

Blunt scrotal trauma in adults: A multi-institution study evaluating the American Association for the Surgery of Trauma organ injury grading scale About 107 cases

Le traumatisme fermé du scrotum chez l'adulte: Une étude multi-centrique évaluant l'échelle de classement des traumatismes d'organes de l'Association Américaine de la Chirurgie Traumatologique. A propos de 107 cas

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R É S U M É

But: Evaluation de l'intérêt de la classification établit par l'AAST (American Association for The Surgery of Trauma) dans les traumatismes fermés de testicule en se basant sur l'échographie scrotale préopératoire et l'examen physique par rapport aux données peropératoires.

Méthodes: Une étude rétrospective a été réalisée sur 107 patients (âge moyen=29,2±5,8 ans) ayant eu un traumatisme testiculaire fermé et traité entre Janvier 2005 et Août 2015. L'échographie préopératoire a été réalisée dans tous les cas. Tous les patients ont eu une exploration scrotale chirurgicale. Ces traumatismes ont été classés selon l'échelle de l'AAST, en préopératoire sur la base de l'examen physique et l'échographie scrotale, par rapport aux données peropératoires définitives.

Résultats: Parmi les patients inclus, 14 avaient des contours testiculaires anormaux à l'échographie, 25 avaient une rupture de l'albuginée. La sensibilité de l'échographie était de 70,8% et la spécificité de 71,2%. L'orchidectomie totale a été réalisée chez 12 patients, l'orchidectomie partielle chez 32 et la réparation de l'albuginée chez 35 patients.

Conclusions: A travers cette étude, l'échographie n'était pas un examen suffisamment spécifique et sensible pour évaluer la sévérité du traumatisme testiculaire. Les données pré et peropératoires étaient significativement différentes. Ainsi, nous continuons à soutenir l'intérêt de l'examen physique et nous encourageons l'exploration chirurgicale lorsqu'une lésion testiculaire est suspectée.

M o t s - c l é s

Adulte, testicule, scrotum, traumatisme fermé, albuginée, Rupture, hématocèle, Échographie, Classification, Reconstruction, Orchidectomie

S U M M A R Y

Purpose: The authors evaluated the usefulness of the American Association for the Surgery of Trauma (AAST) testis injury scale based on preoperative scrotal ultrasonography (US) and physical examination compared to peroperative findings.

Methods: A retrospective review was performed on 107 patients (mean age=29,2±5.8 years) with a testis blunt trauma treated between January 2005 and August 2015. All patients underwent surgical scrotal exploration. Preoperative US was performed in all cases.

Testis trauma was classified according to the AAST organ injury scale, preoperatively based on physical examination and scrotal US and then compared to peroperative definitive grading scale.

Results: Of the included patients, 14 were found to have abnormal testis contours on US, 25 had a rupture of the tunica albuginea, with a sensitivity of 70,8% and a specificity of 71,2%.

Orchidectomy was performed in 12 cases, partial orchidectomy in 32 and tunica albuginea repair in 35 patients.

Conclusions: Through this series, US was not a specific and sensitive exam to really precise the severity grade of testis trauma. Pre- and preoperative findings were significantly different. Thus, we continue to support history and clinical findings and we encourage surgical exploration when testis lesion is suspected.

Key - words

Adult, testis, blunt trauma, rupture, hematoma, echography, classification, reconstruction, orchidectomy

Testicular trauma is the 3rd most common cause of acute scrotal pain (1). It accounts for less than 1% of all blunt trauma-related injuries, because of the anatomic location and mobility of the scrotum (2).

Although common, these injuries are challenging to manage for many trauma surgeons or urologists. If it is unrecognized or improperly managed, testis injury can lead to the loss of fertility or other significant and delayed complications. Since the introduction of testis organ severity injury scales by the American Association for the Surgery of Trauma (AAST) in 1995 (3), allowing a rational approach to diagnosis and management of many organs blunt trauma, there were many reports in the literature on organs blunt trauma using the AAST Organ Injury Scale (OIS). However, papers dealing with the interest of this score in scrotal blunt trauma remain relatively rare.

PURPOSE

The authors compared AAST testis injury grading based on scrotal ultrasonography (US) and clinical findings with the intraoperative findings gathered from the surgery report to provide a rational approach to the diagnosis and management of blunt scrotal trauma and to aid clinicians in the selection of patients for surgical exploration.

METHODS

We performed a retrospective evaluation of the medical records of admitted patients with blunt scrotal trauma from four metropolitan tertiary referral hospitals. A total of 107 Patients were recruited from January 2005 to August 2015.

Inclusion criteria: Only patients with preoperative scrotal US were included.

Non-inclusion criteria: Patients with penetrating scrotal trauma were not included.

Scrotal US were retrieved and reviewed (by an urologist) unaware of the treatment regimen and outcome.

Records were reviewed to the injury severity, etiology, the time from trauma to medical assistance, physical examination findings, US findings, intraoperative findings gathered from the surgery report and surgical management.

All testis injuries were scored retrospectively according to the AAST-OIS for testis injuries on preoperative US and peroperatively according to surgery reports. The two scores are then compared.

Statistic tests: Differences between groups were analyzed by χ^2 test, eventually completed by Fisher exact test and Student T-test. All tests were two-tailed and conducted at the 5% significance level. Relative risk and 95% confidence intervals were determined using SPSS (version 19.0) software (SPSS, Chicago, Illinois).

RESULTS

During the period of study, 122 patients were admitted to four institutions for scrotal trauma.

Patients with penetrating scrotal trauma (n=3) and those who were not explored by a preoperative US (n=12) were not included in this study, thus our population accounts 107 patients only. The mean admission age was $29,2 \pm 5.8$ years (17-62). The majority were under 30 years (n=76). The etiologies of the scrotal blunt traumas were dominated by assault (n=52). Other causes included sports accident (n=16), motor vehicle injury (n=15), fall (n=13), occupational accident (n=10) and not specified in one case.

Associated injuries were found in 39 patients (36,4%) patients: abdominal injury (n=19), head trauma (n=11), perineal skin avulsion (n=12), penile (n=2), and urethral (n=1). Abdominal injuries were dominated by abdominal wall hematoma (n=9) and blunt liver trauma (n=5).

Symptoms after testis trauma were local pain (n=107), scrotal swelling (n=101) and nausea and/or vomiting (n=13) and fever (n=9). The time from injury to the receipt of medical assistance ranges from 1 hour to 7 days. The majority of patients (n=63) (58,9%) were examined within the first 24 hours after the accident.

Leukocytis was found in 57 patients (in all patients with fever). There was no correlation between leukocytosis and medical assistance delay ($p=0,61$).

Preoperatively, the US exploration revealed a normal testis (n=14), intra-scrotal hematoma (n=13), tunica albuginea rupture (n=25), spermatic cord hematoma (n=6) and epididymal disruption (n=5) (Table I). Patients with normal US were explored due to the unconformity between clinical (pain and/or testis deformity) and US data.

Table 1 : Reported scrotal US findings.

US findings	Nb. Of patients
Intact tunica albuginea	56
Hematoma only	12
Intratesticular hematoma	13
Tunica albuginea rupture	25
Testis abnormal contour	14

Early exploration was done in all patients: hematoma evacuation (n=41), evacuation of intra-testicular hematoma (n=13), partial orchiectomy (n=32) and total orchiectomy (n=12) (Table II). The testicle salvage rate was 88,8%. All orchidectomy were performed in patients who went exploration within the first 72 hs after trauma. In one case, pathology concluded to a testis seminoma. With a mean follow-up of 32,7 months, no secondary treatment (especially orchiectomy) was mandatory in all cases.

Table 2 : Surgical reparation

	Nb. Of patients
Exploration (nothing)	07
Hematoma evacuation	41
Tunica albuginea suture	35
Decompression (intratesticular hematoma)	13
Primary repair + partial orchiectomy	32
Orchiectomy	12 (testis cancer in one case)

The presence of testicular pain, swelling, tenderness or testis deformation was not suggestive of significant testicular injury (grade IV-V); however, 9 of testicular rupture were present in absence of swelling.

On scrotal US, we suspected rupture of the tunica albuginea in 51 patients which was confirmed in 34 of them on exploration, giving a sensitivity and specificity for scrotal US of 70,8% and 71,2% respectively. Of 56 patients with a normal testis contour on US, 14 had a rupture of the tunica albuginea, giving a positive and a negative predictive values of 66,7% and 75% respectively.

Testicular injuries were scored retrospectively using AAST testis injury scale (Table III). Of 48 grade I patients, 36 had a normal testis contour. Injuries were graded according to the AAST-OIS preoperatively as grades III to V in respectively 33, 13 and 5 cases. Testis injury was identified peroperatively as grades III to V in 16, 25 and 7 cases, respectively.

Regarding the original US report we found concordance in 52 patients (48,6%) only. Fifty-five US grades did not correlate with operative findings (51,4%). US under-diagnosis was seen in 30 patients (28,0%). Of these, 8 US scores were at least two grades lower than operative findings.

However we detected a lower rate of over-diagnosis in US: 23,4%. Of these, 8 US scores were at least two grades higher than operative findings.

In seven patients grade II and III in US, surgical exploration didn't reveal any lesion. There was a significant difference between US findings and the OIS finding in the surgery ($p=0,003$).

Higher injury grades were associated with a greater number of associated injuries. Grades III to V were associated with 8, 11 and 12 associated injuries, respectively (serious injuries especially head trauma and intra-abdominal visceral trauma). The urethra injury (associated to a grade IV testis blunt trauma was treated conservatively by 3 weeks urethral stenting.

US was not enough sensitive to be used in determining the treatment modality. When we suspect tunica albuginea rupture we decided surgical exploration. Our treatment policy is as follows; conservative for Grade I, exploration and repair for Grade II-IV, and exploration, and a partial orchiectomy or orchiectomy for Grades V.

DISCUSSION

As in the present series, males between 10 and 40 years of age represent the most frequently affected group (4,5). Blunt testis trauma usually results from sporting activities especially full contact sports (about 50%), traffic accidents mostly on bicycles and motorbikes (9%-17% of cases), assault (5-7), or falls. In our study, the most common etiology of testis injury was assault (48,6%). The mechanism of injury consists in a blow forcing the testicle against the thigh or pubis with subsequent intraparenchymal bleeding. The rupture of the tunica albuginea follows when the applied force is too high (5). In most cases only one testicle was involved, with only 1.5% of bilateral blunt testicular injuries (8). All our patients had unilateral trauma.

Scrotal trauma presents a diagnostic challenge. Under- and mis-diagnosis occur often in trauma assessment and even more common in patients with more severe injuries. Delay in diagnosis or inaccurate diagnosis may result in decreased fertility, delayed orchiectomy, infection, ischemia or infarction, and atrophy (9-11).

Patient with scrotal trauma usually presents emergently. Symptoms like pain, nausea, vomiting and sometimes fainting are the most common (5) as in our series. On physical examination tenderness, swelling and ecchymosis of the hemi-scrotum are always present. The testicles are not always easy to palpate especially in

Table 3 : Comparaison pf pre- and peroperatively Testis injury scale

Final scoring	Preoperative scoring					Total
	Grade I	Grade II	Grade III	Grade IV	Grade V	
Normal	-	3	4	-	-	7
Grade I	31	2	7	3	1	44
Grade II	5	1	2	-	-	8
Grade III	5	-	11	-	-	16
Grade IV	7	1	6	8	3	25
Grade V	-	1	3	2	1	7
Total	48	8	33	13	5	107

cases of big haematomas or in case of traumatic dislocation of the testicles (12,13). The amount of swelling and ecchymosis may vary, and (as we confirm it in the present series) the degree of hematoma does not necessarily correlate with the severity of testicular injury. The absence of external signs does not entirely rule out a testicular rupture; a contusion without a fracture of the tunica albuginea may be accompanied by significant bleeding that requires surgical intervention (14). Thus, scrotal trauma calls for careful physical and imaging evaluations to determine the appropriate management of injuries (14).

Since swelling and pain limit physical examination and since the clinical manifestations are not always correlative to testicular injuries (15), US may be the ideal examination tool (2,9-11) and may be helpful in the triage of patients for surgical or nonsurgical management (9-11). It can be used for noninvasive evaluation of the scrotal contents, testicular integrity, and blood flow, as well as to visualize testicular contusion, hematomas, other fluid collections, and foreign bodies (2). US findings may vary from a small haematocoele to a major laceration of tunica albuginea (15, 16). However, it may be difficult to identify the fracture plane through the testis. In a series of scrotal trauma cases evaluated by Jeffrey et al, the fracture plane or fragmentation of the testis was seen in only 17% of rupture cases (17). Other study concluded that scrotal US could not detect minimal rupture of the tunica albuginea (18). In the present series under and over-staging rates were not insignificant. Largely less practiced, testicular MRI or CT- scan may be helpful as second-line imaging modalities (2,11,15,19-21). In any case that imaging studies cannot definitively exclude testicular rupture and if clinically a tear of the tunica albuginea is suspected, surgical exploration is indicated (22,23).

Score systems as the OIS drawn up by the AAST are a valuable guidance for objective trauma assessment. To date the AAST-OIS has been validated for several different organ injuries (24), including those of the heart (25,26), liver (27), spleen (28), abdominal blood vessels (29,30), kidneys (31), ureter (32) but not testis. We analyzed the usefulness of the preoperative AAST testis injury scale with operative findings. We found that scrotal US may be an effective modality at detecting testis lesions, but sensitivity and specificity were not that high. We were surprised to find that there was a significant difference between the US and the definitive findings as assessed in the surgery report. Thus we don't recommend US as a decisive tool to decide an eventual surgical exploration.

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 (33,34). Management of testicular trauma depends on testicular integrity and perfusion. Insignificant testicular injuries without signs of

haematocoele or haematoma should be treated conservatively administrating non-steroidal analgesics, local cooling with ice-packs and elevation of the affected testis in order to avoid pain and scrotal swelling (11, 19). Also in cases of blunt injuries with haematocoeles smaller than three times the size of the contralateral testis, conservative management is recommended (19,35,36). Serious injuries (large haematocoele, tunica albuginea rupture, nonperfusion of the testis, testis rupture) should be treated with early surgical exploration, rapid control of bleeding, drainage of the haematoma or haematocoele, debridement of dead and devitalised tissue (excision of necrotic tissues) and closure of the tunica albuginea (8,9,11,37). Currently, prophylactic antibiotics are not strongly recommended in conservative treatment or after surgical exploration. Our treatment policy is as follows; conservative for Grade I, exploration and repair for Grade II-IV, and exploration, and a partial orchiectomy or orchiectomy for Grades V. It is generally agreed that early exploration and repair is very important in order to improve testicular salvage rates in 80%-90% of ruptured testis and prevent complications (infection, abscess, chronic pain, testicular atrophy and impairment of hormonal function)(11,35). Surgical delay may decrease the salvage rate and may necessitate orchiectomy (38). Cass et al (17) found that presented within 72 hours orchidectomy was done in 9%, but this fell to 45% for those presenting after 72 hours. In our series we didn't confirm this constation.

The number of patients in this multi-institution study, the availability of US and preoperative data are the most important strong points. The main weak point is the retrospective character of the study. Thus, further prospective investigations are needed to evaluate the impact of trauma scores on the workflow in emergency department procedure as structured reporting systems are a valuable guidance in other radiological disciplines.

CONCLUSION

Through this series, US was not a specific and sensitive exam to really precise the severity grade of testis trauma. Pre- and preoperative findings were significantly different. Thus, we continue to support history and clinical findings and we encourage surgical exploration when testis lesion is suspected.

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