

# Characteristics and management of testicular torsion patients presented to a tertiary care hospital: A prospective cohort study

## Original Article

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## ABSTRACT

**Background:** Testicular torsion is a surgical emergency that occurs when twisting of the testicle around the spermatic cord takes place. To our knowledge there are no regional manuscripts discussing testicular torsion.

**Aim:** The current work aimed at filling this gap by studying the characteristics and management of patients presented with testicular torsion.

**Patients and Methods:** Study subjects were recruited from patients presented to Kasr Al-Ainy emergency department complaining of acute testicular pain for variable duration in a period of 6 months. A total of 33 patients were included.

**Results:** The mean presenting age was 19.56 years ( $\pm 6.94$ ). Orchidectomy was done in 18 cases (54.5%) with the mean duration of torsion 6.43 hours  $\pm 4.05$ . Orchidopexy was performed in 15 cases (45.4%) with the mean duration of torsion 28.56 hours  $\pm 11.08$ . There was a significant correlation between duration of torsion and fate of the testis. No statistically significant correlation between degree of torsion and fate of testis. In all cases, the type of torsion was intravaginal. Reactive hydrocele was visualized in 15 patients, 11 of them (73.3%) underwent orchiopepy and 4 cases (26.7%) underwent orchietomy. No hydrocele could be visualized in 18 cases, 14 of them (77.8%) underwent orchietomy and 4 cases (22.2%) underwent orchiopepy. A significant correlation was found between presence of reactive hydrocele and salvage of the testis.

**Conclusion:** The time between the onset of pain and surgical intervention is the most important factor in prediction of the fate of the testis, in preoperative ultrasound, heterogeneity and absence of a reactive hydrocele were predictive factors of organ loss but this is not a reason to delay surgery as some patients did not have.

**Key Words:** Orchidectomy, orchidopexy, scrotal duplex, testicular torsion.

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## INTRODUCTION

Testicular torsion occurs when twisting of the testicle around the spermatic cord takes place, resulting in cutting off the blood flow to the testicle. It is a surgical emergency affecting 3.8 per 100000 males younger than 18 years annually and should be considered in all patients who present with acute scrotal pain. Early diagnosis and treatment are vital to save the testicle<sup>[1]</sup>.

To date, no specific cause of torsion has been identified. The most accepted hypothesis is that torsion is associated with congenital anatomical anomalies. In these cases, some predisposing factors, such as an excessive length of the spermatic cord or bell-clapper deformity, could favor torsion. In some patients, a triggering event such as physical injury or intense effort may be identified. Some authors have also reported sexual activity, testicular cancer, or some diseases that can cause testicular volume

increase. In many cases, however, a specific trigger is not identified<sup>[2]</sup>.

Patient may report repeated attacks of severe hemiscrotal pain of sudden onset and short duration. In between the pain attacks, there are pain-free intervals that vary in duration from hours up to months, which suggest the diagnosis of intermittent testicular torsion (ITT). Imaging studies are not that diagnostic in these cases as the ITT may resolve before being reported by imaging<sup>[3]</sup>.

Surgical detorsion is the definitive treatment for testicular torsion. Patients with testicular torsion must undergo immediate exploration to avoid testicular loss. Surgical repair should occur within 6h of symptom onset; however, the survival with or without future atrophy is reported beyond that critical time<sup>[4]</sup>.

To our knowledge, there are no regional manuscripts discussing testicular torsion. In this manuscript we aimed

at studying the characteristics and management of testicular torsion patients to help us bridge this gap.

**PATIENTS AND METHODS**

After approval of the ethics committee of the Andrology Department, Faculty of Medicine, Cairo University, this prospective study was started on patients attending Kasr Al-Ainy Emergency Department in 6 months duration from January 10, 2020 to July 10, 2020, complaining of acute testicular pain for variable duration and diagnosed as testicular torsion by history, clinical examination, and scrotal duplex. Patients diagnosed with other causes of acute scrotum and patients less than 12 years old were excluded. All patients signed an informed consent to be enrolled in this study.

All patients were subjected to history taking, general and genital examination, and color Doppler ultrasonography (CDUS) using SIEMENS (Werner-von-Siemens-Straße 1, 80333 München, Germany) sonoline G50. It is a highly sensitive (88.9%) and specific (98.8%) preoperative diagnostic tool with a 1% false-negative rate<sup>[5]</sup>. If testicular torsion is confirmed by examination and CDUS, emergency surgical exploration was carried out. Doppler ultrasonography evaluates the size, shape, echogenicity, and perfusion of both testicles. Color Doppler imaging of testicular torsion demonstrates a relative decrease or absence of blood flow within the affected testicle. If blood flow is absent on Doppler imaging and consistent with torsion, immediate surgical exploration is indicated<sup>[6]</sup>.

**Surgical technique**

Through a longitudinal median raphe incision, detorsion of the affected spermatic cord was done until untwisting is confirmed completely. Testicular viability of the testis was evaluated. If viability is questionable, the testicle is placed in warm sponges and warm saline is applied to promote the revascularity of the testis. Reevaluation was performed after several minutes. According to Maguire and Sabharwal and Amato *et al.*, if the testis is viable, as confirmed by fresh bleeding after small incision orchidopexy is done by fixing the testis to the scrotal wall at three points by three nonabsorbable sutures, for example, Prolene 3-0 or

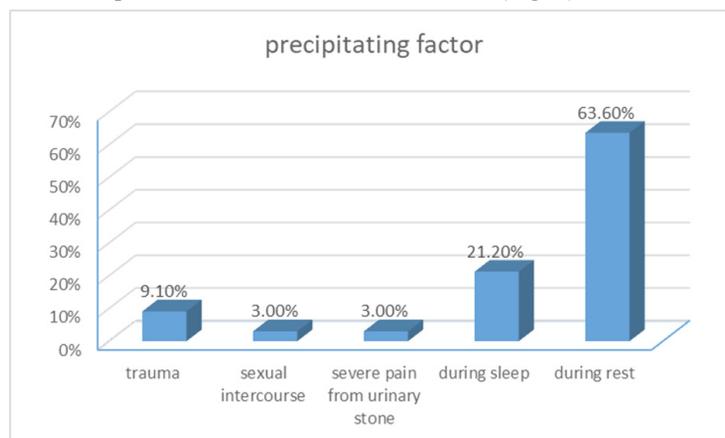
4-0. The sutures must be away from the epididymis, vas, and vessels. Contralateral orchiopexy by the same previous way is always done by default when testicular torsion is confirmed intraoperatively to avoid future torsion of the contralateral testis<sup>[7,8]</sup>. If necrosis nonviability is confirmed as the black color did not change after untwisting and no bleeding appeared after small incision in the testicle<sup>[9]</sup>, orchiectomy is done by placing a large clip or artery forceps over the cord; then the cord is ligated by transfixation sutures using strong absorbable sutures (e.g. 0-G Vicryl) followed by the testicle being excised and sent for pathological examination<sup>[9]</sup>.

**Statistical analysis**

Data were coded and entered using the Statistical Package for the Social Sciences (SPSS), version 26 (IBM Corp., Armonk, New York, USA). Data was summarized using mean, SD, median, minimum, and maximum in quantitative data and using frequency (count) and relative frequency (percentage) for categorical data. Comparisons between quantitative variables were done using the nonparametric Kruskal–Wallis and Mann–Whitney tests<sup>[10]</sup>. For comparing categorical data,  $\chi^2$  test was performed. Exact test was used instead when the expected frequency is less than 5<sup>[11]</sup>. Receiver operating characteristic curve was constructed with area under the curve analysis performed to detect the best cutoff value of pain time for detection of need for orchiectomy. *P* values less than 0.05 were considered statistically significant.

**RESULTS**

A total of 33 patients with testicular torsion were seen within the study period: 23 cases were in the cold season (January, February, and March) and 10 cases were in the hot season (April, May, and June). The ages ranged from 13 to 44 years with a mean of 19.56 years ( $\pm 6.94$ ). In 21 (63.6%) patients, TT happened during rest, in seven (21.2%) patients it happened during sleep, in one (3%) patient it happened after severe pain from urinary stone, in one (3%) patient it happened during sexual intercourse, and in three (9.1%) patients TT happened due to testicular trauma (Fig. 1).



**Fig. 1:** Precipitating factors of TT. TT, testicular torsion.

In 15 (45.5%) patients, history of previous attacks of testicular pain was reported and in 18 (54.5%) patients no history of previous attacks was reported (Table 1). Only one (3%) patient of the 33 patients reported a family history of testicular torsion (his brother).

In 31 (93.9%) patients, the vascularity was absent, while in two (6.1%) patients, the vascularity was diminished. The left testis was involved in 17 (51.5%) patients, and the right testis was involved in 16 (48.5%) patients. In eight (24.2%) patients, testicular pain was associated with lower abdominal pain, in six (18.2%) patients there was abdominal pain preceding testicular pain, and in 19 (57.6%) patients there was no abdominal pain. In 15 (45.5%) patients history of vomiting was reported and in 18 (54.5%) patients no history of vomiting was reported.

By CDUS, the echogenicity of the affected testis was heterogeneous in 20 (60.6%) patients and homogenous in 13 (39.4%) patients. In 15 (45.5%) patients reactive hydrocele was visualized, while it was absent in 18 (54.5%) patients.

On surgical intervention, in 18 (54.5%) patients the testis was found unviable and thus underwent orchiectomy

of the affected testis and orchiopexy of the contralateral testis. In 14 (45.4%) patients, the testis was viable and bilateral orchiopexy was done. One patient underwent redo right orchiopexy (right TT after 2 years of left TT that resulted in left orchiectomy with right orchiopexy).

The contralateral testis in a total of 32 testes was evaluated and one (3%) testis was absent due to previous left orchiectomy. Regarding testicular position, in 19 (57.6%) patients a transverse lie of both testes was noted, in two (6.1%) patients the testes were oblique and freely mobile, and in 11 (33.3%) patients it had a normal lie. In 30 (91%) patients, spiral-like pattern of the cord could be visualized, which is a definitive sign for twisting of the spermatic cord and in three (9%) patients, this sign could not be visualized (torsion and detorsion).

In all the 33 cases, the type of torsion was intravaginal. In 28 (84.8%) cases, bell-clapper deformity was present and in five (15.2%) cases no deformity could be detected (Table 2). In patients with visualized reactive hydrocele in preoperative ultrasound, the median degree of torsion was 360° and it was 540° in patients without detected hydrocele (Fig.2).

**Table 1:** Analysis of patients that reported previous attacks of testicular pain with pain-free intervals, suggestive of intermittent testicular torsion: number of attacks and duration of each attack

	Mean	SD	Median	Minimum	Maximum
Number of previous attacks (ITT)	3.80	3.34	2.00	1.00	12.00
Duration of previous attacks ITT (min)	9.80	8.97	5.00	2.00	30.00

ITT, intermittent testicular torsion.

**Table 2:** Bell-clapper deformity

	Count	%
Type of torsion		
Intravaginal	33	100.0
Bell clapper deformity		
Present	28	84.8
Absent	5	15.2

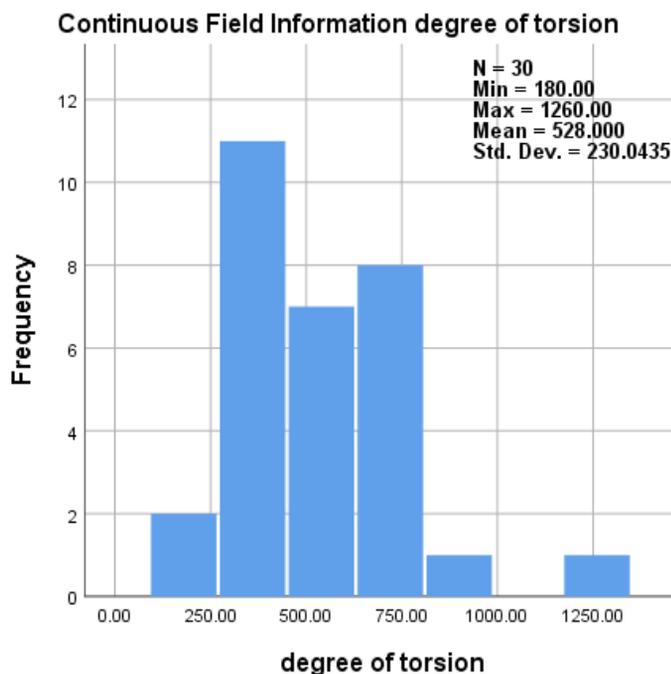


Fig. 2: Degree of torsion.

In 20 (60.6%) cases, the direction of torsion was outward and in 10 (30.3%) cases the direction of torsion was inward. In three (9.1%) cases, the spermatic cord was not twisted at the time of exploration.

In cases that underwent orchiopexy, the mean duration of torsion from the onset of pain was 6.43±4.05h (range, 2–14h). In cases that underwent orchiectomy, the mean duration of torsion was 28.56±11.08h (range, 10–48h). Significant correlation was found between the duration of torsion and fate of the testis (necrosis vs. salvage) with *P* value less than 0.001.

In cases that underwent orchiopexy the median degree of torsion was 360° and in cases that underwent orchiectomy the median of degree of torsion was 540°. No statistically significant correlation was found between the degree of torsion and fate of testis (necrosis vs. salvage) with a *P* value of 0.059.

In 13 (39.4%) patients, the affected testis was

homogenous by US, and all these cases underwent orchiopexy. In 20 (60.6%) patients, the affected testis was heterogeneous; 18 (90%) patients underwent orchiectomy; and two (10%) patients underwent orchiopexy. A significant correlation was found between heterogeneity of the testis by US and necrosis of the testis, *P* value less than 0.001 (Table 3).

Reactive hydrocele was visualized in 15 patients, 11 (73.3%) of them underwent orchiopexy and four (26.7%) cases underwent orchiectomy. No hydrocele could be visualized in 18 cases; 14 (77.8%) of them underwent orchiectomy and four (22.2%) cases underwent orchiopexy. There was a significant correlation between the presence of reactive hydrocele and salvage of the testis with a *P* value of 0.003 (Table 4).

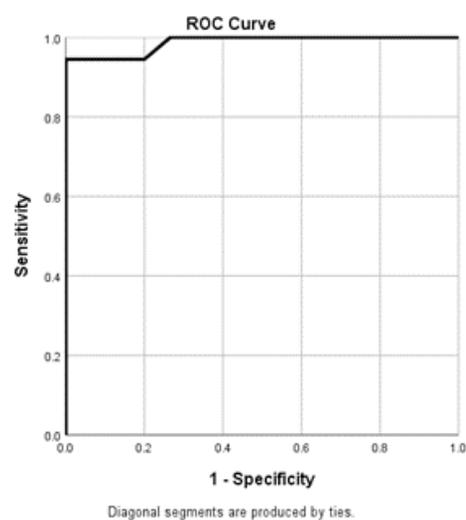
The best cutoff value for decision of orchiectomy of 14.5h with a sensitivity of 94.4% and specificity of 100%. Area under the curve of 98.7% with 95% confidence interval 95.7–100% (Fig.3).

Table 3: Relation between echotexture of the testis and necrosis versus salvage

	Echogenicity				<i>P</i> value
	Homogenous		Heterogeneous		
	Count	%	Count	%	
Exploration					
Orchiopexy	13	100.0	2	10.0	<0.001
Orchiectomy	0	0.0	18	90.0	

**Table 4:** Relation between presence of hydrocele and fate of the testis

	Reactive hydrocele				P value
	Yes		No		
	Count	%	Count	%	
Exploration					
Orchiopexy	11	73.3	4	22.2	0.003
Orchiectomy	4	26.7	14	77.8	

**Fig. 3:** ROC curve for detection of need for orchiectomy using testicular pain duration. ROC, receiver operating characteristic.

## DISCUSSION

This study aimed at detecting the predictive factors of ischemic necrosis in testicular torsion as well as profiling the characteristics of patients suffering from TT and factors affecting salvage of the testis with the best management practice.

The majority of cases occur in younger patients (<25 years old) and are usually due to a congenital abnormality of the processus vaginalis. The history of onset may be spontaneous, exertional, or, in fewer instances, associated with trauma. Testicular torsion accounts for roughly one-quarter of scrotal complaints that present to the emergency department<sup>[12]</sup>.

Testicular torsion is caused by twisting of the blood supply and spermatic cord. The tunica vaginalis is usually solidly adhered to the posterolateral aspect of the testicle and within it, the spermatic cord is not mobile. If the attachment of the tunica vaginalis is high, then this allows for the spermatic cord to twist inside, leading to intravaginal torsion. This defect is referred to as the bell-clapper deformity and is bilateral in at least two-fifth of

cases. Testicular torsion has been known to occur in the presence of testicular malignancy in adults<sup>[1]</sup>.

The classical presentation for TT is sudden-onset severe unilateral pain. The pain, being ischemic in nature, typically requires opiate analgesia. Persistent pain after opiate analgesia should lead to suspicion of TT. The duration of symptoms before presentation can vary significantly, ranging from several hours to several days. However, patients with TT tend to have a shorter duration of symptoms before presentation. Early presentation in cases of TT is associated with higher likelihood of salvage<sup>[13]</sup>.

Patients may report repeated attacks of severe hemiscrotal pain of sudden onset and short duration. In between the pain attacks, there are pain-free intervals that vary in duration from hours up to months, which suggest the diagnosis of ITT. Imaging studies are not that diagnostic in these cases as the ITT may resolve before being reported by imaging<sup>[3]</sup>.

In the current study, a total of 33 patients with testicular torsion were involved in this study. Their age ranged from 13 to 44 years. In this study, the mean age was  $17.33 \pm 3.74$

years old in cases that underwent orchiopexy, and it was  $21.42 \pm 8.43$  years in cases that underwent orchiectomy. This is in agreement with Mansbach *et al.*<sup>[14]</sup> who reported increased incidence of orchiectomy with increased age of patient. This may be due to healthier blood vessels in young age.

Out of the 33 cases, 23 (69.7%) cases presented in cold weather and 10 (30.3%) cases in hot weather. It is believed that the cremasteric muscle fibers contract asymmetrically at low temperature. This is in agreement with what has been reported by Korkes *et al.*<sup>[15]</sup> who found higher incidence of testicular torsions during colder months.

In the present study, the left testis was affected in 51.5% and the right testis was affected in 48.5%. This is in agreement with Sessions *et al.*<sup>[16]</sup> who reported affection of the left testis in 52% and affection of the right one in 48% in retrospective examinations of 186 who underwent surgical exploration. This is because it is generally believed that the left side of the spermatic cord is longer than the right side, so the incidence rate of the left testicular torsion is higher<sup>[12]</sup>.

Acute abdominal pain can be the only presenting symptom of testicular torsion in patients. Physicians should be aware of the a typical clinical presentation of testicular torsion that may delay TT diagnosis<sup>[17]</sup>.

In our study, testicular pain time ranged from 2 to 48h with a mean of  $18.4 \pm 14.05$ h. Testicular pain was associated with lower abdominal pain in 24.2% of cases, abdominal pain preceded testicular pain in 18.2% of patients, and no abdominal pain was reported by 57.6% of patients. This matches with Wang and Mo<sup>[17]</sup>, who reported in their study that in 22% of patients abdominal pain preceded testicular pain.

In our study, 15 (45.5%) patients reported vomiting attacks. This is in agreement with Lavalley and Cash<sup>[18]</sup> who reported that around 50% of patients with torsion complain of vomiting. This clarifies the importance of examination of external genital organs including testicular torsion in the evaluation of lower abdominal pain and vomiting in young males<sup>[17]</sup>.

The etiology of TT is still not completely clear. In this study, we found out that it happened spontaneously in 84.8% of cases, in 21.2% during sleep and in 63.6% during rest. Sexual intercourse was the precipitating factor in one (3%) patient and severe pain from urinary stone in one (3%) patient. Scrotal trauma was the cause in three (9.1%) patients, two of them underwent orchiectomy, and the other underwent orchiopexy. This comes in alignment with Seng and Moissinac<sup>[19]</sup>, who reported that traumatic events can cause an acute scrotum with TT in 4–8% of patients.

One (3%) patient of the 33 cases reported a family history of testicular torsion (his brother), which does not come in

agreement with the meta-analysis by Shteynshlyuger and Yu<sup>[20]</sup>, who reported that up to 10% of patients with TT have an affected first-degree relative.

ITT is a clinical condition characterized by recurrent attacks of severe hemiscrotal pain of sudden onset and short duration. In between the pain attacks, there are intervals without pain that may vary from hours up to months<sup>[21]</sup>. Imaging studies, sometimes, are not diagnostic in these cases as the ITT may resolve before being reported. There is a possibility of losing the testis if ITT is missed in some cases, and this may lead to repeated attacks of scrotal pain and swelling. ITT may cause venous congestion with or without decreased arterial inflow and can lead to damage of the testis that can be reported histologically as atrophic seminiferous tubules, peritubular fibrosis, with possibility of negative impact on spermatogenesis<sup>[22]</sup>. The excellent results of bilateral orchiopexy confirm that ITT was the cause of the pain in most cases<sup>[23]</sup>. It has been reported that 29–50% of patients with a history of intermittent torsion may go on to have acute torsion. Another study showed that 50% of males diagnosed with acute torsion have had previous attacks of testicular pain, which may suggest that they may have had intermittent torsion before complete acute torsion<sup>[20]</sup>.

In our study, it was found that 15 (45.5%) patients reported previous attacks of testicular pain with pain-free intervals, the mean number of attacks was 3.8 (range, 1–12 attacks). This is in agreement with Hayn *et al.*<sup>[21]</sup> who reported that the mean number of painful episodes is three in patients who required emergency operation for acute TT.

In the study by Al-Kandari and colleagues, 63 patients were involved. These patients complained of sudden intermittent testicular pain over a duration of 3 months. The patients were offered orchidopexy or conservative treatment. Nineteen patients chose orchidopexy, while 44 chose conservative treatment. Of the 19 patients who underwent orchidopexy, the pain resolved or improved in 18 (94.7%) cases. On the contrary, only 21 (47.7%) of the 44 cases that chose the conservative approach claimed their pain resolved or improved with a median of 13 months of follow-up. This shows the importance of recognition and management of ITT and the superiority of orchidopexy over conservative treatment in ITT<sup>[3]</sup>.

## CONCLUSION

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Testicular torsion time is the most important factor in predicting the fate of the testis as the results of the current study have shown.

In preoperative ultrasound, heterogeneity and absence of a reactive hydrocele are predictive factors of organ loss, but this is not a reason to delay surgery as some patients did not have complete atrophy.

Repeated attacks of scrotal pain and swelling with a risk of losing the testicle can occur in ITT, which is considered an underreported condition.

## RECOMMENDATION

(1) Rapid diagnosis of TT by ER physicians can decrease the rate of orchiectomy.

(2) ITT should be in mind in any case with recurrent attacks of testicular pain.

(3) Patients with transverse testicular lie and repeated attacks of scrotal pain should be counseled to do elective orchiopexy.

(4) Scrotal pain screening sheet should be in central and general hospitals for early and accurate diagnosis of torsion.

## CONFLICT OF INTEREST

There are no conflicts of interest.

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