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Acute Scrotum in Pediatric: Clinical Presentation and Management in Royal Medical Services Hospitals

Gaith F. Khasawneh[1*], Omar Yabrodi[1], Adnan Bawaneh[1], Raad Aldababi[1], Salim Masadeh[1,] Ahmad Al Raymoni[1], Mohammad Alsmady[1]

[1]Department of Pediatric Surgery, Jordan Royal Medical Services, Queen Rania Hospital, Amman, Jordan

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***Corresponding author:** Dr. Gaith F. Khasawneh

Abstract **Original Research Article**

Objectives: Children with acute scrotum usually present with acute scrotal pain. To rule out testicular torsion with consequent ischemia, this complaint is considered a top emergency that should be treated quickly. The objective of this study was to assess the clinical presentation and treatment of the acute scrotum in pediatric surgery. ***Method*:** A prospective study, which included 107 patients, was conducted in Queen Rania Hospital, Jordan, in the period January 2016–April 2020. Patients above 14 years old and those under conservative treatment, such as IV antibiotics for epididymo-orchitis, were excluded. In addition to scrotal exploration, the diagnosis was made via Doppler ultrasonography (DUS). ***Results*:** The main results revealed that the causes of acute scrotum are testicular torsion (35.5%), epididymo-orchitis (20.5%), torted hydatid of Morgagni (28.9%), hematoma (4.6%), scrotal abscess (1.8%), and tumor (0.9%). The most common signs and symptoms were tenderness (86%), erythema (77.6%), and edema (71.9%). In patients with testicular torsion, the salvage rate was around 65.8% for surgeries performed in durations up to 48 h from symptom onset. ***Conclusion*:** Testicular torsion is the most significant diagnosis that leads to testicular loss.

Keywords: Acute scrotum, testicular torsion, salvage rate.

INTRODUCTION

Acute scrotum is defined as a painful acute swelling of the scrotum or its contents, which is followed by local symptoms of the scrotum or its contents [1]. Due to its various etiologies and overlapping clinical presentations, it poses a diagnostic dilemma [2]. Testicular torsion (TT), epididymo-orchitis (EO), and testicular appendage torsion are the three most common causes (TTA) [3]. TT is the most extreme condition that affects the scrotum and requires immediate diagnosis and care to save the affected testis and to prevent testicular loss, fertility issues, and legal medical problems. Testicular damage commences following 6 h of symptom initiation. Signs of testicular loss will appear over 24 h [4].

Acute scrotal disorders are expected in children. Scrotal pain, swelling, and redness accompany them in the damaged hemiscrotum. However, determining the true cause is difficult. According to popular belief, EO is uncommon in youngsters and is linked to structural abnormalities of the urinary tract [5].

The optimal treatment for TT patients entails early diagnosis and surgical intervention. The surgical techniques used are scrotal exploration, orchidectomy for nonviable testicles, detorsion and orchidopexy for a viable one, and contralateral orchidopexy. The patient's medical history, physical examination, and imaging procedures, such as color Doppler ultrasonography, are used to diagnose TT (DUS). In order to distinguish torsion from other causes of acute scrotal pain, DUS can be used [6]. However, the actual incidence of torsion in patients with severe scrotal pain (acute scrotum) is still uncertain, and the incidence rates reported in the literature have substantially been in the range of 9%–72% [7, 8]. TT should be detected and treated early to avoid necrosis and testicle degradation. It has been suggested that if the torsion is successfully repaired within 6 h from onset of symptoms, the salvage rate will be 80%–100%, whereas after 12 h, the salvage rate will decrease to 20% [9].

Previously reported experimental studies revealed that testicular hemorrhagic infarction can begin within 2 h from torsion onset, irreversible damage after 6 h, and full infarction within 24 h [10]. At

present, the TT diagnosis requires a detailed clinical history, physical examination, and ultrasonic color Doppler. However, cases of missing TT on color DUS and studies on the existence of TT with a corresponding negative ultrasound result have been previously reported [11]. While the use of basic signs and symptoms associated with TT has also been studied [7, 12], no comprehensive set of clinical guidelines exists for torsion diagnostic purposes. The objective of this research is analyzing and comparing clinical manifestations, physical finding, radiographic results in pediatric patients with different pathological diagnosis of acute scrotum, as well as, to accurately establish the true incidence of various pathological diagnosis of acute scrotum in the pediatric surgery department at the Queen Rania Al-Abdalla Hospital in Royal Medical Services.

METHODS

This is a prospective study conducted in Queen Rania Hospital, Jordan, in the period January 2016–April 2020. The study sample consisted of 107 patients. Patients above 14 years of age and those under conservative treatment, such as IV antibiotics for EO, were excluded. The diagnosis was made via DUS in addition to scrotal exploration.

All patients were presented to the emergency room. Ultrasound scan was performed on all of them, and they underwent scrotal exploration as part of the managment. The pediatric surgery specialist or fellow performed the scrotal exploration surgery under general anesthesia, taking into consideration that the surgery should be performed urgently from presentation. Within 30 min before surgery, one shot of the second-generation Cephalosporin was administered to patients. In all cases, scrotal exploration via mid raphe incision and exploration of the affected side were performed, in addition to contralateral exploration of the other testis for fixation if the pathology was proven to be TT.

All patients were admitted for at least 1 night up to 3 days after surgery because in some cases of epydidmoorchitis patient needs to take an IV antibiotics postoperative to reduce the systemic inflammatory signs such as fever which happened in few patients. Also patients were followed up in the clinic 2 weeks after discharge to assess the wound and check the histopathology report.

RESULTS

A total of 107 patients aged 1–14 years were included in this study. In all cases, the final diagnosis was made via DUS and surgical exploration. The diagnosis results are presented in Table 1. There were 38 patients (35.5%) proven to have TT, 22 (20.5%) had EO, 31 (28.9%) had torted hydatid cyst of Morgagni, 5 (4.6%) had hematoma (H), 2 (1.8%) had scrotal abscess, and 1 (0.9%) had tumor (T).

Table 1: Acute Scrotum Causes

Diagnosis	Number	Percentage (%)
Testicular Torsion (TT)	38	35.5
Epididmo - orchitis (EO)	22	20.5
Morgagni (M)	31	28.9
Hematoma (H)	5	4.6
Scrotal Abscess (SA)	2	1.8
Normal (N)	8	6.5
Tumor (T)	1	0.9

Most of the patients (60%) were in the range of 5–7 years, as presented in Table 2 which shows the relationship between the different age groups of patients and the final diagnosis.

Table 2: Relation between different age groups and final diagnosis

Diagnosis	Age group (Year)			
	(1-4)	(5-7)	(8-10)	(11-14)
Testicular Torsion (TT)	3	21	12	2
Epididmo - orchitis (EO)	0	13	8	1
Morgagni (M)	1	19	8	3
Hematoma (H)	0	4	0	1
Scrotal Abscess (SA)	1	1	0	0
Normal (N)	0	5	3	0
Tumur (T)	0	1	0	0

All patients suffered from pain. The common signs were tenderness (86%), erythema (77.6%), and edema (71.9%).

Undescended testes were observed in 6.54% of all patients. Transverse testicular axes occurred in 18.7% of the patients. Absent cremasteric reflex (17.75%), thickened spermatic cord (15.9%), and high-riding testis (19.62%) were also observed.

Table 3: Relationship between physical examination findings and final diagnosis categories in the study

Sign	Final Diagnosis						
	TT	EO	M	SA	H	N	T
Erythema	25	19	29	1	3	5	1
Edema	20	20	28	2	4	3	0
Tenderness	38	21	26	2	4	1	0
High riding testis	20	1	0	0	0	0	0
Thickened spermatic cord	13	4	0	0	0	0	0
Cremastric reflex absent	17	2	0	0	0	0	0
Transverse testis axes	15	3	2	0	0	0	0
Blue dot	0	0	20	0	0	0	0
Undescended testis	6	0	0	0	0	0	1

In our study, the salvage rate is 14 cases (56%), if scrotal exploration is done within 12 hours which is comparable to the one reported in literature (around 50%). This rate fills down to 32% (only 8 cases) if it is performed between 12-24 hours, and it drops down to 12% (3 cases) if it is performed after 24 hours. This emphasize the importance of early surgical explorations, ideally within the first 6 hours which gives salvage rate for around 90% of cases.

The salvageable cases of delayed presentation can be explained by the degree of twist which ranges from 180-720 degrees.

Table 4: Relationship between time from onset of symptoms and testis viability in testicular torsion (n = 38)

Duration [hour] (number)	Viable testis	Non-viable testis
8-12 (15)	14	1
12-24 (10)	8	2
24-48 (8)	3	5
> 48 (5)	0	5
Total	25	13

*Salvage rate was calculated by dividing the total number of viable testis (25) by the number of cases diagnosed by testicular torsion (38).

Color Doppler ultrasound is a useful tool for the diagnosis of testicular torsion with specificity 94%, below the corresponding one in the literature which is around 97%.

Results shown in Table 5 show that five cases out of 38 which were diagnosed intraoperative as a testicular torsion, reported by color Doppler as nearly normal giving sensitivity of 86%, which is comparable to the literature data.

Table 5: US Doppler finding in testicular torsion

Affected blood supply	Heterogeneity	Change in echogenicity
33	13	24

DISCUSSION

TT is considered to be the most extreme condition that affects the scrotum which requires immediate diagnosis and care to save the affected testis and to prevent testicular loss, fertility issues, and legal medical problems. Signs of testicular loss will occur over 24 h following symptom initiation [4]. Childhood TT is a pediatric surgical emergency and requires an urgent and accurate diagnosis [13]. Moreover, 12%–15% of children with acute scrotum have TT [14].

DUS shows complete absence of detectable blood flow in the affected testis and epididymis, which could be useful in confirming the diagnosis. This approach has variable sensitivity (63%–100%) with high specificity (97%–100%). The sensitivity of such technique depends primarily on the experience of the investigator [15]. In our experience, as well as others', DUS is an invaluable imaging tool for the clinical evaluation of acute scrotum patients. However, the knowledge it can provide is operator-dependent and must be accompanied by patient history and physical examination. Where the need for surgical intervention is

removed, DUS findings are likely to constitute essential medico-legal support. Nevertheless, in the presence of clinical suspicion of TT, even with an apparently normal DUS result, surgical exploration is necessary, especially in children [16].

DUS is an outstanding, comfortable, and accurate tool for scrotal disease assessment of patients. It facilitates the detection of nonoperative disorders and decreases the amount of unnecessary exploratory surgeries [17]. This was confirmed by the current sequence of restricted use of DUS. However, it is operator-dependent and can postpone surgery to save the testicles [3]. Conversely, color DUS is considered as an imaging technique which could be used for the assessment of acute scrotum patient and for the diagnosis of TT; also, it has high accuracy rate in the detection of intratesticular blood flow [18].

Color Doppler is highly sensitive in detecting scrotal inflammation, approaching sensitivity of 100% [15]. Color and Doppler readily show hyperemia of the epididymis and/or testis. While echogenicity may be variable, Doppler flow is invariably increased. Demonstration of a normal spermatic cord and lack of an avascular nodule extending from the upper pole of the testis are important findings to exclude torsion of the testis and appendix testis [19]. Epididymo-orchitis has been associated with decreased resistive indices (0.5). In severe cases complicated by infarction, there can be reversal of arterial diastolic flow [20].

It was reported that the presence of vascular flow in the testis could be readily depicted using the ultrasound (US). The use of color Doppler in the detection gives results with, the sensitivity, specificity, and accuracy has been reported to be 86, 100, and 97%, respectively. The use of both color and Doppler further increases sensitivity. It was also reported that color Doppler may help in showing avascular mass with variable flow in the abscess rim and surrounding soft tissues [20].

In this study, the main causes of acute scrotum are TT (35.5%) and EO (20.5%). In fact, from one study to another, the occurrence of different scrotal pathologies varies. Some researchers, such as Nason *et al*., [3], referred to the spermatic cord torsion, whereas Mäkelä *et al*., [21] and Alsbou *et al*., [22] referred to the torsion of the appendages as the most common etiology of acute scrotum in children. In accordance with other series [23], Wael Mohammed *et al*., in 2015 reported that the most common cause of acute scrotum is EO. The three major diagnostic categories (EO, TT, and testicular appendage torsion) represented 84.2% of all patients in the study by Wael Mohammed *et al.*, The study results were in agreement with those of Mäkelä *et al*., [21], and Nason *et al*., [3], with percentages of 90%, 81%, and 92%, respectively.

In this study, the most common signs and symptoms are tenderness, erythema, and edema in 86%, 77.6%, and 71.9%, respectively. Different studies reported common symptoms in different occurrence percentages. In 2015, Wael Mohammed *et al*., found that pain and swelling were the most common signs and symptoms in the percentage of 90.8%, whereas Ibrahime *et al*., [24] and Tabari *et al*., [4] reported the same in the percentages of 78.5% and 62%, respectively. Most patients experienced a sudden onset of pain (overall, 76.3%; TT, 84.6%; testicular appendage torsion, 87.5%; and EO, 63.3%).

Other research indicated that nausea, vomiting, and low-grade fever are the most common signs and symptoms of TT. The hemiscrotum of the affected side is usually swollen and inflamed during physical examination, accompanied by an absent cremasteric reflex and tenderness unrelieved by scrotal elevation [25].

The length and torsion degree influence testicular salvage. If the testicle is explored within 6 h from the onset of symptoms, the salvage rate can be as high as 100%. The rates of testicular salvage decrease to 70% if intervention is performed within 6–12 h, whereas it will decrease to 20% if intervention is performed within 12–24 h [26].

In this study, it was observed that the TT group recorded a total of 65.8% salvage rate in all surgeries mostly performed within 8–12 h (36.8%), 12–24 h (21.1%), and 24–48 h (7.9%) and less in surgeries performed after 48 h (0%) from symptom onset. This finding is in agreement with the previously reported study by I. Alsbou in 2012, who claimed that the primary explanation for such an outcome may be a delayed presentation to the hospital requesting for proper management. However, most reports suggest early exploration in all cases to ensure optimum testicular salvage [27].

CONCLUSION

TT is considered to be one of the most common causes of acute scrotum in pediatrics. Results of this research revealed that the causes of acute scrotum are testicular torsion (35.5%), epididymo-orchitis (20.5%), torted hydatid of Morgagni (28.9%), hematoma (4.6%), scrotal abscess (1.8%), and tumor (0.9%). The most common signs and symptoms were tenderness (86%), erythema (77.6%), and edema (71.9%). In patients with testicular torsion, the salvage rate was around 65.8% for surgeries performed in durations up to 48 h from symptom onset. Early diagnosis of TT should be made because any delay in proper management may lead to testicular loss. TT could not be excluded based merely on patient history and clinical presentation, as it could result in the overlap between signs and symptoms of the different

categories of acute scrotum. Surgical exploration should be done even in case of negative color Doppler finding in case of high clinical suspicion.

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