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Management of Anorectal Injuries in Children: An Eighteen-Year Experience

Abstract

Anorectal injuries (ARI) are rare in childhood and yet occur due to sexual abuse and firearm injuries in developed countries. The labeling of ARI remains controversial in spite of a number of divergent reports over the past decade. We evaluated the surgical indications for primary repair of ARI without stoma, and also the potential risk factors affecting morbidity and mortality in children with ARI. Between 1983 and 2001, 41 children were diagnosed as ARI in our institution due to blunt or penetrating trauma. There were 17 male and 24 female patients. Causes of anorectal injury were blunt injuries in the majority of cases (56%). Vagina and extremity fractures were the organs most frequently associated with ARI. There was isolated ARI in 49% of cases. Intraperitoneal organ injury was found in 3 patients (7%). The distribution of injury location according to the classification of ARI in our children was as follows: 10% in G I, 32% in G II, 51% in G III, and 10% in G V. Primary repair without colostomy was performed in 51% of cases. Primary repair and diversion of faecal stream by loop colostomy was required in 20 (49%) patients. Postoperative septic complications occurred in 29% of cases. Some potential risk factors such as trauma mechanism and associated organ injury were not significantly correlated to postoperative septic complications, while other risk factors such as mode of treatment, time of operative intervention and contamination were significantly related to postoperative septic complications ($p < 0.05$). The sensitivity of trauma scoring systems for the estimation of postoperative complication occurrence was significant for ISS ($p < 0.05$) and ARI score ($p < 0.05$). The relative risk of developing a postoperative septic complication was higher than 2 for patients with ARI grade III, ISS > 15 , primary repair + colostomy group, and time of operative intervention > 8 hours. A child

in the colostomy + primary repair group died on the first postoperative day from rapidly progressing septicaemia and multiple organ failure (2.4%).

The management of ARI can be carried out by primary repair procedure without colostomy in the majority of cases if the needed selectivity is established.

Key words

Anorectal trauma · postoperative complication · trauma score

Résumé

Les plaies ano-rectales (ARI) sont rares chez l'enfant et surviennent après agression sexuelle et plaie par arme à feu dans les pays développés. La définition des ARI demeurent controversée en dépit d'un nombre de rapports divergents durant la dernière décennie. Nous avons évalué les indications chirurgicales, la réparation primaire des ARI sans stomie, et aussi les facteurs de risque modifiant la morbidité et la mortalité des enfants avec ARI. De 1983 à 2001, 41 enfants avec un ARI présentaient un traumatisme fermé ou pénétrant. Il s'agissait de 17 garçons et de 24 filles. La cause de la blessure était un traumatisme fermé dans la majorité des cas (56%). Les plaies vaginales et des extrémités étaient les traumatismes les plus fréquemment associés avec les ARI. Les ARI sont isolés dans 49% des cas. Une plaie d'un organe intra-péritonéal est retrouvée chez 3 patients (7%). La répartition de la localisation des blessures en fonction de la classification des ARI chez les enfants est la suivante: 10% en G I, 32% en G II, 51% en G III, et 10% en GIV. Une réparation primaire sans colostomie était réalisée dans 51% des cas. Une réparation primaire et une diversion des selles par une colostomie étaient réalisées

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chez 20 patients (49%). Les complications septiques post-opératoires surviennent dans 29% des cas. Quelques facteurs potentiels de risque tels que le mécanisme des traumatismes et les blessures associées ne sont pas significativement corrélés avec les complications septiques post-opératoires, alors que d'autres facteurs de risque tels que le type de traitement, le délai de l'intervention et la contamination sont significativement liés aux complications septiques post-opératoires ($p < 0,05$). La sensibilité du trauma score system pour la survenue des complications post-opératoires étaient significatives pour ISS ($p < 0,05$) et le score des blessures ano-rectales ($p < 0,5$). Le risque relatif de développer une complication septique post-opératoire était supérieur à 2 chez les patients avec ARI grade III, ISS > 15 , la réparation primaire avec colostomie et un délai d'intervention supérieur à 8 heures. Un enfant dans le groupe colostomie + réparation primaire mourrait dans le premier jour post-opératoire d'une septicémie rapidement évolutive et d'une défaillance multi-viscérale (2,4%).

Le management des ARI peut être réalisé par une réparation primaire sans colostomie dans la majorité des cas.

Mots-clés

Traumatisme ano-rectal · complication post-opératoire · trauma score

Resumen

Las heridas ano-rectales (ARI) son raras en niños y suelen ocurrir en los países desarrollados como consecuencia de abuso sexual o de heridas por arma de fuego. Su tratamiento es controvertido a pesar de varias publicaciones realizadas en la última década. Evaluamos la indicaciones quirúrgicas del tratamiento primario sin estoma de las ARI y también los riesgos potenciales de morbilidad y mortalidad en ellas. Entre 1983 y 2001 diagnosticamos en nuestra institución 41 niños con ARI causadas por trauma romo o penetrante (17 niños y 24 niñas). Las causas fueron traumas romos en la mayoría de los casos (56%). Las lesiones asociadas más frecuentes fueron las de la vagina y las fracturas de extremidades. La ARI era única en el 49% de los casos y se asoció a lesiones de órganos intraperitoneales en 3 pacientes (7%). La distribución de la localización de la lesión según la clasificación de las ARI en nuestros pacientes fue la siguiente: 10% en G1, 32% en G2, 51% en G3 y 10% en G5. Se realizó reparación primaria sin colostomía en el 51% de los casos y con derivación fecal por colostomía en 20 (49%). Hubo complicaciones sépticas postoperatorias en el 29% de los casos. Algunos factores de riesgo potencial como el mecanismo del trauma y las lesiones de órganos asociados no estaban correlacionadas significativamente con las complicaciones sépticas postoperatorias mientras otros factores de riesgo como el modo de tratamiento, el tiempo hasta la intervención y el grado de contaminación estaban significativamente relacionadas con dichas complicaciones ($p < 0,05$). La sensibilidad de los sistemas de estadiaje del trauma para la estimación de las complicaciones postoperatorias fue significativo para el ISS ($p < 0,05$) y para la puntuación de ARI ($p < 0,05$). El riesgo relativo de desarrollar complicaciones sépticas postoperatorias era mayor de 2 para los pacientes con ARI grado 3, para los ISS > 15 , para los tratados primariamente con colostomía y para las intervenciones realizadas más de 8 horas después del trauma. Un niño con colostomía y re-

paración primaria murió en el primer día postoperatorio de septicemia y fallo multiorgánico rápidamente progresivos (2,4%). El tratamiento de la ARI puede ser llevado a cabo por reparación primaria sin colostomía en la mayoría de los casos si se selecciona adecuadamente los pacientes.

Palabras clave

Trauma ano-rectal · complicación postoperatoria · puntuación de trauma

Zusammenfassung

Anorektale Verletzungen sind im Kindesalter selten und entstehen durch sexuellen Missbrauch und in Entwicklungsländern durch Schusswaffenverletzungen. Die Beurteilung der Verletzungen ist schwierig und auch die Behandlungsmethoden divergieren trotz zahlreicher Publikationen in den letzten 10 Jahren. In der vorliegenden Arbeit wird die chirurgische Indikation zur primären Korrektur anorektaler Verletzungen ohne Enterostoma überprüft, insbesondere im Hinblick auf potenzielle Risikofaktoren, welche die Mobilität und Motilität beeinflussen können.

Material und Methodik: Zwischen 1983 und 2001 wurden 41 Kinder mit einer anorektalen Verletzung, sei es stumpf oder penetrierend in unserer Klinik behandelt. 17 Kinder waren Knaben, 24 Mädchen. Die Ursache der anorektalen Verletzungen waren in der Mehrzahl der Fälle stumpfe Traumen (56%). Besonders häufig waren die Vagina und Extremitätenfrakturen betroffen. Isolierte anorektale Verletzungen wurden in 59% der Fälle beobachtet. Intraperitoneale Organverletzungen traten bei 3 Kindern (7%) auf. Die Verteilung der Verletzungslokalisation entsprechend der Klassifikation anorektaler Verletzungen war in unserem Krankengut die folgende: 10% G1-, 32% G2-, 51% G3- und 10% G5-Verletzungen. Bei 51% der Kinder wurde eine primäre Wiederherstellung der Verletzung ohne Kolostoma durchgeführt. Bei 59% der Kinder ($N = 20$) wurde jedoch ein doppelläufiges Stoma angelegt. Postoperativ kam es bei 29% der Fälle zu septischen Komplikationen, wobei potenzielle Risikofaktoren wie Traumamechanismus, Begleitverletzungen von Organen nicht signifikant mit der postoperativen Sepsisrate korrelierten. Von Bedeutung waren hingegen die Behandlungsmethodik, der Zeitraum bis zur definitiven Korrektur der Verletzung und die Kontamination (Signifikanz $p < 0,05$).

Die Sensitivität für den Traumascore im Hinblick auf die Abschätzung postoperativer Komplikationen war signifikant für ISS ($p < 0,05$) und den ARI-Score ($p < 0,05$). Das relative Risiko, postoperativ eine septische Komplikation zu entwickeln, war zweimal höher für anorektale Verletzungen Grad 3 (ISS < 15), primärer Verschluss mit Kolostomie und für operative Eingriffe, die erst 8 Stunden nach der Verletzung vorgenommen wurden. Ein Kind, bei dem eine primäre Rekonstruktion mit Kolostomie durchgeführt wurde, verstarb am postoperativen Tag aufgrund einer fulminanten Sepsis mit multiplem Organversagen.

Schlussfolgerungen: Bei der primären Behandlung anorektaler Verletzungen kann auf eine Kolostomie in der Mehrzahl der Fälle verzichtet werden, allerdings nur bei korrekter Auswahl im Hinblick auf das Infektionsrisiko des individuellen Patienten.

Schlüsselwörter

Anorektale Verletzungen · postoperative, septische Komplikationen · Traumascore · Kolostomie

Introduction

There has been an increase in the incidence of anorectal injuries (ARI) consistent with escalating civilian violence over the past two decades (14). Proximal colostomy, rectal repair (transabdominal or transanal), distal rectal washout, presacral drainage, and combinations thereof are the most frequently reported management methods (13, 14, 16, 22). At present, confusion continues concerning the routine application of any of these treatments for the management of ARI (14, 22). The role of routine faecal diversion has recently been questioned as the gold standard for treating colon injuries (7, 18, 19). Similar results were seen in ARI, and recently, there have been limited reports of primary repair of ARI without proximal colostomy (10, 13, 20).

The anorectal region is rarely injured in children, and generally occurs as a result of sexual abuse, impalement or firearm injuries (1, 3, 21). The management of ARI in children has not been discussed since Black's series of 16 children with ARI in 1982 (3). We have treated a relatively large number of ARI in children and reviewed our study to define more precisely when primary repair is feasible. We also evaluated the significance of several potential risk factors influencing the outcome in the management of ARI injuries.

Materials and Methods

Between January 1983 and May 2001, 41 children under 15 years of age with anorectal injuries were admitted to the Paediatric Surgical Department of Dicle University Medical School. Preoperative resuscitation and treatment of all patients with anorectal injuries were similar; intravenous fluids, anti-tetanus serum, tetanus toxoid and prophylactic antibiotics were given.

We reviewed each chart according to age, sex, trauma mechanism, the intervals between accident and management, symptoms and signs at presentation, diagnostic methods, location,

associated organ injuries (AOI), treatment, morbidity and mortality and two trauma severity indices (Score of anorectal injuries in children [ARI score] and Injury Severity Score [ISS]). Black et al (3) have classified ARI in children. The separation of ISS between 15 or less for minor trauma and 16 or more for major trauma was proposed as triage criteria (12).

The following risk factors were analysed to determine those that would predict the occurrence of postoperative septic complication: trauma mechanism, the interval between accident and laparotomy (admitted to hospital within 0 to 8 hours, and later than 8 hours after injury), management methods, AOI, ARI score and ISS score.

Statistical analysis

Univariate analysis was performed to determine the relative chances of a patient developing a postoperative septic complication after exposure to one of the above-named risk factors. Analysis was out for those patients who developed postoperative complications and this was compared with those who showed no postoperative complications. According to the number of patients in groups, chi-square test of Fischer's exact test was used to determine the significance of potential risk factors. We also compared the hospitalisation time of the colostomy-treated and colostomy non-treated patients by Mann Whitney U test. A *P*-value less than 0.05 was considered statistically significant.

Results

There were 17 boys (41%) and 24 girls (59%), with a mean age of 7 ± 3.4 years (range 3 to 14 yrs). The mean hospitalisation time was 9 ± 11.02 days (range 2 to 17 days). The arrival of the patient at the hospital after the initial injury was less than 8 hours in 63% of cases.

The causes of anorectal injury were blunt injuries, especially by motor vehicle accidents, in the vast majority of cases (56%). There were also 4 firearm and 6 stabbing injuries causing ARI in our series (Table 2).

A summary of the presenting symptoms and signs are given in Table 3. During initial examination of the 41 patients, 23 (56%) had signs of rectal bleeding. Three patients (7%) (one stabbing

Table 1 Classification of anorectal injuries in children (3)

Grade	Extent of injury
I	Full-thickness injury to anal canal or rectal mucosa
II	Full-thickness injury below IS $\pm$ ES
III	Full-thickness injury above IS without peritoneal involvement
IV	Full-thickness injury above IS with peritoneal involvement (IR involvement), no injury to other intraperitoneal organs
V	Full-thickness injury above IS with peritoneal involvement (IR involvement), associated injury to other intraperitoneal organs

IS: internal anal sphincter, ES: external anal sphincter, IR: intraperitoneal rectum

Table 2 Mechanism of anorectal injuries (n: 41)

Mechanism of injury	No. of patients	%
Blunt		
– Motor vehicle accidents	23	56
– Falls	8	20
Penetration		
– Firearm	4	10
– Stabbing	6	15

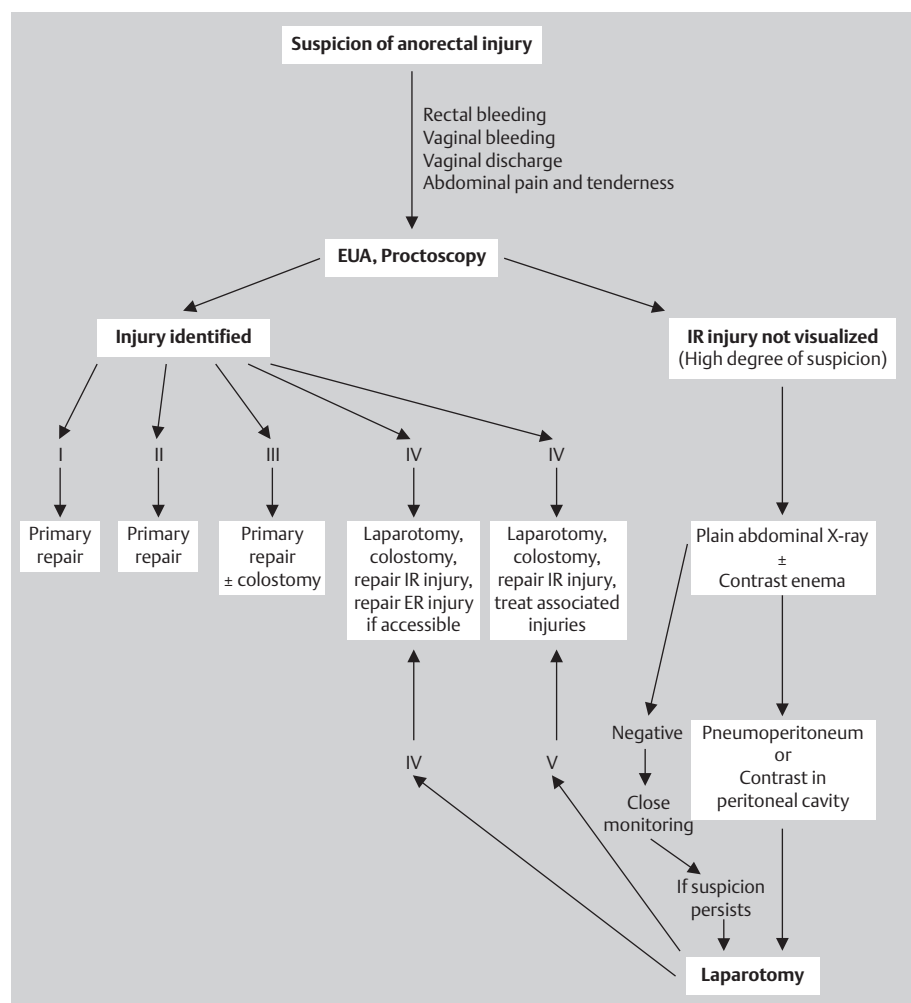


Fig. 1 Algorithm for management of anorectal injuries in our clinic. (EUA: examination under anaesthesia; ER: extraperitoneal rectum; IR: intraperitoneal rectum; I, II, III, IV, V: degree of injury).

Table 3 Presenting signs and symptoms

Signs and symptoms	No. of patients	%
Rectal bleeding	23	56
Rectal + vaginal bleeding	13	32
Rectal bleeding + abdominal tenderness	3	7
Urethral bleeding	2	5
Shock	2	5

and two motor vehicle accidents) had abdominal pain and tenderness. Two of the patients (5%, motor vehicle accident) presented with shock (systolic blood pressure < 80 mm Hg; pulse rate > 110/min; respiration rate > 30/min).

There was isolated ARI in 49% of cases. Table 4 shows associated organ injuries in addition to the ARI in 21 children: extremity fractures and hymen/vagina injuries were the organs most frequently involved.

The diagnostic accuracy of digital rectal examinations was 75%, whereas that for rigid rectosigmoidoscopy was 97% percent. Urethrosistography was performed in 2 patients and double contrast

Table 4 Associated other systemic injuries (n: 41)*

Type of Injury	No.	(%)
Hymen/Vagina	13	(32)
Gallbladder	2	(5)
Small bowel	1	(2.4)
Upper extremity fractures	2	(5)
Lower extremity fractures	6	(15)
Pelvic fractures	2	(5)
Vertebral fractures	1	(2.4)
Femoral vein	2	(5)
A. V. iliaca externa	1	(2.4)
Scrotum	2	(5)

* Patients can have more than one associated injury.

colon graph in 3 patients, leading to a definition of the anorectal and bladder injuries. Plain abdominal radiographs showed pneumoperitoneum in one of three patients with abdominal tenderness.

After resuscitation, 3 patients with abdominal signs (2 of them in shock) underwent immediate surgery. The first patient had blunt

Table 5 Analysis of postoperative septic complications versus the method of anorectal injury repair in 41 patients

Complication	Primary repair (n = 21)	Primary repair + colostomy group (n = 20)
Wound infection	1 (5%)	3 (15%)
Wound dehiscence	–	2 (10%)
Recto-vesical fistula	–	1 (5%)
Recto-vaginal fistula	1 (5%)	1 (5%)

abdominal trauma and yet was not in shock. Jejunal perforation was noted in addition to rectal injury. Treatment was primary repair and colostomy. The second and third patients injured by blunt trauma were in shock due to major vascular injuries, and bladder ruptures were present in addition to rectal injuries. Primary repair and colostomy were carried out in these patients. The injuries of all patients were examined under general anaesthesia with palpation of the anorectum and proctoscopy. The distribution of injury location according to Black's classification of ARI in our children was as follows: 10% in G I, 32% in G II, 51% in G III and 10% in G V. No patient was grade IV. Primary repair without colostomy was carried out in 51% of cases. Primary repair was carried out in all Grade I and II patients and in 4 patients with Grade III injury. Primary repair and diversion of faecal stream by loop colostomy (20 patients) were carried out in the remaining patients with G III and G IV injuries. The management of patients with ARI in our clinic according to year of injury is as follows: primary repair in 2 patients and primary repair + colostomy in 6 patients between 1983–1988; primary repair in 5 patients and primary repair + colostomy in 13 patients between 1989–1994; primary repair in 11 patients and primary repair + colostomy in 5 patients between 1995–2001. In the last 10 years, algorithms have been used for the management of ARI (Fig. 1).

Table 5 shows postoperative septic complications which occurred in 9 (29%) patients out of 41. The occurrence of complications was observed in 35% of patients of the colostomy + primary repair group and in only 10% of patients in the primary repair group. Wound infection was the most frequently seen complication of the primary repair + colostomy group. Wound infection was treated conservatively. Rectovaginal and rectovesical fistula occurred in two patients. The patient with rectovaginal fistula had had only primary repair and a diverting colostomy was performed on this patient. The patient with rectovesical fistula had primary repair + colostomy. Both of these patients' fistulas healed spontaneously after 2 weeks of wound care. Surgical treatment was carried out in 2 patients with wound dehiscence.

The average hospitalisation time for the colostomy + primary repair group was 11.8 days (range 6 to 17 days) and 7.2 days (range 2 to 13 days) for the group with only primary repair.

The average day of colostomy closure was 105 days after the initial operation. The average hospital stay after colostomy closure was 5.4 days (range 4 to 7 days). No postoperative complications

Table 6 Univariate analysis for postoperative septic complications rate (n = 41)

Prognostic factors	Class	Complication rate (%)	P-value	(95% Confidence interval) Odds ratio
Trauma mechanism				
	MVA (1)	23/4 (17)		
	Falls (2)	8/3 (37)	1 vs 2	1.385
	Firearm (3)	4/1 (25)		
	Stabbing (4)	6/1 (17)	ns	
Time to operative intervention				
	≤ 8 h	26/3 (11)		
	> 8 h	15/6 (40)	0.05*	2.156
AOI				
	(+)	21/5 (24)		
	(–)	20/4 (20)	ns	1.375
Management method				
	PR	21/2 (9)		
	PR + C	20/7 (35)	0.05*	2.672
Contamination				
	(+)	17/7	0.05*	3.094
	(–)	24/2		
ISS				
	< 15	25/3 (12)		
	> 15	16/6 (38)	0.05*	2.063
ARIS				
	I (1)	4/0 (0)		
	II (2)	13/1 (8)		
	III (3)	21/7 (33)	2 vs 3	4.500
	V (4)	3/1 (33)	0.09*	

RR: relative risk, MVA: motor vehicle accidents, AOI: associated organ injury, ISS: Injury severity score, ARIS: anorectal injury score, PR: primary repair, PR + C: primary repair + colostomy, *Significant value ($p < 0.05$)

occurred in these 20 patients. The average hospital stay in the two groups (7.2 days vs. 12.1 days), including the days for both initial and colostomy closure admission, was significantly different ($p < 0.05$).

A 3-year-old child in the colostomy + primary repair group, injured by motor vehicle accident, died on the first postoperative day from rapidly progressing septicaemia and multiple organ failure. Iliac bone fractures, a. v. iliaca externa, bladder and vaginal injuries were present in this patient.

The mean ISS value for all patients was 12.4 ± 4.2 (range 9 to 35). The mean value of ISS patients with postoperative septic complications was 19 ± 3.1 . In patients without postoperative complications, the mean value of the ISS was 7.7 ± 4.7 .

Potential risk factors were evaluated for their contribution to the development of postoperative complications. The univariate statistical analysis is outlined in Table 6. Some potential risk factors such as trauma mechanism and associated organ injury

were not significantly correlated to postoperative complications, while some other risk factors such as mode of treatment ($p < 0.05$) and time of operative intervention ($p < 0.05$) were significantly related to postoperative septic complications. The sensitivity of trauma scoring systems for estimation of postoperative complication occurrence was significant for ISS ($p < 0.05$) and ARI score ($p < 0.05$). The relative risk of developing a postoperative septic complication was higher than 2 for patients with ARI score grade III, ISS > 15 , primary repair + colostomy group, and time to operative intervention > 8 hours.

Discussion

Anorectal injury is uncommon in children and generally occurs by one of two mechanisms. The first is an accidental impalement or a firearm injury. The second and most common rectal trauma is a result of sexual abuse (1,3,11,21). In a recent report, 11 of 16 such injuries were due to sexual abuse (3). In the southeastern part of Turkey, children are common victims of road-traffic accidents, falls from heights and penetration injuries (8,23). Therefore the mechanism of injury was usually blunt trauma (76%) in the majority of our patients. Sexual abuse is the major cause of injury and blunt trauma is the lesser cause of trauma in reports of developed countries (3,11,21).

During World War I, the primary repair of colon injuries resulted in a high mortality rate of more than 67%; there was little experience with colostomy or injury exteriorization (19). Treatment involving colostomy and exteriorization of combat wounds of the colon rapidly improved the mortality and morbidity rates (5.4%) during and after World War II. Improved shock resuscitation, early operation, and adequate perioperative antibiotics have reduced the mortality of colon wounds from 30% to 2% during recent decades (2,9,18). Similar results were seen in the treatment of ARI, using colostomy and presacral drainage of anorectal combat wounds. This standard treatment during and after World War II rapidly improved mortality rates (30%) (14). During the Vietnam conflict, there was a decrease in mortality from 22% to 0% and in morbidity from 72% to 10% with repair of the injury when possible, diverting sigmoid colostomy, presacral drainage and distal rectal washout (16). Today, the reported mortality rates in civilian injuries to the rectum range from 0% to 10% with an associated morbidity of 10% to 45% (5,13,16,21). At present, there are four main management approaches: 1) diverting colostomy, 2) primary repair, 3) presacral drainage, and 4) distal bowel washout (13,14,16,22). Different combinations of the above techniques are being suggested as the ideal methods of treatment. However, the use of all these therapeutic methods is accepted for wartime injuries.

In the last 20 years, primary repair has assumed an increasingly important role for the treatment of colon injuries (7,18,19) but the friability of the repair, in view of serosal absence and technical difficulties and the prolongation of the operative time due to injury localisation and precise suturing, make the value of primary rectal repair even more questionable (22). McGrath et al (14) in their study of adult patients reported that most intraperitoneal injuries and injuries in selected patients with extraperitoneal wounds to the upper two thirds of the rectum can prob-

ably be managed with primary repair in a similar fashion to colon injuries. Distal rectal washout did not affect outcomes in their study. Velmahos (22) in a recent adult civilian rectal gunshot wound study pointed out that diverting colostomy without rectal repair or drainage appears to be safe for the management of most civilian retroperitoneal rectal gunshot wounds. We carried out primary repair with or without colostomy in our management of ARI. In the last 5 years, we have preferred to carry out primary repair without colostomy in selected patients with ARI to treat colon injuries (7). Others have reported small numbers of paediatric and adult patients who were repaired primarily without diversion (1,10,13,20). Most of these injuries were at the peritoneal reflection. In 51% of our patients, anorectal injury was managed by primary repair after debridement with a simple closure without colostomy. We identified full-thickness extraperitoneal rectal injuries in the 17 of these patients (81%). Our data suggest that it may be feasible to manage certain extraperitoneal rectal injuries without diversion. Patients who underwent faecal diversion had a statistically significant higher ISS than those who underwent primary repair without diversion. This treatment should be limited to stable patients who have ARI scores of 2 or less with minimal contamination, and who are treated within 8 hours of injury. Additionally, primary repair, if accessible can be used in G III patients without diversion. We performed primary repair without colostomy in our 4 patients with G III rectal injuries and no complication was observed. These patients were stable, arrived at the hospital less than 8 hours after injury and had a low ISS value. Only one of 21 patients developed rectovaginal fistula. We would not recommend this treatment for a patient where extensive mobilisation of the rectum would be required to perform the repair, because of the risk of vascular compromise of the repair. If the injury cannot be easily visualised, the patient should have diversion of the faecal stream with primary repair. Levine et al (13) reported 6 adult patients (20%) (including 2 gunshot wounds) who underwent primary repair without diversion, noting no morbidity or mortality. Their selection criterion was similar to ours, but we also carried out primary repair without colostomy in 4 patients with G III rectal injuries.

Colostomy and primary repair was required in 20 patients, especially for haemodynamically unstable patients with ARI grade III, IV or V, treated later than the first 8 hours after injury. We observed a higher complication rate in our colostomy group (35%) in comparison to our primary repair group (10%) that was similar to that reported by Levin (13) and Velmahos (22). This morbidity was due to septic complications from faecal contamination and the associated colonization of a large variety and number of virulent microorganisms. This supports the assumption that colostomy alone may increase the rate of infectious complications in anorectal injuries. Furthermore, colostomy requires a subsequent admission for operative closure, which in itself has the potential for increased morbidity. However, although some authors (17,18) reported a high rate of colostomy closure complications ranging from 22% to 26%, no closure-related complications were observed in our patients. Other authors have suggested that the risk of colostomy closure has been exaggerated (6). Even though the risk of colostomy closure has been exaggerated, the financial, psychological and social disadvantages of a colostomy should be also emphasised.

Black et al (3) proposed an ARI index as a grading system based on the full-thickness injury, below or above the internal anal sphincter, peritoneal involvement or associated injury to other intraperitoneal organs. Using these criteria, most of our patients (42%) were Grade II with 6% morbidity rate. Twenty patients in Grade III presented a significantly higher morbidity rate (35%) compared to Grade II ($p < 0.05$). We performed primary repair in all cases with Grade II and 20% of cases with Grade 3, in spite of Black's report on contrary indications for primary repair in Grade III. The rectal organ injury scale for adults proposed by Moore (15) and Black's (3) rectal injury scale for children are similar to one another; both ARI scales are only anatomic scales and do not include important non-anatomic risk factors of contamination, delay, and shock. We agree with Levine's decision that contamination and delay are important for the choice of treatment.

The issues of presacral drainage and washout are the most controversial issues in the treatment of ARI. In the McGrath et al (14) study, there was no statistical significance for the development of a presacral infection with respect to washout. Their study does not support distal rectal washout as an important adjunct to rectal injury treatment. Presacral drainage is perhaps the most controversial aspect in the management of rectal injuries. Recent studies have found no difference in morbidity after drainage of the presacral space. Thomas et al (20) found no advantage in drainage in their series of 52 patients. Bostick et al (4) reported no septic complications in the small number of their patients who were not drained. However, all of these authors recommend routine use of presacral drainage, especially where injuries to the extraperitoneal rectum are suspected. In our series, no patient had distal rectal washout and presacral drainage.

The results of this study suggest, 1) the major reason of blunt abdominal trauma and associated anorectal injuries in our region are motor vehicle accidents and falls. 2) Primary repair should be the standard approach in children. This treatment may be preferred in stable patients who have ARI scores of 2 or less with minimal contamination, and who are treated within 8 hours of injury. Additionally, primary repair, if accessible, could be used in G III patients without diversion. 3) Colostomy may be preferred in cases of prolonged delay, i.e. > 8 hours to diagnosis, multiple associated severe organ injuries with an ISS higher than 15 and the presence of contamination.

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