complications. Based on the limited sample size, one should avoid making any definitive recommendations but, it appears, primary repair without fecal diversion can be performed safely in select children in spite of a longer time to surgery. Laparoscopy may be used for the immediate management of the penetrating trauma patient to rule out intraperitoneal extension, repair a perforation and guide the colostomy if necessary.

Keywords Rectal injury · Laparoscopy · Diverting stoma

Introduction

In the pediatric population, rectal injuries usually occur as a result of motor vehicle collisions, and both associated pelvic fractures and urinary tract injuries are common. Less frequently, rectal injuries may occur as a result of penetrating injuries. Recently, there has been an increased interest in selective diversion of rectal injuries in adults and increased utilization of laparoscopy both as a diagnostic and therapeutic adjunct. To the best of our knowledge there are no reports in the pediatric literature echoing similar changes in practice. The aim of the study was to review our institutional experience with rectal injuries to determine if there was a subset of patients who could be managed with selective diversion.

Methods

The medical records of children admitted with a rectal injury to our institution, a freestanding level I paediatric trauma center, over the last 20 years (1984–2004) were retrospectively reviewed. Data abstraction included patient demographics, mechanism of injury, injury severity score (ISS) [1], associated injuries, presenting symptoms, methods of diagnosis, treatment and resultant complications. Institutional research ethics board approval was obtained.

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Table 1 Patients characteristics

Patient	Age	Sex	Injury		Lesion		Associated lesions	RIS	ISS
			Type	Mechanism	Localization	Type			
1	5	F	Blunt	Pedestrian struck by car	Extraperitoneal	Rectal avulsion + anal laceration	Perineal crush, open book pelvic fracture, ureteral disruption, femur fracture	IV	34
2	10	M	Blunt	Cyclist struck by truck	Intraperitoneal	Rectal tear serosa laceration	Open book pelvic fracture, avulsed mesentery of ileum, bladder rupture	III	29
3	13	M	Blunt	Fall playing hockey	Extraperitoneal	Rectal perforation	Coccyx fracture	II	8
4	16	M	Blunt	Pedestrian struck by train	Intraperitoneal	Rectal tear	Femur fracture, pelvic fracture	I	13
5	9	M	Penetrating	Landed on pool cue	Intraperitoneal	Rectal perforation	Mucosal anal tear	II	9
6	10	M	Blunt	Cyclist struck by truck	Intraperitoneal	Rectal full thickness laceration	Pelvic fracture, right diaphragmatic hernia, liver laceration	IV	50
7	9	M	Penetrating	Fall on bottle	Extraperitoneal	5 cm full thickness laceration of the rectum from the anus	None	IV	9
8	6	F	Penetrating	Fall on plant	Extraperitoneal	Rectal perforation	None	II	13
9	7	M	Penetrating	Fall on toilet roll	Intraperitoneal	Rectal perforation	None	II	9
Average	9.4								**19.3**

RIS rectum injury scale, *ISS* injury severity score

Results

Mechanism and severity of injuries

Nine patients with rectal injuries were identified. Patient characteristics are shown in Table 1. Seven of the children were male. Five patients sustained a blunt injury, whereas four patients suffered penetrating trauma by impalement. The average ISS was 19.3. Four patients had extra-peritoneal injuries. Moreover, a penetrating mechanism was less likely to result in multiple associated injuries. Most patients with blunt injuries had associated pelvic fractures such as open book injuries; these patients were also likely to sustain a urinary tract injury.

Management

Management modalities are summarized in Table 2. Two patients with penetrating injuries underwent laparoscopy (patients 8 and 9). In both, laparoscopy was able to define the intraperitoneal extension of injuries and guide the colostomy. Two other patients had an exclusively perineal approach and after a sigmoidoscopy their injuries were primarily repaired (patients 3 and 7). Three patients received a drain and rectal tube placement for rectal washout. Five patients underwent a diverting stoma in addition to elective repair of their rectal injuries. Primary repair without a diverting colostomy was performed in two patients (patients 2 and 5) with time to surgery of less than 6 h (intraperitoneal), and in one other patient (patient 7) who had primary perineal management of the injury 24 h after his trauma (extraperitoneal).

Outcome

The outcomes of the patients are summarized in Table 3. Most children were extubated shortly after surgery. The

Table 2 Management

Patient	Approach	Procedures						Days to colostomy closure	Other procedure
		Surg time	For the rectal lesion	Diverting stoma	Irrigation	Presacral drainage	For the other injuries		
1	Sigmoidoscopy + midline incision	16.7	Terminal sigmoidostomy-suture of the rectum-external anal sphincter repair	Y	Y	N	.ORTHO: debridement of open femur fracture site-fixation external femur .URO: suprapubic cystostomy-drainage pelvic area	260	Mitrofanof procedure
2	Sigmoidoscopy + midline incision	5.5	Suture repair of the laceration	N	N	N	.ORTHO: external fixation pelvic bone .URO: suture of bladder laceration-supra-pubic cystostomy .GEN: segmental resection of intestine	/	None
3	Sigmoidoscopy	10	Suture repair of the laceration	N	N	N		/	None
4	Sigmoidoscopy + midline incision	Unknown	Sigmoid colostomy	Y	N	N	.ORTHO: treatment of pelvic and femur fracture	Unknown	Unknown
5	Sigmoidoscopy + midline incision	5	Elective repair, anuscopy, rigid procto-sigmoidoscopy, flexible sigmoidoscopy	N	N	N		/	None
6	Sigmoidoscopy + midline incision	Unknown	Sigmoid loop colostomy-repair of the rectum laceration	Y	N	N	.ORTHO: open reduction of pelvic bone fracture and internal fixation-debridement of open pelvic fracture .GEN: repair of R diaph Hernia	81	None
7	Perineal	24.3	Suture of laceration of anus and rectum, rigid sigmoidoscopy and insertion of rectal tube	N	Y	N		/	None
8	Sigmoidoscopy + laparoscopic	13.5	Sigmoid loop colostomy, rigid procto -sigmoidoscopy, rectal irrigation	Y	Y	N	.URO: cystoscopy-vaginoscopy	173	None
9	Sigmoidoscopy + laparoscopic	7.5	Loop colostomy, rigid procto-sigmoidoscopy	Y	N	N		97	None
Average		11.8						153	

Surg time time between trauma and surgical procedure (h)

Table 3 Outcome

Patient	Length of ventilation (days)	ICU LOS (days)	LOS (days)	Complications within 30 days	Follow up (months)	Urologic and intestinal functional status
1	0	0	23	none	165	Fecal continence Neurogenic bladder + IC
2	1	1	22	Infection due to external ortho device	1.5	Continent
3	0	0	1	None	42	Continent
4	0	0	Transferred	Unknown	Unknown	Unknown
5	0	0	5	None	26	Continent
6	2	4	68	Kidney stones (hypercalcemia secondary to prolonged immobilization)-G Tube insertion (feeding difficulty)	48	Continent
7	0	0	12	None	37	Continent
8	0	0	15	Fever unspecified	12	Continent
9	0	0	8	Viral infection not further specified	15	Continent
Average		**0.6**	**19**		**43**	

ICU LOS intensive care unit length of stay, *LOS* length of stay, *IC* intermittent catheterization

average length of hospital stay was 19.3 days. No patient in our series developed perineal sepsis. Furthermore, at a median follow up time of 43.5 months, all the patients in our series are continent to stool and flatus. All five patients with a diverting stoma, had it reversed after a mean of 153 days post injury. One patient developed a neurogenic bladder that required an appendico-vesicostomy for intermittent catheterization, but the patient had good fecal continence.

Discussion

Anorectal injuries are uncommon in children. Diagnosing a rectal injury in a child can be challenging. Missed or delayed diagnoses are common in the published literature and are associated with adverse outcomes and higher rates of complications [2]. Clues to a correct and timely diagnosis include a suggestive mechanism and associated injuries of the bony pelvis or lower urinary tract. Digital rectal examination is unreliable in ruling out a rectal injury [3]. In our study all patients underwent sigmoidoscopy prior to intervention. Of note, even with the use of endoscopy, miss rates of up to 66% have been reported [4]. In our series, all patients had abdominal computed tomography (CT) as part of their trauma work-up. We found CT scan to be a reliable diagnostic test. The accuracy of this modality has been reported by others especially in the setting of blunt abdominal trauma [4].

The principals for treating rectal injury have stemmed from military conflict [5]. These principals have traditionally included a diverting colostomy, drainage of the perineal wound, and rectal irrigation. These principals were standardized in 1984 [6]. The institution of this standardized approach yielded significant improvement in survival and reduction of sepsis [7, 8, 9]. More recently, the management of recto-colic trauma in adults has progressively moved towards a more limited surgical approach with selective diversion [10]. Such an approach has been limited to patients who are hemodynamically stable at presentation and present less than 6 h from the time of injury [10]. There has been no similar reported experience in children.

Haut and colleagues [11] reported a case series of children with colorectal injuries. In their report of 53 children, 9 had a rectal injury. All children with rectal injuries were treated by a diverting colostomy. The authors concluded that in patients who had no evidence of shock, multiple blood transfusion, multiple other injuries and extensive contamination, a more selective approach could have been a reasonable alternative to their treatment strategy. Likewise, in the series by Ameh [12], all children presenting with rectal injury, regardless of whether it was extra- or intra-peritoneal, were diverted.

In our series, four out of nine children did not receive a diverting colostomy and not uncommonly was the time to surgery more than 6 h. Interestingly, we observed no post-operative abdominal or perineal sepsis as a result. Conversely, the only patient who developed a perineal wound infection (patient 2) was a patient who was treated within 6 h of the injury. Moreover, in children with intraperitoneal rectal injuries who do not develop clinically overt peritonitis, there may be a role for a primary repair without a diverting stoma. This is supported by our experience with two patients in this series (patients 2 and 5). We would also submit that selective patients with an extraperitoneal injury could be managed with primary repair and no diversion, as was the case in patients 3 and 7 in our series. Of note, both patients had prolonged delay to operative treatment, this however, did not seem to affect their outcomes.

To our knowledge, this is the first report of the use of laparoscopy in the management of rectal injuries in children. The role of laparoscopy in this setting remains to be defined. We would advocate using laparoscopy in patients who are hemodynamically stable. We found the advantage of using this technology, in addition to the obvious cosmetic improvement, was the ability to diagnose the intraperitoneal extension of the rectal injury, repair the lesion with improved visualization and guide the colostomy creation if needed.

Long term follow up of these children is crucial. In one series 20 out of 79 patients developed long term complications, namely, anal stenosis and incontinence [3]. As discussed above, delayed diagnosis has detrimental effects on long-term outcomes in rectal injuries. The mean follow-up in this series was 43.5 months. Eight patients had normal fecal continence and did not experience any soiling. One patient was lost to follow-up. One patient required intermittent bladder catheterizations secondary to a neurogenic bladder and urethral disruption.

In summary, rectal injury in children is rare and the optimal management continues to evolve. Our series is small, but a good functional outcome and low morbidity did not appear to be related to fecal diversion, time to surgery, intra- versus extra-peritoneal injury, rectal injury score, or blunt versus penetrating mechanism of injury. Based on the limited sample size, one should avoid making any definitive recommendations but, it appears primary repair without fecal diversion can be performed safely in select children in spite of a longer time to surgery. Laparoscopy may be used for the immediate management of the penetrating trauma patient to rule out intraperitoneal extension, repair a perforation and guide the colostomy if necessary. In Fig. 1 we propose an algorithm for treatment based on our experience. Further reports of institutional experience in treating pediatric rectal injuries, or ideally, a population-based study are needed to challenge the current surgical dogma and refine the treatment approach.

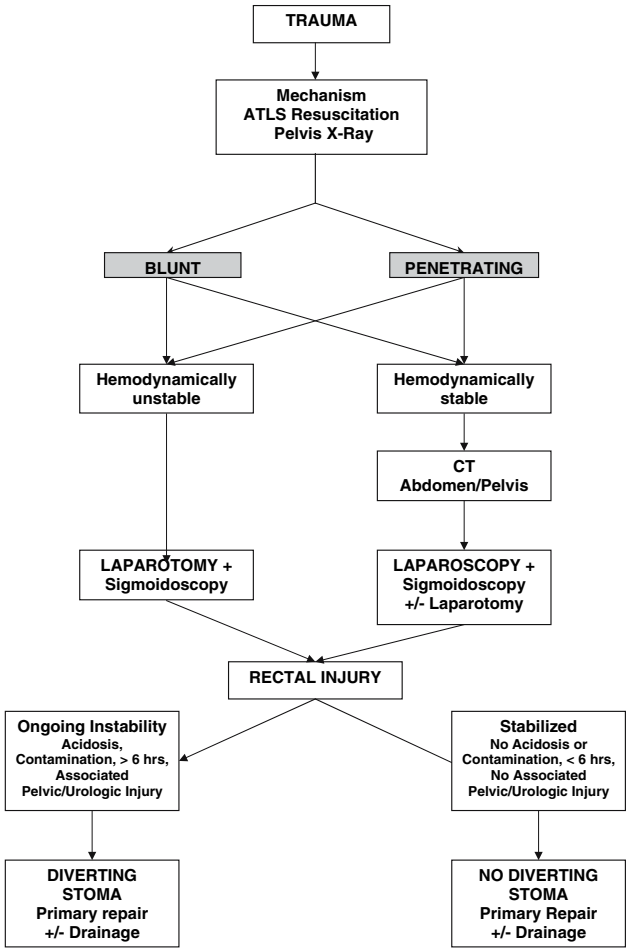

Fig. 1 Proposed algorithm for management of rectal trauma in children

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