

Testicular Injuries-Efficacy of the Organ Injury Scale Developed by the American Association for the Surgery of Trauma

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Purpose: According to the AAST (American Association for the Surgery of Trauma) injuries to the testes are rare, but there are many reports in the literature on other organs using the AAST Organ Injury Scale (OIS). In the present study, the authors evaluated the usefulness of the AAST OIS when applied to the testis.

Materials and Methods: A retrospective review was performed on 65 patients (mean age 30.0 years) with a testis injury treated between March 1986 and July 2006. Of the 65 patients, preoperative ultrasonography was performed on 51. Injuries were classified according to the OIS of the AAST, based on history taking, a physical examination and scrotal ultrasonography.

Results: Of the 51 patients, 46 and 5 underwent surgical intervention and conservative management, respectively. Of the included patients, 38 were found to have abnormal testis contours on ultrasonography, 29 had a rupture of the tunica albuginea, with a sensitivity of 76.3%. Of the 13 patients with normal contours, the tunica albuginea was normal in 7, and 8 underwent operation, with a specificity of 87.5%. Of the 12 Grade I patients, 7 underwent an operation, but the testes contours were normal. Of the 8 Grade II patients, only 1 underwent a primary repair with partial orchiectomy, but of the 45 Grades III, IV or V patients, 35 underwent a primary repair with a partial orchiectomy or orchiectomy with a hematoma evacuation performed in 10.

Conclusions: Ultrasonography was found to be the most effective modality for detecting a rupture of the tunica albuginea, and the authors conclude that the AAST OIS can be used to determine the treatment modality. Our recommended treatment policy is as follows; conservative for Grade I, exploration and repair for Grade II, and exploration, and a partial orchiectomy or orchiectomy for Grades III, IV or V. In particular, an orchiectomy is the most commonly used modality for Grade V. (Korean J Urol 2007;48:61-65)

Key Words: Testis, Wounds, Injuries, Ultrasonography

대한비뇨기과학회지
제 48 권 제 1 호 2007

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접수일자 : 2006년 9월 7일
채택일자 : 2006년 11월 13일

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PURPOSE

In 1987, the American Association for the Surgery of Trauma Organ Injury Scale (AAST OIS) Committee was formally organized, and devised clinical investigation and outcomes research about each organ. The AAST OIS Committee later devised a testis organ injury scale in 1995.¹ Since

the introduction of organ severity injury scales by AAST, clinical investigations and outcome research has been undertaken in many organs, but clinical research on testis injury is comparatively rare after the introduction of the testis OIS, because injury to the male external genitals is uncommon, though several reports are available on gun shot injuries.²⁻⁵

Thus here, the authors report on the usefulness of the AAST testis injury scale based on preoperative scrotal ultrasonography

and physical examination. And the authors compared AAST testis injury grading based on scrotal ultrasonography with operative finding and follow up.

MATERIALS AND METHODS

From March 1986 to July 2006, we performed a retrospective review of 65 patients with trauma injury to the testis, who were treated at our urologic department. Records were reviewed with special attention to the injury severity, etiology, ultrasonographic and physical examination findings, time from injury to medical assistance, local wound care, operative findings, surgical reconstruction, and outcomes.

Testicular injuries were scored retrospectively using the AAST testis injury scales. Furthermore, treatment outcomes and subsequent follow up data, particularly concerning assessments of complications including testis atrophy, and micturition were reviewed (Table 1).

Table 1. Testis grade according to the American Association for the Surgery of Trauma (AAST) organ injury severity scale

Grade	Description
I	Contusion/hematoma
II	Subclinical laceration of the tunica albuginea
III	Laceration of the tunica albuginea with less than 50% parenchymal loss
IV	Major laceration of the tunica albuginea with 50% or greater parenchymal loss
V	Total testicular destruction or avulsion

RESULTS

Of 65 patients 63 (96.9%) had experienced a blunt trauma to the testis and 2 (3.1%) a penetrating trauma. The etiologies of the blunt traumas were; violence (34), sports (15), traffic accident (8), fall down (5) and industrial accident (1). And the penetrating traumas were caused by a broken glass bottle (1) and an iron bar in a construction site (1). The sports involved were soccer (6), combative sports like taekwondo (5), basketball (1), baseball (1) and cycling (1). Traffic accidents involved were a motorcycle (5) and a car (3) (Table 2).

Symptoms after testis injury were; scrotal swelling (63), local pain (60), discoloration (30), and nausea and/or vomiting (1). Scrotal ultrasonography was performed in 51 of 65 patients. Of 38 patients that sustained a rupture of the tunica albuginea by scrotal ultrasonography, 29 patients had a rupture of the tunica albuginea on exploration; giving a sensitivity for scrotal

Table 2. Etiology of testicular injury

Classification	No. of patients (%)
Blunt injuries	63 (96.9)
Assault	34 (52.3)
Sports	15 (23.1)
Motor vehicle injury	8 (12.3)
Fall down	5 (7.6)
Industrial	1 (1.5)
Penetrating injuries	2 (3.1)
Stab wound	2 (3.1)
Total	65 (100)

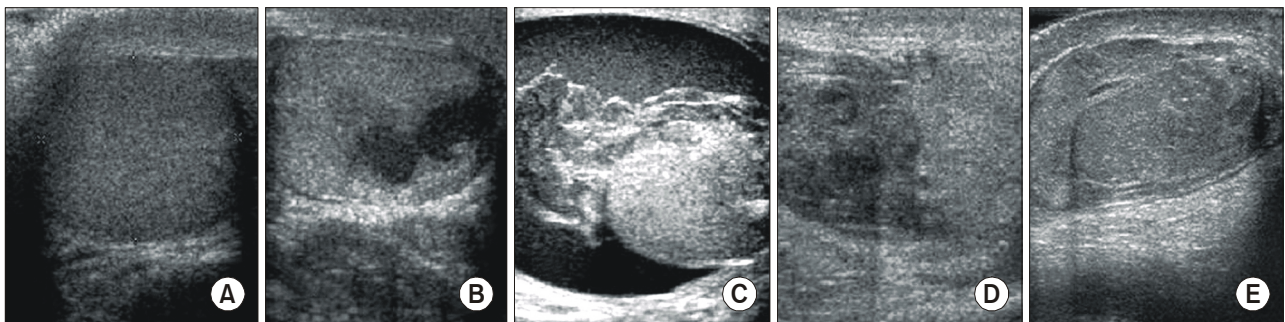


Fig. 1. Testis injury, American Association for the Surgery of Trauma Organ Injury Scaling. (A) Grade I, (B) Grade II, (C) Grade III, (D) Grade IV and (E) Grade V.

Table 3. Ultrasonographic findings

Ultrasonographic finding	No. of patients	T. albuginea at operative finding	
		Intact	Tearing
Normal	2*	0	0
Only hematoma	11 [†]	7	1
Abnormal contour	5	2	3
Abnormal contour with hematoma	33	7	26

*: 2 patients conservative management, [†]: 3 patients conservative management, sensitivity 29/38=76.3%, specificity 7/8=87.5%

ultrasonography of 76.3%. On the other hand, of 13 patients that sustain no rupture of the tunica albuginea on scrotal ultrasonography 8 underwent scrotal exploration and 1 was found to have a normal testis; giving a specificity for scrotal ultrasonography of 87.5% (Fig. 1) (Table 3).

The mean time from injury to the receipt of medical assistance was 73 (5-960) hours. Of 46 patients that went exploration within 72 hours, 6 (13.0%) received orchiectomy, and of 12 patients that underwent exploration after 72 hours, 1 (8.3%) received orchiectomy.

Of 51 patients who went preoperative ultrasonography, 46 underwent exploration, decompression, and primary repair with partial orchiectomy and orchiectomy, and the other 5 patients underwent conservative management. Of 38 patients with an abnormal testis contour detected ultrasonographically, 29 had a rupture of the tunica albuginea; a sensitivity of 76.3%. Of 13 patients with a normal contour, the tunica albuginea was normal in 7 of the 8 that underwent operation; a specificity of 87.5% (Table 4).

Testicular injuries were scored retrospectively using the AAST testis injury scale. Of 12 Grade I patients, 7 patients underwent an operation, but a normal testis contour was found in all patients; of 8 Grade II patients, only one received primary repair with partial orchiectomy; and of 45 Grade III, IV, or V patients, primary repair with partial orchiectomy or orchiectomy was done in 35, and exploration with hematoma evacuation in 10. In particular, of 4 Grade V patients, orchiectomy was performed in 3.

The authors evaluated the difference between preoperative AAST OIS and postoperative AAST OIS. As our result, one

Table 4. Operative treatment vs. conservative management

Conservative	5
Operative	60
Exploration & hematoma evacuation	21
Decompression	3
Primary repair with partial orchiectomy	29
Orchiectomy	7
Operation finding	
Testis intact, only hematoma	22
T. albuginea rupture	15
Testis parenchyme disperse	23

of 8 Grade II patients was Grade III. Of 31 Grade III patients, 9 were Grade II. Of 4 Grade V patients, one was Grade III. Because preoperative AAST OIS is based on scrotal ultrasonography and physical examination, scrotal ultrasonography did not find minimal injury of tunica albuginea and testis parenchyma.

We followed up 33 patients of 65 patients and 32 were without any complication like testis atrophy, voiding difficulty, inflammation, infection, or necrosis. However, one Grade II case developed testis atrophy 10 years after partial orchiectomy and was treated by orchiectomy of the atrophic testis.

DISCUSSION

The authors analyzed the usefulness of the AAST testis injury scale with operative finding and followed up the patients. With high sensitivity (76.3%) and specificity (87.5%), we found that scrotal ultrasonography is the most effective modality at detecting tunica albuginea rupture, and that the AAST testis injury scale can be used to determine treatment modality.

In our study, the most common etiology of testis injury was blunt trauma (63) caused by violence or sports or traffic accidents. Soccer was the most common sport associated with type of injury followed by taekwondo. Mohr et al.⁶ reported that of 116 cases of external genitalia injury, 88 were gun shot related injuries, 13 were caused by traffic accidents, and that other causes included falls, industrial accidents, animal bites, and skiing. Wan et al.⁷ reported the following percentages for sports-related injuries to the testicles; football (44%), hockey (19%), baseball (15%), soccer (12%), and basketball (6%), and commented that the most common injury site of injury was the

kidney. Because of their location and mobility the testes are less vulnerable to crush injury and disruption. Gomes et al.⁸ and Cumming and Boullier⁹ reported animal bites of the male external genitalia are common among children, and that the majority require an emergency operation. Moreover, it is evident that the etiologies of testicular injury are socially and culturally related.

Cass and Luxenberg^{10,11} found that of those that presented within 72 hours or incident that orchiectomy was done in 9%, but that this fell to 45% for those presenting more than 72 hours later. In our study the mean time from injury to receiving medical assistance was 73.0 (5-960) hours. Of those that presented within 72 hours 13% received orchiectomy and this fell to 1 (8.3%) for those that presented more than 72 hours later, indicating that early operation is related to injury severity.

The ultrasound features of testicular trauma with rupture are an irregularity of the testicular outline and an inhomogeneity of testicular texture.¹²⁻¹⁴ Buckley and McAninch¹⁵ concluded that scrotal ultrasonography is highly sensitive and specific for diagnosing testicular rupture in the context of an otherwise equivocal scrotal examination, and found that accurate diagnosis and prompt repair led to a salvage rate for testicular rupture specifically of 83% and overall of 92%, with preservation of the testicular parenchyma and hormonal function, and the avoidance of delayed complications such as atrophy and orchiectomy. In the present study, the sensitivity of scrotal ultrasonography was 76.3%, and its specificity was 87.5%. Based on the finding of 76.3% of sensitivity and 87.3% of high specificity from the scrotal ultrasonography used to detect the rupture of tunica albuginea, we suggest that surgical exploration should be applied if scrotal ultrasonographic findings suggest the rupture of tunica albuginea. Fournier et al.¹⁶ and Anderson et al.¹⁷ reported sensitivities for scrotal ultrasonography of 100% and 90%. However, another study cautioned that scrotal ultrasonography cannot detect minimal rupture of the tunica albuginea.¹⁸ In our study, scrotal ultrasonography could not detect minimal rupture of the tunica albuginea due to peritesticular hematoma and scrotal edema.

The AAST grading of testicular trauma was found to readily differentiate patients with high grade injuries that require operative management, and patients that can be safely managed nonoperatively.⁶ According to the AAST testis injury scale, testis injury is scored according to testis echogenicity, hematoma, and contour (Table 1). AAST Grade II includes intra-

testicular hematoma with suspicious minimal scrotal laceration. In our study, there were 12 Grade I, 8 Grade II, 31 Grade III, 10 Grade IV, and 4 Grade V patients. Of the 12 Grade I patients, 7 underwent an operation, but a normal testis contour was found at operation room. A scrotal exploration is not necessary in Grade I in our study, and Mohr et al.⁶ reported that even Grade II is manageable nonoperatively. However, in the present study, one Grade II patient needed primary repair with partial orchiectomy, and thus, we recommend scrotal exploration in Grade II. Of 45 Grade III, IV, or V patients, primary repair with partial orchiectomy or orchiectomy was performed in 35, and exploration with hematoma evacuation in 10. In particular, of the 4 Grade V patients orchiectomy was performed in 3.

In our study, the limitation is that different treatment options had been adopted to manage testicular injuries due to retrospective study over twenty years.

CONCLUSIONS

We conclude that, ultrasonography is the most effective modality at detecting tunica albuginea rupture, and that the AAST testis injury scale can be used to determine treatment modality. Conservative treatments are invariably required in cases of the AAST Grade I, exploration and repair in Grade II, exploration or partial orchiectomy or orchiectomy in Grades III, and IV, and most cases with a Grade V injury required orchiectomy.

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