

# Etiology of acute scrotal pain in children and adolescent patients admitted in Ahvaz Educational Hospitals

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**Purpose** Acute scrotum is an emergency condition requiring rapid intervention. The aim of this study was to evaluate the clinical and epidemiological specifications of acute scrotum.

**Patients and methods** This retrospective study was carried out on patients less than 21 years admitted with a diagnosis of acute scrotum in the surgical and medical wards from 2009 to 2010. One hundred and thirty-nine patients were included in this study. Epi-info version 6.4 (CDC) was used for data analysis.

**Results** The final diagnoses were as follows: spermatic cord torsion ( $n=57$ , 41.00%), incarcerated inguinal hernia ( $n=30$ , 21.60%), epididymo-orchitis ( $n=28$ , 20.14%), missed torsion ( $n=15$ , 10.79%), testicular trauma ( $n=5$ , 3.60%), and torsion of the appendix of the testis ( $n=4$ , 2.87%). The most common age groups in relation to the diagnoses were as follows: testicular torsion and missed torsion (10–15 years, 34.7%), torsion of appendix testis (10–15 years, 100%), epididymo-orchitis (15–21 years, 85.71%), and incarcerated inguinal hernia with two peaks of age (<5 years, 46.7%). Fifty-eight patients (41.72%) visited the hospital less than 6 h after the onset of pain. Twenty-eight patients underwent orchiectomy or orchiopexy and 38 patients underwent detorsion and bilateral orchiopexy. A herniotomy was performed in 15 patients and herniorrhaphy in 10 patients. An appendectomy was performed in four patients. Other procedures were carried out in seven patients. Out of 72 patients diagnosed with torsion (57 patients) or missed torsion (15 patients),

38 patients (52.7%) underwent a testicular salvage surgery (detorsion and orchiopexy). Out of all patients (139 patients), 92 patients underwent surgery and the rest (47 patients) were treated conservatively. These 47 patients had epididymo-orchitis ( $n=28$ ), testicular trauma ( $n=4$ ), incarcerated inguinal hernia ( $n=5$ ), and missed torsion and testicular torsion ( $n=10$ ). Out of 27 patients with abnormal urinary findings, 19 patients had epididymo-orchitis.

**Conclusion** The most common important differential diagnosis for acute scrotum is spermatic cord torsion. Most of the abnormal urinary findings were observed in patients with epididymo-orchitis. Most of the patients underwent surgery less than 6 h of disease onset. In patients with spermatic cord torsion, the affected testis has to be evaluated and treated during the first 6 h of presentation. *Ann Pediatr Surg* 7:148–151 © 2011 Annals of Pediatric Surgery.

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**Keywords:** epididymitis, epididymo-orchitis, herniotomy, hydrocele, inguinal hernia, orchiopexy, scrotum, testicular torsion, trauma

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## Introduction

Acute scrotum is an emergency situation that involves hemiscrotum pain. Pain may or may not be associated with skin redness and swelling. This is a serious condition because there is a risk of loss of testicular function. Acute scrotum frequently presents a diagnostic and therapeutic challenge [1]. One of the most important differential diagnoses for acute scrotum is spermatic cord torsion (SCT). The incidence of SCT among patients with acute scrotum varies from 18 to 45% depending on the age of the patients, the type and locations of the hospital, and the methods of diagnosis [2]. The incidence of torsion in men younger than 25 years is approximately one in 4000 [3]. The aim of this study was to evaluate the clinical manifestation and epidemiological feature of acute scrotum among patients.

## Patients and methods

This retrospective study was carried out on patients less than 21 years old admitted with a diagnosis of acute scrotum in surgical and medical wards from the 2009 to

2010. All patients' files with a diagnosis of acute scrotum (testicular torsion, testicular appendix torsion, epididymitis, epididymo-orchitis, incarcerated inguinal hernia, and testicular trauma) were included in the study. All patients who were discharged before completion of treatment were excluded. Finally, 139 patients were included in this study. A chart was made for each file to collect the following data: age, initial diagnosis, final diagnosis, type of surgery, the duration from onset of symptoms to surgery, complete blood count, radiologic investigations, and postoperative hospital stay. Epi-info 6.4 (CDC) was used for data analysis. The  $\chi^2$  test was used for analysis. This study was approved by the ethical committee of the hospital.

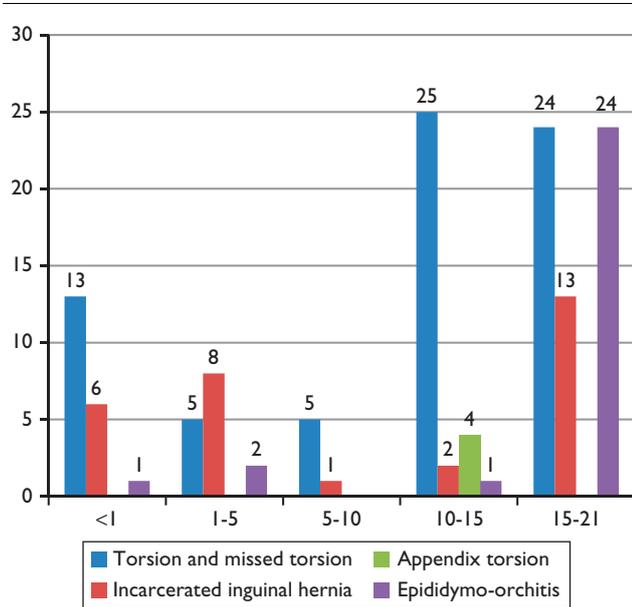
## Results

One hundred and thirty-nine patients were included in this study. The age distribution of the patients is listed in Fig. 1. The white blood cell (WBC) count was less than  $1 \times 10^{10}/l$  in 64 (40.04%) patients,  $1 \times 10^{10}/l$  through  $1.5 \times 10^{10}/l$  in 55 (39.56%) patients, and greater than

$1.5 \times 10^{10}/l$  in 20 (14.38%) patients. Out of 76 patients with torsion-type disease, 35 (46.06%) had WBC count less than  $1 \times 10^{10}/l$  ( $P = 0.0005$ ). Out of 28 patients with

epididymo-orchitis, 15 (53.57%) patients had WBC count from  $1 \times 10^{10}/l$  through  $1.5 \times 10^{10}/l$  ( $P = 0.01$ ). WBC count greater than  $1.5 \times 10^{10}/l$  was found in 53.3% of patients with incarcerated inguinal hernia ( $P = 0.009$ ) (Table 1). Most of the patients with testicular torsion and appendix torsion visited the hospital in the first 6 h (39 cases). Sixteen patients visited the hospital after 18 h of onset of clinical symptoms. All patients with missed torsion visited the hospital after 18 h. Most patients with incarcerated inguinal hernia visited the hospital in the first 12 h after clinical onset (25 cases). Overall, most of the patients with acute scrotum visited the hospital within the first 6 h of disease onset or after 18 h compared with other periods ( $P < 0.05$ ) (Table 2). Most patients with testicular torsion, missed torsion, and incarcerated inguinal hernia underwent an operation in the first 6 h ( $P < 0.05$ ) (Table 3). In our patients, 47.5% had the disease for less than 6 h until surgery. Forty-seven patients (33.81%) required no surgery (Table 4). Overall, 28 patients underwent orchietomy or orchiopexy and 38 patients underwent detorsion and bilateral orchiopexy. A herniotomy was performed in 15 patients and herniorrhaphy in 10 patients. An appendectomy was performed in four patients. Other procedures were carried out in seven patients. The postoperative hospital stay ranged from 48 to 72 h ( $P = 0.0001$ ) for more than half of the patients ( $n = 58, 63.04\%$ ) (Table 5). Urine analysis was normal in 81.8% of the patients. Abnormal urinary findings were found in 27 cases. Hematuria was found

Fig. 1



Age distribution among patients with different diagnoses.

Table 1 Initial, final diagnosis, and WBC among cases

	Initial diagnosis	Final diagnosis	WBC < $1 \times 10^{10}/l$	$1 \times 10^{10}/l < \text{WBC} < 1.5 \times 10^{10}/l$	WBC > $1.5 \times 10^{10}/l$
Torsion	57 (41.00%)	57 (41.00%)	35 (46.05%)*	28 (36.85%)	13 (17.10%)
Missed torsion	12 (8.63%)	15 (10.79%)	-	-	-
Torsion of appendix	0	4 (2.87%)	-	-	-
Epididymo-orchitis	25 (18.00%)	28 (20.14%)	5 (17.85%)	15 (53.57%)*	8 (28.58%)
Incarcerated inguinal hernia	40 (28.77%)	30 (21.60%)	5 (16.67%)	9 (30.00%)	16 (53.33%)*
Testicular trauma	5 (3.60%)	5 (3.60%)	5 (100%)	-	-
Total	139 (100%)	139 (100%)	50 (35.98%)	52 (37.41%)	37 (26.61%)

WBC, white blood cell.

\* $P < 0.05, \chi^2$ .

Table 2 Duration of clinical symptoms until visit to the hospital

Final diagnosis	<6 h	6-12 h	12-18 h	>18 h	Total (100%)
Testicular torsion and appendix torsion	39 (63.94%)	3 (4.92%)	3 (4.92%)	16 (26.22%)	61 (100%)
Missed torsion	-	-	-	15 (100%)	15 (100%)
Incarcerated inguinal hernia	14 (46.66%)	11 (36.67%)	-	5 (16.67%)	30 (100%)
Epididymo-orchitis	3 (10.72%)	10 (35.72%)	6 (21.42%)	9 (32.14%)	28 (100%)
Testicular trauma	2 (40.00%)	3 (60.00%)	-	-	5 (100%)
Total	58 (41.72%)*	27 (19.42%)	9 (6.48%)	45 (32.38%)*	139 (100%)

\* $P < 0.05$ .

Table 3 Duration of time from visit until surgery

Final diagnosis	<6 h	6-12 h	12-18 h	>18 h	Conservative treatment	Total
Testicular torsion and missed torsion	44 (61.11%)	2 (2.78%)	4 (5.55%)	12 (16.66%)	10 (13.90%)	72 (100%)
Appendix torsion	4 (100%)	-	-	-	-	4 (100%)
Incarcerated inguinal hernia	18 (60.00%)	4 (13.33%)	3 (10.00%)	-	5 (16.67%)	30 (100%)
Epididymo-orchitis	-	-	-	-	28 (100%)	28 (100%)
Testicular trauma	-	1 (20.00%)	-	-	4 (80%)	5 (100%)
Total	66 (47.50%)*	7 (5.03%)	7 (5.03%)	12 (8.64%)	47 (33.80%)	139 (100%)

\* $P < 0.05$ .

**Table 4 Duration of disease before surgery**

	Frequency (%)
<6 h	66 (47.50)
6–12 h	7 (5.03)
12–18 h	7 (5.03)
>18 h	12 (8.63)
No surgery	47 (33.81)
Total	139 (100)

**Table 5 Length of hospital stay after surgery in patients in relation to diagnosis**

Length of hospital stay	n (%)	Diagnosis
24 h or less	2 (2.17%)	Testicular torsion (n=2), discharge himself
48–72 h	58 (63.04)*	Testicular, missed and appendix torsion (n=48), incarcerated inguinal hernia (n=10)
>96 h	32 (34.79)	Incarcerated inguinal hernia (n=18), testicular trauma (n=4), testicular torsion (n=10)
Total	92 (100)	

\* $P=0.0001$ ,  $\chi^2=14.70$ .

**Table 6 Results of sonography in relation to the final diagnosis**

Final diagnosis	Consistent with final diagnosis	Not consistent	No sonography
Torsion, torsion of appendix, and missed torsion	25 (32.9%)	14 (18.4%)	37 (48.9%)
Epididymo-orchitis	24 (85.7%)*	2 (7.15%)	2 (7.15%)
Incarcerated inguinal hernia	11 (36.6%)		19 (63.4%)
Trauma	6 (54.5%)		

\* $P=0.009$  ( $\chi^2$ ).

in four cases and all of them had epididymo-orchitis. Hematuria-pyuria was found in four cases and all of them had epididymo-orchitis. Pyuria was seen in 19 patients. Out of these 19 patients, 10 patients had epididymo-orchitis; five patients had incarcerated inguinal hernia; one patient had testicular trauma; and three patients had testicular torsion. Bacteriuria was not seen. Other patients had normal urinary findings. Most of the patients with abnormal urinary findings ( $n=18$ , 66.6%) had epididymo-orchitis ( $P<0.05$ ). Sonography was consistent with the final diagnosis in 45.9% of the patients. Sonography was not carried out in 39.9% of the patients and in 21(14.2%) patients, sonography findings were not consistent with the final diagnosis. Table 6 shows the results of sonography in relation to the final diagnosis. As can be seen in Table 6, except for trauma, because of a small sample, the highest positive sonography finding was observed in epididymitis. Among the patients with epididymo-orchitis, 26 sonographies were carried out. Of these, positive findings were obtained in 24 patients (92.30%). Among patients with torsion, 39 sonographies were carried out. Of these, 25 (64.10%) positive sonography reports were found. A positive sonographic finding was significantly higher in patients with epididymo-orchitis compared with those with torsion disease ( $P=0.009$ ). Doppler sonography was performed in four patients (2.7%). Of these, three patients had findings consistent with the final diagnosis of torsion. In the rest of the patients, sonography findings suggested torsion but the final diagnosis was epididymo-orchitis.

The duration of clinical manifestation until visit to the hospital was less than 6 h in 58 (41.72%) patients and 6–12 h in 27 (19.42%) patients (Table 2). In 45 patients (32.38%), clinical manifestation lasted greater than 18 h. In nine patients (6.48%), clinical manifestations were present from 12 to 18 h (Table 2).

## Discussion

The most important differential diagnosis for acute scrotum is SCT. In the study carried out by Abul *et al.* [4] on patients aged 0–69 years, epididymitis was the most common cause of acute scrotum, followed by testicular torsion. In most reports, torsion of the appendix of testis was the most common diagnosis [5–7]. In general, appendix torsion is less common than testicular torsion, but at a prepubertal age, torsion of the appendix is more common [8]. The peak incidence of torsion of testicular appendage occurs in the prepubertal age group (9–10 years) and that of testicular torsion in the pubertal age group (12–17 years) [9,10]. Lyronis *et al.* [11] reported that epididymo-orchitis is the most common etiology for acute scrotum. They studied boys up to 14 years of age. The most common diagnosis was epididymo-orchitis (49 boys), followed by torsion of the testicular appendage (42 boys), SCT (35 boys), and trauma (four boys). We studied boys up to 21 years of age and this may be the reason for the variation in the results compared with those of the Lyronis *et al.* study [11]. Sakellaris *et al.* studied 66 boys with acute scrotum. They found that 29 patients had acute epididymitis, eight patients had torsion of the testis, 12 patients had torsion of appendix testis, four patients had scrotal abscess, five patients had idiopathic scrotal edema, and eight patients had trauma. Only 6.8% of the patients had a total leukocyte count beyond  $12\,000/\text{mm}^3$ , with a neutrophilia [12]. In our study, four patients had torsion of the testicular appendage and all of them were 4 years old. In the study carried out by Mäkelä *et al.* [13] on 388 scrotal examinations, there were 100 patients (26%) with SCT, 174 patients (45%) with torsion of the testicular appendage, 38 patients (10%) with epididymitis, 32 patients (8%) with incarcerated inguinal hernia, and 44 patients (11%) with other conditions. In a 25-year review of acute scrotum in South Africa during the period 1970–1996, 199 boys were studied. The diagnosis was made clinically in all cases. On examination, 62 boys (31%) were found to have torsion of the testis. Sixty-two boys (31%) had torsion of the testicular appendage and 56 boys (28%) had epididymo-orchitis [14]. In this study, the next common cause of acute scrotum was incarcerated inguinal hernia. However, this is an etiology that has been less commonly reported by others [6]. The third common etiology in this study was epididymo-orchitis (20.14%) and this is similar to other reports [8]. Because there is some overlap between epididymitis and epididymo-orchitis, we categorized these diagnoses into one category. In this study, torsion and missed torsion were the most common causes of acute scrotum, followed by incarcerated inguinal hernia and epididymo-orchitis. The difference in the results may be because of the difference in the age groups of the patients in the two studies. In this study,  $\text{WBC} = 1\text{--}1.5 \times 10^{10}/\text{l}$  was found in 37.41% of the patients and  $\text{WBC}$  count greater than  $1.5 \times 10^{10}/\text{l}$  was found in

26.61% of the patients. Leukocytosis and pyuria have been reported to occur in around two-thirds of patients with epididymitis [15] but have occasionally been observed in patients with testicular torsion [16]. In this study, we found that WBC count less than  $1 \times 10^{10}$  was generally found in patients with torsion and WBC count greater than  $1.5 \times 10^{10}/l$  was more frequently seen in patients with incarcerated inguinal hernia. This finding is similar to that obtained in other reports [16]. In this study, abnormal urinary findings (hematuria, pyuria, and hematuria-pyuria) were seen in 27 (19.42%) of the patients. About 66.6% (18 cases) of these patients had epididymo-orchitis, which is similar to other reports [15,16]. In this study, in 85.7% of patients with epididymo-orchitis, the finding of 36.6% of patients with incarcerated inguinal hernia and 32.2% of patients with torsion (testicular, missed, and appendix) was consistent with the final diagnosis. In other studies, 72.7% accuracy has been reported in the diagnosis of torsion [4]. Melekos et al. [10] also reported an accuracy of 50% in the diagnosis of testicular torsion and 80% in the diagnosis of other scrotal conditions. Reports in the literature have suggested that ultrasonography for testicular torsion has a specificity of almost 100%, but the sensitivity varies from 50 to 100% [10,16,17]. A salvage rate of 90–100% was found in patients who underwent detorsion within 6 h of pain; the viability rate decreased to between 20 and 50% at 12 h; and to 10% if detorsion was delayed more than 24 h [3,18].

## Conclusion

The most common and important differential diagnosis for acute scrotum is SCT. In this study, most of the patients underwent surgery within first 6 h of disease onset. Most of the abnormal urinary findings were found in patients with epididymo-orchitis. A careful clinical examination and assessment of history represent the most important means to evaluate a patient with acute scrotum. Ultrasonography, a noninvasive method, may play a role in confirmation of the diagnosis. To prevent

infarction and testicular damage, the testis involved must be evaluated and treated within 6 h of presentation.

## Acknowledgements

### Conflicts of interest

There are no conflicts of interest.

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