

Impalement and Anorectal Injuries in Childhood: A Retrospective Study of 12 Cases

By H.A. Beiler, Z. Zachariou, and R. Daum
Heidelberg, Germany

Background/Purpose: Because of the small numbers of impalement and anorectal injuries in childhood, a standardized therapeutic approach is necessary to avoid major complications. On the basis of a retrospective analysis of 12 children with such injuries treated from 1986 to 1996 in our department, the authors tried to establish guidelines for their treatment.

Methods: Additional therapeutic problems and main complications are elucidated after meticulous analysis of three selected cases.

Results: In two cases of anorectal impalement and a primary colostomy, no complications occurred. However, in three cases involving anorectal injury a primary fecal diversion was

not performed, making a secondary colostomy necessary after wound infection.

Conclusions: The current standard principles in the treatment of severe anorectal injuries in children are fecal diversion, wound drainage, and broad spectrum antibiotics. A primary reconstruction in cases of impalement can be recommended only after exclusion of anorectal injury.

J Pediatr Surg 33:1287-1291. Copyright © 1998 by W.B. Saunders Company.

INDEX WORDS: Impalement, anorectal injuries, therapeutic approach.

THE SEVERITY of anorectal wounds after impalement is difficult to estimate because the primary wound is often small, and accompanying injuries may not be obvious. Furthermore, because very little data concerning these injuries were published in pediatric surgical literature, and these injuries are rare in childhood, making experience limited, we thought that a report on such cases including practical experience and therapeutic guidelines could be valid and important.

We analyzed retrospectively all cases of impalement and anorectal injuries admitted in our department in the last 10 years. Studies on therapeutic approaches indicating a standardized treatment for such injuries with good results have been published only in adults,¹⁻⁸ leaving comparable reports in children nearly nonexistent.

Consequently, the current therapeutic approach for anorectal injuries in children is similar to that of adults consisting of fecal diversion, debridement and closure, rectal stump irrigation, presacral drainage, and broad spectrum antibiotics.^{2,3,5,6}

MATERIALS AND METHODS

Between January 1, 1986 and December 31, 1996 12 patients, seven girls and five boys, aged 5 to 14 years (average, 9 years), were included in this study (Table 1). All medical records and the follow-up data were reviewed.

We analyzed the accident mechanism, the severity of injury, and the surgical approach in each case. There were 10 cases of impalement and two cases of anorectal tear-off resulting from a traffic accident (Table 1). Of special interest were five patients (three boys and two girls) with anorectal injury. Both girls were admitted with combined vaginal and anorectal injuries (Table 1). Two boys were injured in a traffic accident, and the other boy had an impalement. Fecal diversion was performed

primarily in two cases and in three cases secondarily because of local wound infection (Table 1). In all three cases with secondary colostomy, the severity of the injury was underestimated at the time of admission. We also compared the age, sex, preoperative diagnostics, postoperative antibiotic therapy, postoperative complications, and cosmetic results, within this group (Table 1). A rectoscopy was performed preoperatively only in three of all 12 cases, and a diagnostic vaginotomy was performed in five girls. A postoperative antibiotic therapy was administered in all cases. In four patients complications occurred, including wound infection in three patients, a superficial fistula in one patient and temporary insufficiency of the anal sphincter in two patients (Table 1). One of these two patients with anal sphincter insufficiency was trained with the biofeedback method (second case report). Before closure of the colostomy, the sufficiency of the anal sphincter was controlled with sodium chloride enema and three-dimensional sphincter manometry. The other patient (1st case report) also had temporary insufficiency of the anal sphincter, which improved spontaneously. The sufficiency before closure of the colostomy was verified by contrast enema and rectal-digital examination.

Case Reports

Case 1. A 14-year-old boy fell from a tractor. The anorectum was completely torn out and separated from the soft tissue (Fig 1). The accident mechanism remains unclear because this boy was alone when the accident occurred. Preoperatively, a colonoscopy was omitted. The pelvic floor and the anorectum were reconstructed, and a primary wound closure with adequate wound drainage was performed without fecal diversion. Eleven days after the initial operation, a secondary

From the Department of Pediatric Surgery, Ruprecht-Karls-University, Heidelberg, Germany.

Address reprint requests to H.A. Beiler, MD, Department of Pediatric Surgery, Ruprecht-Karls-University, INF 110, D-69120 Heidelberg, Germany.

*Copyright © 1998 by W.B. Saunders Company
0022-3468/98/3308-0023\$03.00/0*

Table 1. A Survey of Patients With Impalement and Anorectal Injuries From 1986 to 1996

Patient No.	Age (yr)	Sex	Accident	Injury	Wound Closure	Colostomy		Complications
						Primary	Secondary	
1	14	M	Traffic accident	Anorectal tear off	Primary		11 days postoperatively	Wound infection Secondary wound healing Fever Insufficiency of the anal sphincter
2	12	M	Traffic accident	Anorectal tear off with severe soft tissue damage	Secondary		7 days postoperatively	Wound infection Secondary wound healing Fever Insufficiency of the anal sphincter
3	9	F	Fall on a fence	Impalement of rectum, vagina and perineum	Primary		5 days postoperatively	Wound infection Secondary wound healing Wound fistula
4	6	M	Fall on a pointed object	Impalement of the anorectum	Primary	Yes		
5	13	F	Fall on a pointed object	Impalement of rectum and vagina	Primary	Yes		
6	5	F	Fall on a pointed object	Impalement of the vaginal orifice	Primary			
7	10	F	Fall on a fence	Impalement of the vaginal orifice	Primary			
8	9	M	Fall on a fence	Impalement of the perineum	Primary			
9	11	F	Fall on a pointed object	Impalement of vagina and perineum	Primary			
10	5	F	Fall on a pointed object	Impalement of the perineum	Primary			
11	6	F	Fall on a fence	Impalement of the vagina	Primary			Secondary wound healing
12	14	M	Fall on a pointed object	Impalement pararectal without anorectal injury	Primary			

NOTE. Patients 1 through 5 had anorectal injury.

colostomy was necessary because of a wound infection. Because of a temporary sphincter insufficiency, colostomy was closed 8 months later after the sphincter muscle function was normal. Figure 2 shows the good cosmetic result.

Case 2. A 12-year-old boy was involved in a bus accident as a pedestrian resulting in injuries of the anorectum, the anal sphincter, and the paraanal soft tissue (Fig 3). A primary wound closure was not possible because of the extended soft tissue damage. Colonoscopy showed no signs of perforation of the upper rectum. A primary colostomy was not carried out, but the wound was drained extensively. One week later a colostomy had to be performed secondary to infection of the severely damaged paraanal soft tissue. This boy had a temporary anal sphincter insufficiency as well. After successful biofeedback training, colonic continuity could be reestablished 6 months after the accident. The boy is continent with a fairly good cosmetic result (Fig 4).

Case 3. A 13-year-old girl fell off a wardrobe and impaled herself with the metal stick of a stand lamp. The stick penetrated the vestibulum vaginae approximately 15 cm (Fig 5). Vaginoscopy showed only a small wound in the dorsal wall of the vaginal orifice. Additionally rectoscopy showed perforation of the rectum. Increasing signs of peritonitis made a laparotomy inevitable, and multiple rectum perforations were primarily closed and a colostomy performed. The vaginal wall was reconstructed and the wound drained. Subsequently, the postoperative course was

without complications. No insufficiency of the anal sphincter occurred, and colostomy could be closed at 3 months.

RESULTS

Table 1 summarizes the data of all 12 patients with impalement and anorectal injuries treated surgically in our department in the past decade. A fall on a pointed object was the cause for the injury in six cases. Four children were injured while climbing a fence, and two children had a traffic accident.

Anorectal Injuries

There were five cases of anorectal injury. Both girls in this group had combined vaginal and anorectal injuries. A preoperative diagnostic rectoscopy and vaginoscopy were performed in one of the two girls and rectoscopy in only one of the three boys. In all cases without primary fecal diversion, a secondary colostomy had to be performed because of wound infection. In all patients of this

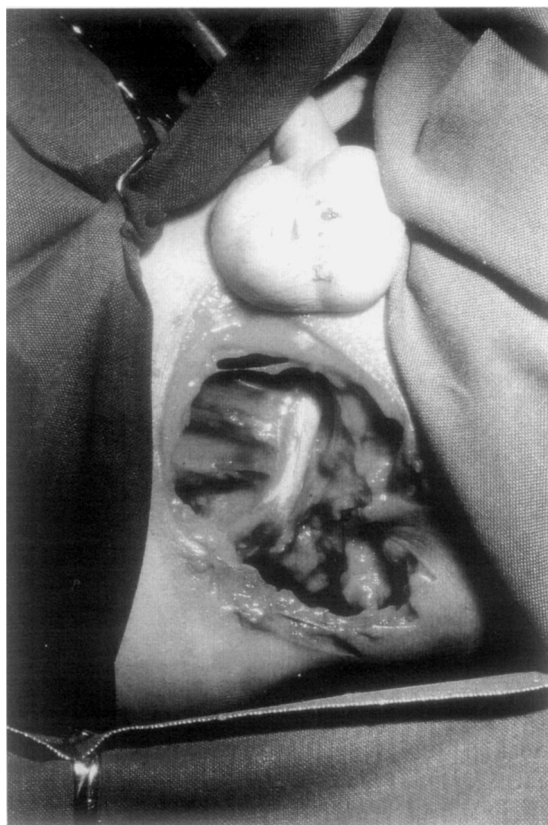


Fig 1. Completely torn out anorectum in patient 1.

subgroup, the anorectal injury was drained initially. Primary wound closure was not possible in one case of severe anorectal tear off. A postoperative antibiotic therapy with cephalosporin and metronidazol was administered in all patients of this group. The two boys with severe anorectal tear off showed temporary anal sphincter insufficiency. Because three-dimensional sphincter manometry was not available at the time when one of the two boys was injured, insufficiency of the anal sphincter was verified by barium enemas and rectal-digital examination. The second boy showed significant changes in

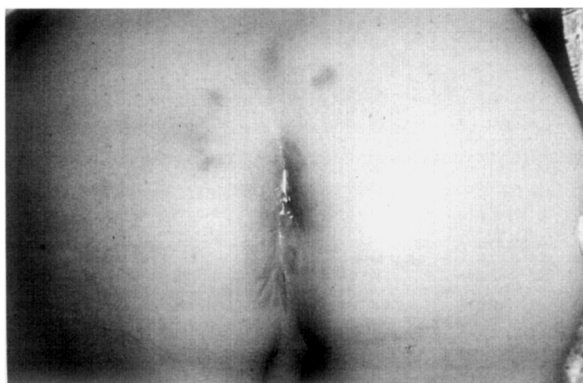


Fig 2. After complete wound healing in patient 1.

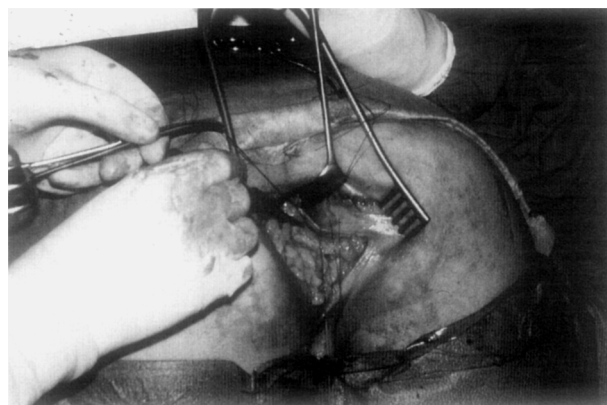


Fig 3. Wound in patient 2 with torn out anorectum and severe paraanal soft tissue damage.

three-dimensional sphincter manometry with radial asymmetry of 26.6% (normal, <20%) and pressure vector volume of 68.7 cm³ (normal, >100 cm³). After 5 weeks biofeedback training the radial asymmetry was 11.6%, and pressure vector volume was increased up to 119.9 cm³. The enema examination with 80 mL sodium-chloride showed no insufficiency of the anal sphincter. The closure of the colostomy of the two boys was performed 8 and 6 months after the initial operation, respectively. Both patients showed normal continence

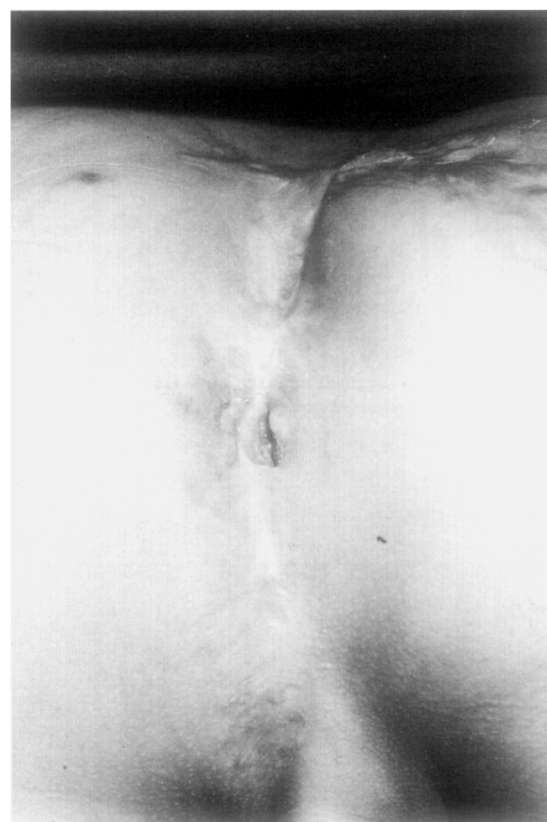


Fig 4. After complete wound healing in patient 2.

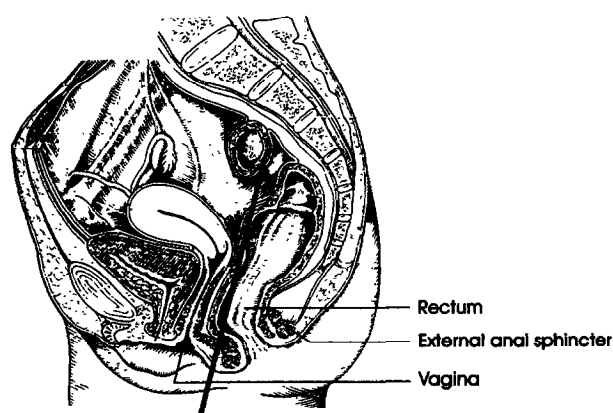


Fig 5. Sagittal view of the female pelvis. The impalement (black beam) took place in the dorsal wall of the vagina and was about 15 cm deep with multiple perforations of the anorectum in patient 3.

after colostomy closure. An anal sphincter insufficiency did not develop in the three remaining children so the colostomy could be closed 3 months later without preoperative defecogram. One girl had to undergo surgery on a superficial wound fistula inbetween the primary operation and the colostomy closure. The average time of fecal diversion for the whole group was 5 months. The follow-up was 0.5 to 2 years. There were no late complications, especially no permanent anal sphincter insufficiencies.

Impalement Without Anorectal Injuries

The second subgroup included all patients with impalement without anorectal injury. There were five girls and two boys in this group. Four girls had vaginal injury, and one girl had an impalement of the perineum. All girls with vaginal injury had a diagnostic vaginoscopy preoperatively. The two boys of this group showed perineal impalement. One of the two boys had pararectal impalement reaching the sacrum without rectal injury, verified by diagnostic rectoscopy. In all patients, primary wound closure and anatomic reconstruction were possible. Drainage of the impalement area was necessary in four cases. A postoperative antibiotic therapy with cephalosporin was administered in all patients. A primary wound healing without complications was present in six patients. Only one girl had a local wound infection with secondary wound healing. The follow-up in this group was 0.5 to 1 year.

DISCUSSION

The main causes for penetrating perineal injuries in adult patients are stab and gunshot wounds as well as rectal foreign bodies.^{1-7,9} In childhood, the main cause is impalement⁷; however, in every case of vaginal and anorectal injury, sexual abuse has to be excluded. Because these injuries make out only a small percentage of

all traumatic cases in childhood,^{4,10} standardized treatment is difficult. To estimate the severity of the penetrating perineal injury and to rule out bowel perforation, primary proctoscopy and rectoscopy are recommended. In girls, additional vaginoscopy is necessary to exclude accompanying injuries. Because urethra, bladder, and ureter may also be injured, a cystoscopy and a urography should be performed if a hematuria is present.

In cases of anorectal injuries, therapy is similar to that of adults, including (1) fecal diversion, (2) debridement and closure, (3) rectal stump irrigation, (4) presacral drainage, and (5) broad-spectrum antibiotics.^{2,3,5,6} However, it is not always mandatory to perform all the above steps. Recent literature suggests an individual management for anorectal injuries.^{1,3,4,6} However, primary fecal diversion is the most important step, as shown by our own experience. Only small and isolated anal injuries may be sutured primarily without colostomy.^{3,6,7} In more extensive anorectal wounds, fecal diversion, wound drainage, and broad-spectrum antibiotics are obligatory.^{1-4,10}

In our series, we reconstructed continuity after a mean time of 3 months. However, in two cases, colostomy was closed more than 6 months after primary operation because of temporary sphincter insufficiency.

In seven children without anorectal injury, all wounds could be closed primarily. In four patients, a wound drainage was necessary. All children were treated postoperatively with broad-spectrum antibiotics, and wound infection occurred in only one of seven cases. It is important to note that no other complications in patients without anorectal injury were observed.

The main complication after penetrating perineal injuries is wound infection with abscess formation and subsequently sepsis.^{3,5,7,10} In 30% of all our cases, wound infection was observed. Another complication is the anal sphincter insufficiency, which was observed twice in our series. This was, however, only a temporary sphincter insufficiency. In the follow-up, anal sphincter insufficiency was suspected after rectal-digital examination. This was verified by a sodium chloride enema and three-dimensional sphincter manometry.¹¹ The treatment of sphincter insufficiency consisted of biofeedback training with significant improvement of anal sphincter function thereafter. Strictures of the vaginal orifice or the bowel are possible, but did not occur in this series.

The prognosis of penetrating perineal injuries in childhood is good, even in cases with severe anorectal damage, as long as the following recommendations are considered. Bowel perforation has to be excluded by proctocoloscopy, diagnostic vaginoscopy should be performed in girls, and cystoscopy is mandatory in cases of suspected urinary tract injury. Standard therapeutic principles in severe anorectal injury are (1) fecal diversion,

(2) wound drainage, (3) and broad spectrum antibiotics. Colonic continuity can only be reestablished after manometric confirmation of anal sphincter sufficiency and complete wound healing.

Penetrating perineal injuries without anorectal injury can be treated with primary wound closure, wound drainage, and broad spectrum antibiotics. We suggest a 1-year follow-up for these patients.

REFERENCES

1. Bostick PJ, Johnson DA, Heard JF, et al: Management of extraperitoneal rectal injuries. *J Natl Med Assoc* 85:460-463, 1993
2. Chareonkwan P: Rectal injuries. *J Med Assoc Thai* 76:576-580, 1993
3. Ivatury RR, Licata J, Gunduz Y, et al: Management options in penetrating rectal injuries. *Am Surg* 57:50-55, 1991
4. Renz BM, Feliciano DV, Sherman R: Same admission colostomy closure (SACC). A new approach to rectal wounds: A prospective study. *Ann Surg* 218:279-293, 1993
5. Steinman E, Cunha JC, Branco PD, et al: Traumatic rectal injuries. *Arq Gastroenterol* 27:120-125, 1990
6. Thomas DD, Levison MA, Dykstra BJ, et al: Management of rectal injuries. Dogma versus practice. *Am Surg* 56:507-510, 1990
7. Yao JG, Masso-Misse P, Malonga E: Ano-rectal injuries in civilian practice in Cameroon. 10 case reports. *Med Trop Mars* 54:157-160, 1994
8. Velmahos GC, Degiannis E, Wells M, et al: Early closure of colostomies in trauma patients. A prospective randomized trial. *Surgery* 118:815-820, 1995
9. Sola JE, Buchman TG, Bender JS: Limited role of barium enema examination preceding colostomy closure in trauma patients. *J Trauma* 36:245-247, 1994
10. Beiler HA, Schäfer K, Benz G, et al: Ausgedehnte anorektale Verletzung mit schwerer paraanaler Weichteilschädigung im Kindesalter.—Ein Fallbericht—. *Zentralbl Kinderchir* 6:125-130, 1997
11. Benz G, Kroesen A, Laufs E, et al: Manometrische Therapieevaluation operierter Anal- und Rektumatresien mit konventioneller und 3-D-Vektormanometrie. *Zentralbl Kinderchir* 4:199-208, 1995