

Four-year retrospective look for acute scrotal pathologies

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ABSTRACT

OBJECTIVE: A group of diseases in the scrotum setting forth by the sudden swelling and redness and pain consist of acute scrotal pathologies. The most common causes of acute scrotum in children are epididymitis, epididymo-orchitis, orchitis, testicular torsion, torsion of the appendix testis, incarcerated inguinal hernia and traumatic hydro/hematocele. In this study; we aim to evaluate patients with acute scrotal pathologies who were interned in our department.

METHODS: All hospital data of cases who were interned at our department due to acute scrotum in between June 2010-June 2014 were evaluated retrospectively. Cases with incarcerated inguinal herni were excluded in this study.

RESULTS: In a 4-year-period 114 cases were interned in our department with acute scrotum. Mean age of the patients was 7.6 ± 4.577 years (min: 1m-max: 18yrs). Doppler US was performed in 112 patients to evaluate the blood flow while in 2 patients applied after normal office hours were evaluated without Doppler US and operated under emergency conditions. The patients had received diagnosis of epididymitis/ epididymo-orchitis/ orchitis (n=83 cases; 72.8%), testicular torsion (n=24; 21.1%), torsion of the appendix testis (n=2; 1.8%) with and traumatic hydrocele/ hematocele (n=5; 4.4%). While detorsion was performed in 18 (75%) cases with testicular torsion and orchiectomy in 6 (25%) cases. Histopathological evaluation of orchiectomy specimens revealed hemorrhagic necrosis and hemorrhagic infarction or ischemic changes. Normal testicular size and vascularity were detected in 11 (61.1%) cases with detorsioned testis as detected by follow-up Doppler US. Late orchiectomy was performed in 7 cases (38.9%) with complete atrophy due to lack of blood supply.

CONCLUSION: Although Doppler US is very helpful for differential diagnosis of patients with acute scrotum who applied early period, if Doppler US will lead to a waste of time, direct surgery without delay will reduce the risk of testicular loss.

Keywords: Acute scrotum; Doppler ultrasound; testicular loss; testicular torsion.

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A group of diseases in the scrotum setting forth by the sudden swelling and redness and pain consist of acute scrotal pathologies and acute scrotum is a common pediatric surgical emergency. Especially acute scrotum refers to signs and symptoms associated with these local inflammatory conditions [1]. The most common causes of acute scrotum in children are epididymitis, epididymo-orchitis, orchitis, testicular torsion, torsion of the appendix testis, incarcerated inguinal hernia, traumatic hydrocele and hematocele [1].

Testicular torsion was described firstly in 1776 by Hunter [2]. Testicular torsion is defined as a rotation of the testis around the longitudinal axis of the spermatic cord, resulting in obstruction of testicular blood flow, which accounts for 13–54% of acute scrotal disease [3]. Torsion of testis is exactly the most serious condition affecting the scrotum that needs urgent diagnosis and early surgical treatment to save the affected testis and avoid testicular loss and possible fertility problems and medicolegal issues [1].

This study was planned to evaluate the patients with acute scrotal pathology who were hospitalized at our department and to prove the relationship between the prevention of the testicular loss by the early surgical intervention.

MATERIALS AND METHODS

This retrospective study was conducted on children with acute scrotal pain and swelling who were referred to our department between June 2010 and June 2014. Patients with incarcerated inguinal hernia were excluded from this study. All medical records of the patients with acute scrotum related to the information about age, symptoms, medical history, time of admission onset of symptoms and surgery, involved side and examination findings, ultrasound (US) and Doppler US findings, initial and definitive diagnosis, medical treatment and/or surgical therapy, fixation of the contralateral testis at the same session and follow-up data were analyzed. Time elapsed from the onset of symptoms to the surgery in cases with testicular torsion was determined as the sum of the actual time lost. The real lost time was separated in three groups as 0–6,

6–12 and 12 hours and operative findings, histopathologic results of the orchiectomized testes and follow-up Doppler ultrasonography were compared in these three groups according to this classification of timing. Failure of normal posterior anchoring of the gubernaculum, epididymis and testis is called a bell clapper deformity because it leaves the testis free to swing and rotate within the tunica vaginalis of the scrotum much like the clapper inside of the bell. Rotation of the testis around the axis of the spermatic cord is called spermatic cord torsion. Data were presented as the mean \pm standard deviation (SD). Ethics Committee approval was obtained for this study.

RESULTS

During the 4-year period, 114 children were hospitalized at our department with acute scrotum. The mean age was 7.6 ± 4.6 years (age range, 1 month to 18 years). Initial diagnoses based on findings of the physical examination and Doppler US were 83 cases as epididymitis, epididymo-orchitis and orchitis in 83 (72.8%), testicular torsion in 24 (21.1%), and traumatic hydrocele/hematocele in 5 (4.4%), and torsion of the appendix testis in 2 (1.8%) cases. The mean ages were 8.1 ± 4.1 years (min: 1 yr, max: 18 yrs) in children with epididymitis/epididymo-orchitis/orchitis was and 7.4 ± 4.6 years (min: 1 yr, max: 13 yrs) in children with traumatic hydrocele/hematocele, 6 years (min: 5 yrs, max: 7 yrs) in children with torsion of the appendix testis, 6.0 ± 5.8 years (min: 1 m, max: 16 yrs) in children with testicular torsion, 9.3 ± 7.2 years in three newborns with testicular torsion. Etiologic distribution of patients is summarized in Table 1.

Doppler US was performed in 112 patients to evaluate the blood flow while in 2 patients Doppler US could not be performed because they applied after normal office hours. Increased blood flow of the affected testis as detected by Doppler US had been reported to be compatible with testicular orchitis, epididymitis, epididymo-orchitis in 85 cases, while 2 patients had a history of trauma and in 22 patients lack of the blood supply to the testicles was detected on Doppler US. In 5 patients with a history of

TABLE 1. Etiology of cases with acute scrotum detected during the 4 years in our department

Etiology	n=114	
	n	%
Epididymo-orchitis	83	72.8
Torsion of testis	24	21.1
Torsion of testicular appendix	2	1.8
Traumatic causes	5	4.4

TABLE 2. Pain duration between onset of symptoms and timing of the surgery in our cases with testicular torsion

Time interval	Patient numbers (n=24)	
	n	%
≤6 hours	8 cases	33.3
6–12 hours	8 cases	33.3
>12 hours	8 cases	33.3

trauma, Doppler US results were reported as scrotal hematoma and scrotal hematoma plus varicocele and cellulitis, orchitis and epididymo-orchitis. In 2 of these 5 patients who had been reported to have normal testicular blood flow by Doppler torsion of the appendix testis was observed during the operation and three of these 5 cases had history of scrotal trauma. Testicular torsion secondary to trauma was not detected in any case. Two patients who applied to the hospital after office hours were operated under emergency conditions without prior Doppler examination.

Twenty-six suspect cases with testicular torsion were operated and intraoperative diagnosis of 24 cases were compatible with testicular torsion, while in other 2 patients torsion of the appendix testis was observed. The patients with testicular torsion were operated within the first 6 hours (n=8), between 6–12 hours (n=8), and more than 12 hours (n=8) after onset of the clinical symptoms. Time intervals after the onset of the clinical symptoms are

summarized in Table 2. Patients with epididymo-orchitis or traumatic hydrocele, hematocele were not operated. Preoperative diagnosis was made as suspicious testicular torsion according to the physical examination in two cases without Doppler US examination and torsion of the appendix testis was determined during the operation.

Six (25%) testes were found clearly necrotic during the operation and orchiectomy was performed in these cases. Five of these cases were operated more than 12 hours and one case between 6 and 12 hours after onset of the symptoms. Histopathological evaluation of orchiectomy specimens revealed hemorrhagic necrosis (n=4) and hemorrhagic infarction (n=2). Detorsion was made in 18 cases (75%) torsioned testis with a good blood supply. The bell-clapper anomaly was detected in 6 of these 18 detorsioned cases. Late orchiectomy had been indicated in 3 patients with this anomaly, which had been performed 6 and 12 hours in 2, more than 12 hours after onset of the symptoms. Contralateral orchiopexy also had been made in these 6 patients.

Normal testicular size and vascularity were detected in 18 detorsioned testes by follow-up Doppler US. Perfusion of 11 testes (61.1%) were found to be normal in late follow-ups. Late orchiectomy was performed in 7 cases (38.9%) of 18 due to complete atrophy of testes and lack of blood supply. Detorsion was made in 18 patients during the operation; 8 cases who had normal perfusion were operated within the first 6 hours, one patient between 6–12 hours and two patients more than 12 hours after onset of symptoms. Totally 13 of 24 patients lost their one testis (63.9%). Relationships between the onset of symptoms and surgical findings are summarized in Table 3.

The final postoperative diagnoses were epididymitis, epididymo-orchitis and orchitis in 83 (72.8%) testicular torsion in 24 (21.1%), torsion of the appendix testis in 2 (1.8%), and traumatic hydrocele/hematocele in 5 (4.4%) cases.

DISCUSSION

Acute scrotum is a common urologic emergency. The primary objective of management of the acute

TABLE 3. Time intervals between onset of the symptoms and surgery

Surgical therapy	Time intervals between onset of the symptoms and surgery		
	≤6h	6–12h	>12h
Cases (n=24)			
Early Orchiectomy (n=6)	0	1	5
Detorsioned Testis (n=18)	8	7	3
*Normal follow-up with Doppler US (n=11)	8	1	2
*Late orchiectomy (n=7)	0	6	1

*Follow-up findings of detorsioned testis; US: Ultrasound.

scrotum is to avoid testicular loss. This requires a high index of clinical suspicion and prompt surgical intervention of the testicular torsion [4].

In a study with 620 patients who had presented with acute scrotum, 68 of these 620 patients had been underwent surgical exploration. Mean age of patients was 21.9 ± 16.6 years (range, 2 month-95 years) [5]. Our study which was carried out only in the pediatric age group is different from the above research, and patients without symptoms of acute scrotum were excluded from this study (namely patients with hydrocele, undescended testis, varicocele or tumors). Average age of the cases with epididymo-orchitis was found as 7.8 years (1–14 years) in another study [6]. In our study, the mean age of these patients was similar. Torsion of testicular appendage showed a peak incidence between 10 and 12 years of age [7]. But in our study, the mean age of children with torsion of the appendix testis was 6 years (min: 5 yrs, max: 7 yrs). In an another study, mean age of the patients with testis torsion was 10.9 years (newborn-14 years). If 9 newborn patients were excluded, mean age was found to be 7.5 years (ranged 2 months to 14 years old) in 50 children with acute scrotum during the 5-year period [6]. In another study, 18 of the patients had been hospitalized due to testicular torsion whose ages changed between 3 days to 168 months, and the mean age was found as 104.1 ± 73.2 months in that study [8]. In our study, the mean age of the children with testicular torsion was 6.0 ± 5.8 years (min: 1 m -max:

16 yrs). The mean age was 9.3 ± 7.2 days in three newborns with testicular torsion.

Acute scrotum in children has several different etiologies and each etiologic entity shows different symptoms and pathology [7]. The symptoms of epididymitis and orchitis generally arise more slowly than those of testicular torsion. There may be dysuria, indicating a concomitant urinary tract infection. In these patients with epididymo-orchitis, scrotal ultrasonography reveals hyperemia with increased vascularization, along with enlargement of the epididymis or testis [9]. Another study which analyzed the clinical presentation and physical examination parameters together with the results of imaging studies in order to find out predictors for the differential diagnosis of acute scrotum with special emphasize on testicular torsion had been carried [10].

Although symptoms are very similar, ultrasonographic (especially Doppler US) findings of the epididymo-orchitis and testicular torsion are different. The clinical approach to the acute scrotum must begin with a standardized and rapidly performed diagnostic evaluation. Doppler ultrasonography currently plays a main role [9]. The ultrasonographic evaluation of testicular perfusion includes both the arterial and the venous flow signals. Demonstration of the central vessels in the testicular parenchyma is important, as perfusion may be preserved in the periphery and the outer coverings of the testis even in the presence of testicular torsion. In a case series including 61 cases of testicular torsion, the criterion

of demonstrable central perfusion found could be identified by Doppler US [9].

Doppler US in the initial triage of patients with acute scrotum presenting to the emergency department have been suggested as a routine procedure because it is a highly sensitive preoperative diagnostic tool [5]. Testicular torsion was suspected in 20 patients and confirmed in 18 by preoperative ultrasonography. Doppler ultrasonography had 94% sensitivity, 96% specificity, 95.5% accuracy, 89.4% positive predictive value, and 98% negative predictive value for the diagnosis of testicular torsion in that study [5]. Postoperative diagnoses of 68 cases were testicular malignancy (n=11), hydrocele (n=8), inguinal hernia (n=8), testicular hematoma (n=5), testicular mass (hematoma or malignancy (n=3), scrotal abscess (n=3), extratesticular tumor (n=3), undescended testis (n=3), orchiepididymitis (n=1), and Fournier gangrene (n=1), scrotal hematoma (n=1), funiculocoele (n=1), and testicular torsion (n=20) [5]. In our study, any cases of orchiepididymitis or traumatic acute scrotum did not undergo surgery and in addition all cases with incarcerated inguinal hernia were excluded from this study. Results of the preoperative Doppler US were found to be compatible with peroperative findings in all patients. Only two patients were operated after normal office hours without prior Doppler US examination, because Doppler US is not at our hospital under overtime circumstances.

Doppler ultrasonography for the diagnosis of acute scrotum had been requested from our pediatric surgery departments. But theoretically, testicular perfusion could also be evaluated with magnetic resonance imaging (MRI) or scintigraphy, but these imaging modalities are of little value for the diagnostic assessment of the acute scrotum in routine clinical practice because they are time-consuming, expensive and hard to obtain [7]. In general, these auxiliary methods are not valuable as Doppler ultrasonography in the urgent clinical practice so these are secondary important methods. Besides, there are no facilities like MRI and/or scintigraphy in some hospitals too.

In a study, the diagnosis of orchiepididymitis was confirmed with Doppler US in 22 patients with or-

chiepididymitis and all were treated conservatively [6]. Rates of orchiepididymitis among our patients were found more than some similar studies. Most researchers have chosen their patients among those who were highly suspected of torsion [1, 2, 6]. Most of the patients (34%) were in the first year of their lives so that the number of their patients with testicular torsion were higher than patients with epididymo-orchitis [1]. In another study, epididymo-orchitis was detected during scrotal exploration [4]. Diagnosis of orchiepididymitis was confirmed with Doppler US in our patients with orchiepididymitis, and all of them were treated conservatively during that period.

In hydatid torsion, small appendages of testis and epididymis undergo torsion and become ischemic. These appendages are embryologic remnants of the Mullerian and Wolffian ducts [11]. The clinical manifestations in hydatid torsion resemble those of testicular torsion. Hydatid torsion generally treated when symptomatic, with bed rest and application of local cold compress, and if necessary with anti inflammatory drugs [11]. Torsion of appendix testis is rarely diagnosed during the operation. In a study by Yapanoğlu et al., one of cases with torsion of appendix testis was diagnosed intraoperatively [8]. Two cases were diagnosed as hydatid torsion peroperatively, because Doppler US examination is not performed on call circumstances at our hospital.

Blunt trauma can cause a hematocele or edema of the scrotum. US and Doppler US are needed to rule out posttraumatic torsion or capsule rupture of the testes [9]. In our cases with traumatic acute scrotum, US's were found to be compatible with hematocele but testicular blood supply was normal in Doppler US. Any surgery was required like rupture of the tunica albuginea of testes in our cases.

In the neonatal period sometimes scrotal hematoma, as a rare complication of adrenal hemorrhage, may mimic testicular torsion and an emergency surgical approach may be required [12]. Seventy percent of neonatal testicular torsions were diagnosed before the birth in the literature, the rest was diagnosed within the first month of life [13].

Anatomical variants such as the bell-clapper anomaly, in which the gubernaculum, testis and

epididymis are not anchored as they normally, predispose to testicular torsion. Failure of normal posterior anchoring of the gubernaculum is called a bell clapper deformity because it leaves the testis free to swing and rotate within the tunica vaginalis of the scrotum much like the gong (clapper) inside of a bell. Twisting of the testis around the axis of the spermatic cord is called spermatic cord torsion. Supravaginal torsion is more common in infants, while intravaginal torsion of spermatic cord is the usual variant occurring in adolescence and is much more common overall [9]. In our study, bell-clapper anomaly was detected in 6 patients during the operation. Contralateral orchiopexy was performed at the same session in these patients. Fixation of the contralateral testis to the scrotum should be scheduled in the same session for the possibility of the contralateral testis torsion [9]. Our cases of intrauterine testicular torsion were extravaginal torsion, which were similar with the literature [14]. Unfortunately, in most cases the testicles can not be recovered even with appropriate surgical exploration. Testicular salvage rate of 8.96% has been reported in the neonatal testicular torsion. This rate would be increased up to 21.7% in emergency operations [13]. In the early exploration of three cases with intrauterine testis torsion, two of them went to orchiectomy in our study. In follow-ups of one case, testicular blood supply was determined in late Doppler US after the detorsion procedure.

Experimental studies have shown that testicular hemorrhagic infarction begins to appear within 2 hours of onset of testicular torsion, irreversible damage occurs after 6 hours, and complete infarction is established by 24 hours [3]. The delay six hours after pain onset was considered as lateness in presentation. It is known that early presentation and diagnosis and prompt surgical intervention may reverse testicular ischemia and avert unnecessary orchidectomies. This early diagnosis may involve using Doppler US where diagnosis of testicular torsion is in doubt and facilities are available. The diagnosis of using Doppler ultrasound is based on the finding of decreased or absent blood flow on the affected side. On the other hand, delay may lead to progressive, time dependent testicular damage because

twisting of the testicle causes venous occlusion and engorgement as well as arterial ischemia, leading to infarction of the testicle. How tightly the testicle is twisted appears to correlate with how quickly the testicle becomes rudimentary from ischemia [15]. Primary orchiectomy should be performed only if the testis is clearly necrotic; in all other cases, the testis should be anchored to the scrotum with two sutures. Having been left in place, the testis can later be reassessed ultrasonographically for reperfusion and potential secondary parenchymal changes [9].

Testicular salvage rates in testicular torsion are 85–97% if operated within 6 hours of onset of symptoms [7]. In a study by Yapanoğlu et al., the authors had applied manual detorsion in 3 of 4 patients with testicular torsion, surgical detorsion in one of them (5.6%) and fixated all of the testes of all patients who came within 12 hours after onset of the symptoms. If the patients came to the hospital 24 hours after onset of symptoms, they proposed orchiectomy and fixation of the other testis. Eight patients accepted surgery among the 14 (77.8%) children in that study [8]. When patients were assessed according to the presence or absence of intermittent testicular torsion symptoms, the ones that had significantly longer times from the onset of symptoms to emergency admission and significantly higher rates of orchiectomy (63% versus 44%) in a study of 6 years' [16]. Surgical detorsion and salvage were performed in two of those cases who were operated at 36th hours due to incomplete torsion [16]. Orchiectomy was performed in 6 patients and detorsion and orchiopexy was performed in 5 patients; testicular atrophy was detected in 2 of the patients in late follow up in this study [6]. Manual detorsion were not implemented before the operation in our patients, most pediatric surgeons's opinion that manual detorsion without surgery may be preferred in adults. In our study, 6 testes were found clearly necrotic during the surgery and orchiectomy was performed in these cases. Five of these cases have been operated in over the 12 hours, and one case had been operated in between 6 and 12 hours. It supports time-dependent testicular damage. Detorsion was made in 18 cases with testicular torsion that was a good blood supply. Normal testicular size

and vascularity were detected in 18 detorsioned testes by follow-up Doppler US. Perfusion of 11 testes were found normal in late follow-ups. In these 11 cases, 8 of had been operated in first 6 hours, and two patients had been operated in between 6–12 hours, and one patient was operated after 12 hours. Late orchiectomy was performed in 7 cases of 18 due to complete atrophy of testes and lack of blood supply. The ratio of our patients with late orchiectomy was quite high, we think some came late still had viable testes in the operation findings. Totally 13 of 24 patients were lost their one testes. Our orchiectomy rates were found 54% slightly higher but 16 of 24 patients (66%) had late presentation. Our testicular salvage rates in testicular torsion are 100% if operated within 6 hours of onset of symptoms.

In conclusion, Doppler US is very helpful for differential diagnosis of patients with acute scrotum who applied to the hospital at an early period. Although accuracy of imaging studies is higher for the differential diagnosis of testis torsion and epididymo-orchitis, there is a considerable risk of misdiagnosis. If performing Doppler US will lead to a waste of time, emergency surgery may decrease the risk of testicular loss. Therefore, differential diagnosis of acute scrotum, particularly testicular torsion, still remains a clinical diagnosis and clinical parameters deserve more importance in surgical decision making. Patients with acute scrotum must be evaluated urgently and surgeons should have been performed an urgent testicular exploration when the slightest suspicion arises in terms of a testicular torsion.

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