Original Research Article

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External genital injuries in childhood: obey the rules and detect the unseen

Ahmet A. Tuncer^{1*}, Didem Baskin Embleton¹, Nese N. User², Salih Cetinkursun¹

¹Department of Pediatric Surgery, ²Department of Emergency Medicine, Afyon Kocatepe University Medical Faculty, Afyonkarahisar, Turkey

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*Correspondence:

Dr. Ahmet A. Tuncer, E-mail: drtaali@yahoo.com

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ABSTRACT

Background: This paper evaluates the patients with external genital organ injuries (EGOI) and the suitability of the Onen's genital injury scoring (GIS) for the management of such patients.

Methods: This is a cross-sectional study. Patients with the complaints of EGOI were retrospectively explored regarding to age, sex, trauma type, hospitalization time, classification of injury type, presence of additional pathologies and treatment methods. After the injury types are classified by using the Onen's GIS, we investigated the sufficiency of this scoring method for our treatment modalities.

Results: A total of 57 patients, 19 females and 38 males, were diagnosed as EGOI. These patients were classified with Grades (G) by using the Onen's GIS (G1: 42, G2: 7, G3: 5, G4: 2, and G5: 1 patient.). The Grade 5 patient had a colostomy. The external anal sphincters of two patients were repaired to avoid incontinence in the future. The other patients received either medical or non-specific surgical treatments for their injuries. A G3 patient with testicular hematoma had testicular atrophy in the following year. There was no mortality in the present series.

Conclusions: The EGOI at childhood ranges from minor derma-abrasion to complete tears of anorectum which requires colostomy. Onen's GIS ensures better management.

Keywords: Child, Genital injury, Injury score, Trauma

INTRODUCTION

Traumas are one of the main reasons for children to apply the emergency services. More than one million children receive medical treatments because of traumas worldwide in a year and approximately 150.000 of them stay in hospitals during their treatments.¹

External genital organ injuries (EGOI) are rarely seen compared to other childhood traumas. External genital traumas occur in a broad spectrum, from a minor perineal derma-abrasion or erosion to a serious urinary tract or anal sphincter damage, which may cause mortality.²

There are many controversies regarding the proper management of perineal traumas of children.

Some of these controversies at emergency services are as follows: whether a simple treatment or a surgery is required; whether an emergency or a delayed treatment of sphincter damage is needed; whether applying colostomy to avoid perineal contaminations, etc.

There are protocols in the literature for better managements of injured children.²⁻⁶ Onen's classification for genital injuries of children is one of these protocols (Table 1).³

Table 1: Onen genital injury score.

GIS	Extend of injury			
I	Isolated genital laceration below hymen or			
	limited to penile and /or scrotal skin			
II	Isolated genital laceration including hymen			
	or tunica dartos of scrotum and or Bucks			
	fasia of penis			
	Isolated genital laceration including vajina			
III	or testis and/or penile cavernous of distal			
	uretra			
IV	Grade II or III injury plus partial tear of			
1 V	anorectum			
V	Grade III injury plus complete tear of			
V	anorectum			
	Key: GIS= Genital injury score.			

This study retrospectively explores the external genital organ injuries (EGOI) in children and investigates the sufficiency of the Onen's genital injury scoring (GIS) method for their treatment managements.

METHODS

This study is performed retrospectively with the permission of the Clinical Researches Ethics Institute of Dumlupinar University (2015-KAEK-86/07-144, Date: 26.05.2016, Decision Number: 2016-7-12). All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee

and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The families of children have signed the patient consent forms about the usage of patients' pictures for academic research purposes only.

In this paper, a retrospective cross-sectional study is presented. We went over the hospital records of the pediatric patients who visited our hospital with the complaints of trauma. All the children between 0-18 years old applied to the emergency department for trauma were included in the study. A total of 57 children were included in the study among 13210 children applied with trauma between March 2011 and March 2016. The 32 patients with EGOI were retrieved from the hospital registry system by using the genital trauma code ICD-10. Added to this, the files of 691 patients, the 5.23% of 13210 children that had pediatric surgery consultation were examined, and 25 additional patients with EGOI were retrieved. The patients who were excluded from the study were as follows: patients older than 18 years old; children who had other injuries related with orthopedy, neurosurgery or plastic surgery, without the genital damages; patients who applied to the emergency service with the complaint of genital trauma but do not have a record in the system with the ICD-10 code; and children who were discharged from the emergency service without a consultation of the department of pediatric surgery.

The patient flow chart is presented in figure 1.

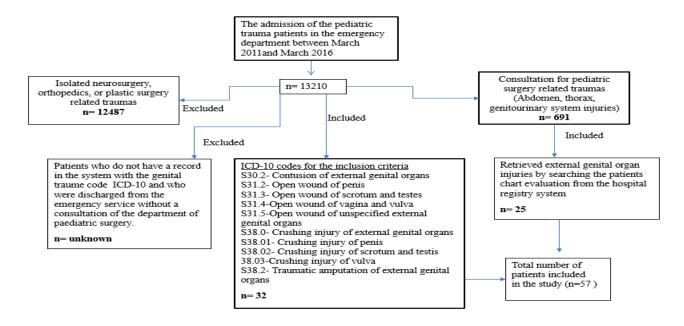


Figure 1: The patient flow chart.

The initial data was retrieved from the patient evaluation forms of the emergency department. The follow-up data

was retrieved from the patient charts or the hospital computer program (Enlil Hospital Patient Information

Systems, Turkey©). Patients in the determined study group were retrospectively explored regarding to age, sex, trauma type, hospitalization time, classification of injury type, presence of additional pathologies treatment methods and results. Trauma injury severity scores (TRISS) were calculated by using the evaluation forms of the emergency department.^{7,8} After the injury types were classified by using the Onen's GIS, we investigated the sufficiency of this scoring method for our treatment modalities.

The SPSS software (SPSS, SPSS Inc, Chicago, IL, USA) was used for the statistical analyses of the study group. Data distribution was examined by using the Kolmogorov-Smirnov test. Continuous variables were expressed as the mean±standart deviations (range: minimum-maximum). The appropriate categorical variables were denoted as numbers and percentages. The

Chi-square and Mann-Whitney U tests were applied to evaluate the categorical data and the quantitative variables, respectively. Two-tailed P values less than 0.05 were accepted to be statistically significant.

RESULTS

A total of 13210 children with trauma applied to the emergency service between March 2011 and March 2016. EGOI was detected in a total of 57 (0.431 %) patients, which consists of 19 females and 38 males. Considering the statistically significant difference with P=0.006, mean ages were 8.11±4.56 (in 2-18 age range) and 7.32±2.84 years old (in 4-16 age range) for males and females, respectively. The patients were grouped according to their age ranges as follows: 13 patients between 0-4 years; 28 patients between 5-9 years; and 16 patients between 10-18 years (Table 2).

Table 2: Mechanism of external genitalia injuries within age groups.

Age (years)	Saddle injury	Bicycle accident	Traffic accident	Hit by an object	Post circumcision bleeding	Zipper squeeze of foreskin	Chemical exposure
0-4 (n=13)	2	3	2	2	2	2	
5-9 (n=28)	11	11	2	2	1	1	
10-18 (n=16)	4	3	4	3	1		1

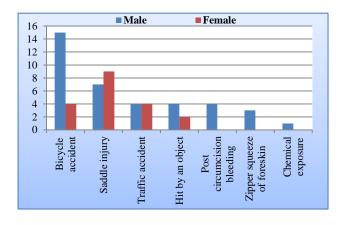


Figure 2: Patients according to the trauma types and gender.

Considering the statistically significant difference with P= 0.001, the averaged hospitalization time for male and female patients were 36.3 hours (between 1 hour and 12 days) and 72.6 hours (between 1 hour and 10 days), respectively.

The patients were classified according to their injury types as follow: saddle injuries (21 patients), bicycle accidents (19 patients), traffic accidents (8 patients), post circumcision bleedings (4 patients), zipper squeezes (3 patients) and chemical exposure (1 patient) (Figure 2). While the most frequent EGOI reason among boys was the bicycle injury, it was the saddle injury for girls.

Table 3: Grade of injuries within each group.

GIS	Saddle injury		Traffic accident	Hit by an object	Post circumcision bleeding	Zipper squeeze of foreskin	Chemical exposure
I	12	15	3	4	4	3	1
II	3	2	2				
III	1		1	2			
IV	1		1				
V			1				

The TRISS of the patients were found as 3.23±4.774 (ranging 1-23). The patients in the study group were classified with Grades (G) by using the Onen's GIS (G1: 42, G2: 7, G3: 5, G4: 2 and G5: 1 patient.) (Table 3).

A total of 14, or 36.84%, of male patients and a total of 14, or 73.60%, of female patients received examination and surgical operation under the sedation/general anesthesia. In our study group, the 8 of 9 patients who had perineal injury were females. Three of these female patients had injuries involving the anus. The Grade 5 patient received a colostomy. This patient's TRISS was calculated as 23. The patient also had a serious fecal contamination. The external anal sphincters of two patients were treated to avoid incontinences (Figure 3).

Patient in figure 3 is a 10-years-old female patient who had a traffic accident in a car. First picture of the patient

taken at the emergency service. It is seen that there is only bleeding from her genital area. An optimal genital examination could not be applied because she could not move her left lower extremity. Her left femur shaft fracture, which prevented her movements, was observed at the multi-detector computed tomography. At the examination under the general anesthesia, a deep skin cut, which was in the front, was observed. It caused a partial tear at anus while damaging the perineal body where cuts the lower vagina with a line from the 3 and 9 o'clock. After inserting the urinary catheter, the repairment of the vaginoplasty, and the perineoplasty external anal sphincter are done. Also, the anoplasty is applied. Although the Grade 4 patient had a score of ISS as 17, we did not open colostomy because the patient didn't have prolonged delay, shock or contamination. In the same session, a fixation is applied to the femur fracture. The incontinence has not developed and the patient has been observed without any complication.

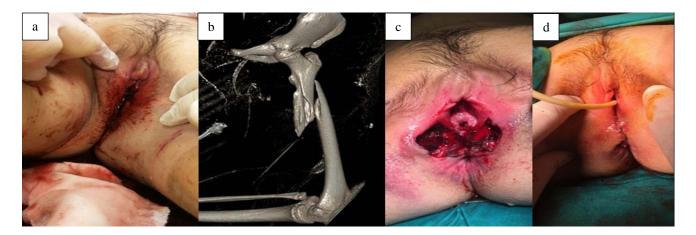


Figure 3: Obey the rules and detect the unseen: A 10-years-old female patient who had a traffic accident in a car. (a) preoperatif, (b) computed tomography scan, (c) peroperative, and (d) postoperative images of the patient



Figure 4: A patient who had right testis rupture because of a teeter-totter crash. The borders of tunica albuginea (solid arrows) and the hematoms between seminifer tubules (dashed arrows) were observed.

Considering a suspicion of serious injury, we applied a scrotal exploration to a male patient who had redness, swelling and pain at his scrotum but it corresponded with hematoma (an injury in Grade 1 class.). We surgically explored four patients (grade 2 injury) who had testis luxation through scrotal tear and figured out that they did not have damage in their testis tissues. Therefore, their tunica dartoses were repaired by putting the testes into their scrotums. The tunica albugineas of three patients who had testis ruptures were fixed (Figure 4).

We applied orchiectomy for the treatment of testis atrophy to a patient who had been followed with medical treatment because of his testis hematoma for one year. A patient who had been followed for one year because of the non-regressive traumatic hydrocele was treated by partial hydrocelectomy. The other patients received either medical or non-specific surgical treatments for their injuries (Table 4).

A total of 8 patients, 3 males and 5 females, had other injuries as well, in addition to genital ones. These other injuries were as follows: four patients had symphis pubis diastasis; three patients had femur fractures; three patients had anal fissures; one patient had sacrum

fracture; one patient had iliac crest fracture; one patient had tibia fracture; one patient had clavicle fracture; and one patient had lung contusion. Six of these eight patients had traffic accidents, one patient had a bicycle accident and one had saddle injury.

Table 4: Applied external organ injury treatment methods according to the trauma types.

Treatment	Saddle injury	Bicycle accident	Traffic accident	Hit by an object	Post circumcision bleeding	Zipper squeeze of foreskin	Chemical exposure
Warm sitz bath/medical	11	10	2	2		3	1
Hemostasis					4		
Labium majus/minus repair	2	2	1	1			
Vaginoplasty	3	1	3				
Perineoplasty	2	4	3	1			
External mea repair			1				
Scrotal skin primary repair		3					
Tunica dartos repair	1	1	2				
Tunica albuginea repair				3			
Anoplasty	1		2				
Inserting a urinary catheter	2	2	5				
Scrotal exploration	1						
Colostomy			1				

The applied treatment protocols have been compatible with Onen's GIS, except two patients. One of these patients had Grade 1 injury and had scrotal exploration. The other patient had also Grade 1 injury and resulted in testicular atrophy probably because of crush injury to testis. There was no mortality among this study group.

DISCUSSION

Genital injuries occurred accidentally are not common in the pediatric population. While the EGOI is seen mostly because of falling down, traffic accidents, strikes to the genital area, etc. in the developing countries, the most common reason of the genital injuries in the developed countries is sexual abuse. 9,10 If there is a weak correlation between the examination results and the trauma story, a sexual abuse should definitely be considered. The most frequent reasons seen at our study group were saddle injuries, bicycle and traffic injuries. There was no suspicion of sexual abuse at the examinations of our study group. In our study group and in the literature, it is seen that the genital traumas due to traffic accidents or falling downs are more serious because anorectal or other organ damages may also accompany the genital organ injuries. Patients in this situation have higher injury severity score (ISS) and the management of them should be different according to trauma mechanisms or anorectal damages.³

The external genital organs of both genders intend to bleed exceedingly even with a minor injury so hemodynamic stabilization should be ensured at emergency rooms. As in all trauma cases, it is important to stabilise the patient and to determine the extent of the injuries quickly. Prompt diagnosis and early surgical repair of a perineal injury offer the best functional outcome.¹¹ Because of the different structures of male and female external genital organs, the effects of traumas on both genders are also different. Traumas of male children usually cause the injuries of testis and scrotum. The external genital organ injuries of female children mostly lead to the damages through the anus and rectum. A few classification methods are proposed for a common language to speak in case of external genital organ injuries. The most known of these methods are the injury severity scoring (ISS) of the American Association of the Surgery for Trauma (AAST), the TRISS which is a modified version of ISS, and the Onen's GIS.3,7,10

The scoring of AAST organ injury severity scale evaluates each organ (scrotum, testis, penis, etc.,) separately. The AAST classification method successfully discriminates whether each organ should receive operational or non-operational treatments. This method may lead to incorrect evaluations and improper managements in case of injuries from vagina or from scrotum to the anorectum.

Levine et al. and Onen et al. present that the contamination is very important to choose a delayed or shocked treatment modality.^{3,12} The effects of these factors to the treatment modality shows that Onen's GIS seems more functional and easier to perform compared to AAST organ injury severity scale, where the organs are separately classified.

In Onen grade IV or V patients, if ISS is larger than 15; if there is a serious contamination; and if the immediate treatment is delayed more than 8 hours, the frequency of postoperative complications increase. Therefore Onen et al. suggests adding colostomy to the primer repair of Grade 4 patients if the cases in the previous sentence occur.³

We opened colostomy to the Grade 5 patient in our study group according to the Onen's GIS. The ISS of this patient was calculated as 23 and the patient had serious fecal contamination. However, Grade 4 patients received primary repair and they have been observed without any complications. One of these Grade 4 patients had a score of ISS as 17. The Onen's GIS would suggest to open colostomy but the patient was treated without any complication by having permissive constipation and serious wound care to prevent fecal contamination.

Primary repair is mostly enough for the patients with Grade 4 or with the lower Grade levels. In some cases, reconstructive procedures, skin flaps or grafts may also be required for those patients. During a primary repair, the debridement of devitalized tissue should be done and the wound should be dressed regularly. After an urethrogram, we inserted urinary catheters to two male patients who had abrasion and one male patient who had pubic fracture and hematuria.

Bakal et al suggests endoscopic interventions to show the presence and seriousness of vagina, urethra and rectum injuries of the patients with a GIS score between 3 and 5.¹³ In our studies, these organs could clearly be evaluated under anesthesia so we did not need to apply endoscopic procedures.

The blunt scrotum traumas of males cause a broad clinical table such as testis rupture, torsion, luxation of testis, hematocele, and testis contusion. ¹⁴ The most common scrotal damage is the testis hematoma. Pain, swelling, sensitivity and purple spots at scrotum can be seen in case of the scrotal traumas of males during physical examinations. ¹⁵

Seminiferous tubules come out from the laceration of tunica albugine in testicular rupture. The ultrasonography may show the damage at the tunica albuginea and helps the exact diagnosis.¹⁵ Testis injuries were tracked conservatively until 1970s. The studies of Cass and Gross about the early surgical explorations and repairs are the fundamentals of recent approaches.¹⁶ The repair in the first 72 hours ensures successful testis rupture treatments

with a percentage of 82%-86% testicular salvage.¹⁷ In our study group, all injuries of male patients were Grade 3 or lower degrees according to the Onen's GIS. The 17 of these injuries were consisted of scrotum and testis. A total of 3 patients had testis rupture and the 4 patients had testis luxation due to the tunica dartos laceration. The 9 patients had skin cut and the injuries were compatible with hematoma.

The required surgical interventions are done in the first 12 hours. We did not observe testis loss, except in one patient. Onen's GIS does not include the effects of hematoma, which resulted in testicular atrophy in one of our patients. In our study group, primer repair was enough for the patients with Grade 4 or lower degrees as Onen et al. suggests. We needed to apply additional colostomy to the primary repair for the Grade 5 patient. Colostomy was closed in postoperative second month. No complications were observed in the group, except testis atrophy in one patient. Generally, we can say that our patient management was proper according to the Onen's GIS and its treatment principles.

Genital injuries of females rarely result with mortality. However, if the EGOI is not managed properly, the female patients may have chronic discomfort, dyspareunia, infertility or fistula formation. Male patients should be tracked to avoid testis loses due to hematoma and undetermined ruptures in the long term.

Having a retrospective study design, being non-randomized and having not many grade 4 or grade 5 patients are the limitations of our study group. Although this study design is retrospective, we believe that it will serve the practical usage of scoring methods for the doctors who have patients with genital traumas and will lead to the new prospective studies in the future.

CONCLUSION

Traumas at childhood are seen rarely but their influences may affect the patients during their whole life. Hence the severity of a trauma should be determined, and a proper treatment modality should be applied as soon as possible. Due to the additional organ injuries beside EGOI and the fractures of pelvis or lower extremity bones, an examination might be difficult at an emergency room. Therefore, a detailed and precise examination of a child patient with seemingly complicated EGOI should be done under sedation. Using a protocol such as Onen's GIS helps the usage of a common language and makes the management of the patients easier. In addition, we believe that the trauma scoring methods such as AAST or Onen's GIS help the critical decisions of young clinicians for patient managements.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

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