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THE VALUE OF SIGNS AND SYMPTOMS IN THE DIAGNOSIS OF SPERMATIC CORD TORSION

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Abstract

The aim of this study is to evaluate the most useful clinical signs and symptoms in the diagnosis of spermatic cord torsion, and so decreasing unnecessary surgical exploration and testicular loss rates for these patients.

Between August 2013 and November 2014, patients with suspected spermatic cord torsion were included in this study; patient case sheets were prepared; history, examination, imaging, and post-operative results were recorded. The patients then divided into non-torsion and torsion groups, the torsion group further subdivided into salvaged and orchiectomy groups. Data evaluated and correlated with the result of the surgical exploration.

Seventy-seven patients were included, 11 (15%) patients without torsion and 66 (85%) with torsion. Of the torsion group 35 (53%) were salvaged while orchiectomy done to the remaining 31 (47%).

The patients' age ranged from 1 to 29 years with a mean of 16.22 years with standard deviation of 6 years, and they commonly presented during winter months, the salvageability rate decline with increase duration of symptoms especially after 24 hours.

There were a significant difference ($p<0.05$) between torsion and non-torsion groups in the testis lay, testis orientation, cremasteric reflex, high riding testis, left side, and cord knotting. There were significant difference ($p<0.05$) between salvaged and orchiectomy groups in duration of symptom, onset of symptom, and in presence of scrotal edema.

A univariate analysis showed that the pain was very sensitive but lacks specificity; the duration less than 6 hours, abnormal lay, absent cremasteric reflex, high riding testis, abnormal orientation, presence of cord knot, and presence of nausea and vomiting are highly specific.

The multivariate analysis then repeated for combination of nausea and vomiting, high riding testis, abnormal lay, and absence of cremasteric reflex; showed 100% specificity if three and more of these four feature were present.

In conclusion, careful history and physical examination can aid diagnosis of testicular torsion, no clinical signs and symptoms were highly specific and sensitive for torsion, and a constellation of clinical feature can aid the diagnosis.

Introduction

The new onset of pain, swelling, or tenderness of the scrotal contents called acute scrotum, and is one of the common presenting complaint in urology[1]. Spermatic cord torsion (testicular torsion) is the second most common cause of acute scrotum, represents (20% to 30%) of acute scrotum cases, the other common causes are appendix testis torsion which is the most common diagnosis (40%-60%), epididymitis (5% to 15%), and other or no pathology (~10%)[2-6]. Spermatic cord torsion affects a wide age range, there is a

bimodal age distribution of patients with peaks in the first year of life and in early adolescence and most commonly is between the ages of 12 and 18 years, when the testes rapidly increase in size due to the sudden surge in the testosterone levels, after which the incidence slowly decreases[7]. Torsion can either be intravaginal or extravaginal[1].

The direct precipitating event in susceptible individuals is unknown but may include cold temperature, sudden movement, or trauma with activation of the cremasteric reflex, and/or rapid growth of the testis at puberty[8-10].

Other predisposing factors are familial predisposition and undescended testes although the prevalence in these groups as a whole is low[11,12].

The torsion initially obstructs venous return, subsequent equalization of venous and arterial pressures compromises arterial flow, resulting in testicular ischemia[13].

The degree of ischemia depends on the duration of torsion and the degree of rotation of the spermatic cord, rotation can range from 180 degrees to more than 1020 degrees; greater degrees of rotation lead to a more rapid onset of ischemia[14].

To date, no single reliable clinical feature or examination can give 100% diagnostic accuracy[15].

Nausea and vomiting (postulated to be secondary to stimulation of celiac ganglion) occurs in 10% to 60%, scrotal edema and erythema depend on the duration or degree of torsion, dysuria and fever are occasionally reported, and the most common physical findings are generalized testicular tenderness and absence of the cremasteric reflex[6,16].

The cremasteric reflex is a genito-femoral reflex arc which is normally present in boys after 2 years of age[1]. It is elicited by scratching the inner thigh with resultant elevation of the testis within the scrotum (considered positive if the testicle moves at least 0.5 cm), and it is one of the most useful and specific signs for spermatic cord torsion. Normal cremasteric reflex strongly correlated with intact blood flow to the testis but does not infallibly indicate normal testicular perfusion, especially if the clinical presentation is otherwise suggestive of torsion[1,17].

Urinalysis performed to identify pyuria and/or bacteriuria; a pyuria may be present and create diagnostic confusion[18].

Doppler ultrasound is useful to evaluate an acute scrotum, with a sensitivity of 63.6-100% and a specificity of 97-100%, and a positive predictive value of 100% and negative predictive value 97.5%, the false-negative results may be caused by intermittent torsion or by early torsion when only venous outflow is occluded[15,19.20].

Magnetic resonance imaging (the whirlpool/twisting pattern, the torsion knot appear as swirls centered over a low-signal-intensity focus) has been shown as a specific signs that help differentiate torsion from epididymitis[21].

The addition of radiographic imaging, both ultrasound and nuclear scintigraphy, has helped to improve the diagnostic accuracy and to reduce the incidence of negative surgical exploration[22,23].

The risk of orchiectomy after surgical exploration of cases with torsion was approximately 5%, 20%, 40%, 60%, 80%, and 90% at 0-6, 7-12, 13-18, 19-24, more than 24, and more than 48 hours after onset of pain, respectively. The approximate risk of late atrophy was less than 10%, 40%, and 75% after less than 12, 12 to 24, and more than 24 hours of pain, respectively, in those treated with orchiopexy[24].

Therefore any patient with a history and physical examination suspicious for torsion should have immediate surgery, a negative surgical exploration is preferable to a missed diagnosis, the imaging should be done only in equivocal cases in which suspicion for torsion is low[25]. Delay in diagnosis (and subsequent delay in surgery) risks testicular viability, whereas

over diagnosis subjects patients to unnecessary surgery[26,27].

Early surgical intervention (mean torsion time <13 hours) with detorsion was found to preserve fertility, but prolonged torsion periods (mean torsion time of 70 hours) followed by orchiectomy jeopardizes fertility[28].

Most surgeons currently use a selective approach in cases of acute scrotum, but a minority continue to recommend urgent surgical intervention for all cases of acute scrotum to avoid any risk of inaccuracy associated with the clinical and imaging diagnosis of spermatic cord torsion[5].

In our locality, the primary responders to the acute scrotum cases are the doctors of primary health centers, private clinics, outpatient clinic, and the emergency departments; these doctors are of variable specialty and experience. In addition, in many patients, there was a delay in seeking medical attention. All these factors may have negative implications on the management of spermatic cord torsion cases and may cause a delay in the treatment and eventual loss of testis. Hence, the aim of this study was to identify easily elicited, reliable, and reproducible clinical parameters that best predict or exclude spermatic cord torsion in a patients presenting with acute scrotum.

Patients and methods

This is a prospective cross-sectional observational study, conducted from August 2013 to November 2014. After taking the appropriate approvals in Basrah General Hospital, which is 600 bed multispecialty hospital that provides health care for more than 3 million people living in the Basrah and the nearby governorates. It is major referral hospital provide health care for more than 200 thousands outpatient visits, 12 thousands admitted patients, and 100 thousands patients seen in the emergency department per year.

All patients referred to the urology department (from the private clinics, outpatient clinic, and the emergency room) with acute scrotum in whom spermatic cord torsion was highly suspected and subsequently underwent emergency scrotal exploration were included in this study. Patients of suspected torsion of spermatic cord in undescended testis were excluded from the study. The management practice was observed never been influenced and so the decision making process was influenced by routine practice of the on-call urologists treatment opinion.

A patient case sheet was prepared which include date and time, chief complaint and its duration, history notes, scrotal examination findings, ultrasound results, and the operative finding results. The history notes include scrotal pain and its duration, onset of pain, previous similar attacks of pain, presence of nausea and vomiting, and the presence of swelling. The scrotal examination finding include presence of high riding testis, testis orientation, testis lay, loss of boundaries, presence of tenderness, presence of cremasteric reflex, cord knotting, and blue dot sign. The ultrasound results include the presence of decreased perfusion and the presence of mass. The surgical finding include the degree of torsion, the degree of bell clapper deformity, the presence of contralateral bell clapper, whether orchiectomy done or not, and the presence of torted testicular appendages. These parameters were selected to be reproducible, reliable and easily elicited by the doctors.

The urology resident on-call asked to notify us about cases that come to the hospital with scrotal pain in whom spermatic cord torsion suspected and a surgical exploration planned, then the patients' case sheet was filled and the preoperative history and examination and if available, the imaging study (Doppler ultrasound) results were recorded.

The cremasteric reflex regarded negative if ipsilateral testis fail to elevate more than 0.5 cm when scratching the inner thigh. The high riding considered positive when possible if the testis hanged up in the scrotum and cannot pulled down easily. Abnormal orientation regarded positive when the epididymis not found posterior by palpation, abnormal lay consider positive when the testis longitudinal axis not found vertical by palpation.

The testicular color Doppler ultra-sonography done by experienced radiologists either pre admission when the patient referred from other hospital or from private clinics, or the imaging done immediately after admission in the morning when the radiologist was available.

Surgical exploration performed after the informed consent from the patient and his family had been completed. The patient taken to the operating theatre for emergency exploration as soon as possible.

The exploration usually done by a midline raphe incision to facilitate exploration of both tunical spaces, then the involved testis firstly explored and examined for presence of torsion. After de-twisting the testis and warming the testis with warm normal saline socked pack for 10-20 min the decision whether to remove or to fix the testis was done according to the presence of any sign of re-perfusion like improvement in the color of testis or the presence of fresh blood oozing from the cut tunica albuginea surface. The fixation done for both of testes or to the contralateral one only when orchiectomy done.

The degree of twists, color of testis, and the presence of bell clapper deformities on both sides also documented in the patient case sheet.

From a total of 92 patients with scrotal exploration for spermatic cord torsion 15 further excluded due to incomplete form records.

Seventy-seven patients were finally included, data analyzed and compared with the surgical result. These patients divided into two groups a spermatic cord torsion (TT) and a non-torsion (nTT) group, and the torsion group then subdivided into a salvaged (sTT) and an orchiectomy (oTT) groups for analysis.

The statistical analysis done using the Statistical Package for Social Sciences, version 20 (IBM Corporation, Armonk, NY, USA), the data were presented as the mean ± standard deviation (SD) and range.

The differences between groups calculated using the independent t-test. Frequency, percentage, sensitivity, specificity, positive predictive value, and negative predictive value calculated with univariate and multivariate analysis.

Results

Seventy-seven patients were included in this study, all underwent explorative scrotal surgery for the suspicion of having spermatic cord torsion.

During the surgery torsion was confirmed in 66 patients (85%), all were of the intravaginal type; the remaining 11 patients (15%) did not have torsion (unnecessary surgical exploration). Five patients (7%) had torted testicular appendages, and 6 patients (7%) had epididymo-orchitis as shown in Figure (1). Of the 66 (85%) torsion cases, 35 (53%) were salvaged and fixed (testis salvage rate), while 31 (47%) were nonviable and orchiectomy done (orchiectomy rate), figure (1). Of the 31 orchiectomy cases, Seven patients (23%) were missed by another doctor and they presented late, on another hand 5 patients (16%) were referred for emergency exploration but the patient or his family initially refused surgery, see figure (2).

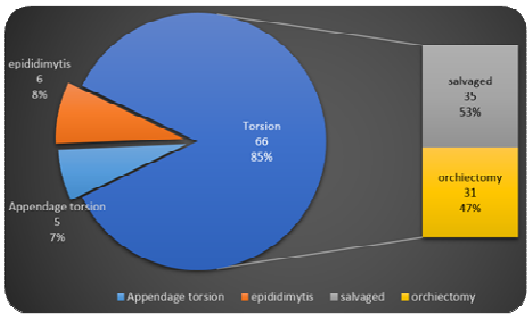

Figure 1: Patients distribution chart.

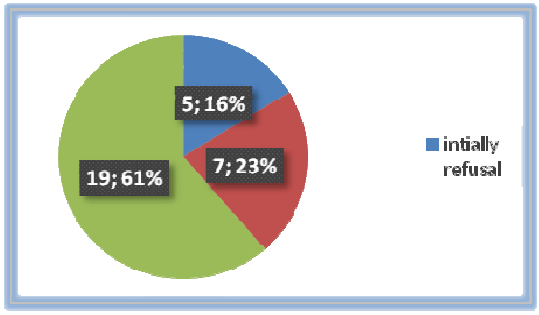

Figure 2 : The orchiectomy distribution chart

The overall presenting symptoms were 55 (72%) scrotal pain, 4 (5%) loin pain, three (4%) excessive crying, 5 (6%) inguinal pain, and 10 (13%) scrotal swelling.

The age of the included patients ranged from 1 to 29 years with a mean of 16.22 years with standard deviation of 6 years. Forty fife patients underwent Doppler ultrasound (39 of the torsion group and 6 in the non-torsion group).

Bell clapper deformity (testis takes a transverse lay in case of intravaginal torsion) found in all of the 66 cases of torsion, 51 (77%) out of the 66 torsion cases found to have contralateral bell clapper deformity as well. The degree of torsion in the ipsi-lateral side ranged from 180 degree to 560 degree, of the total 66 TT cases, 42 (64%) found to have 360 degree (one complete twist), 17 (26%) have 180 degree (half twist), and 5 (10%) have 560 degree (one and a half twist). There was significant difference between sTT and oTT groups) in which orchiectomy rate increases with the increase in twist degree, the average twist degree in sTT was 180 degrees while the average twist degree in oTT was 360 degrees.

In the figure (3) the age distribution shows that 49 (63%) cases were between (14-20 years), with peak incidence at age of 18 years represented by 20 (25%) cases, although this peak is more pronounced for the TT group than the nTT group, there is no statistical difference between TT and nTT regarding the age of presentation (p = 0.808).

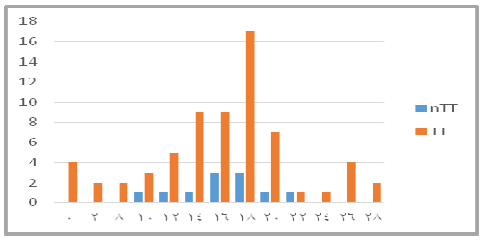

Figure 3: The age distribution in years of TT and nTT patients (p = 0.808)

Also the month in which the cases were presented is also plotted on a 12 month histogram in figure (4). It shows that the occurrence of cases were not evenly distributed over the months of the year, most of explored cases presented in the period between October and April 61 (79%) cases, with peak incidence in December and January 27 (35%) cases. Although this peak was more pronounced for the TT group than the nTT group, there is no statistical difference between TT and nTT in the month of presentation (p = 0.998), 45 (68%) of the TT group presented between October and April, while 8 (73%) of nTT group presented between October and April.

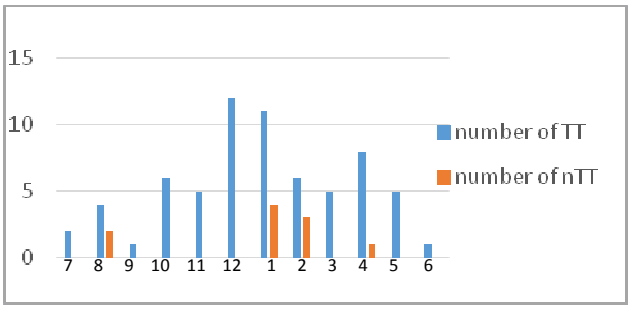

Figure 4: The distribution of patients over the year.

Table I shows the duration of symptoms prior to exploration is correlated with the final diagnosis, it is shown that 93% of cases presenting less than 6 hours were spermatic cord torsion and of those 71% are salvaged. The salvage rate slowly decline and the orchiectomy rate slowly increase as the time elapse, however when passing the 24 hour cut point, the salvage rate sharply diminished to 13% and the orchiectomy rate increase to 87% as shown in figure (5).

Table I: Patients distribution according to the duration of symptoms.

GROUP	<6 hr	<12 hr	<24 hr	>24 hr	All
Torsion (TT)*	14(93%)	35(90%)	51(86%)	15(83%)	66
Salvaged (sTT)**	10(71%)	23(66%)	33(65%)	2(13%)	35
Orchiectomized(oTT)**	4(29%)	12(34%)	18(35%)	13(87%)	31
Non torsion (nTT)*	1(7%)	4(10%)	8(14%)	3(17%)	11
Total cases	15	39	59	18	77

* Percentage calculated for each duration category. ** Percentage calculated for each duration category of torsion case only.

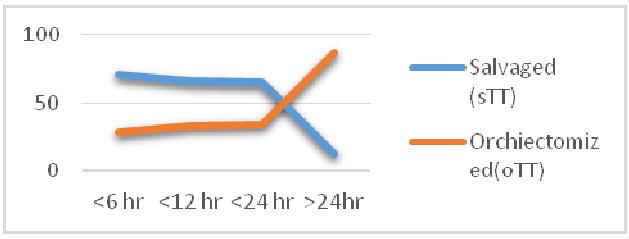

Figure 5: The salvageability with the duration.

Table II shows the statistical comparison between cases of TT and nTT, using range, mean, standard deviation, percentage, and P value was done. There is statistically significant difference between the two groups in the abnormal lay of the testis, abnormal testis orientation, absence of ipsilateral cremasteric reflex, high riding testis, left side symptom, and presence of cord knotting; in which these parameters were present significantly more in cases of TT than nTT. The most common signs and symptoms in TT group were pain 64 (97%), abnormal lay 30/37 (81%), high riding testis 52 (79%), absent cremasteric reflex 49 (74%), left sided pain 48 (73%) was more common than the right side (no bilateral torsion in this study), sudden onset of pain 45 (68%) and so on, see figure (6). There is also statistical difference between the two groups regarding blue dot sign which was found predominantly in nTT. There is no statistical difference regarding age, duration of symptom, presence of pain, edema and loss of boundaries, onset of symptoms, presence of tenderness, previous similar symptoms, presence of swelling, history of nausea and vomiting, decrease vascularity by Doppler ultrasound, and presence of mass by

ultrasound. It had been noted that the vascularity was normal in 12 cases of proven TT 12/39 (30%).

Table II: Statistical comparison between TT and nTT patients

Clinical feature	TT (n 66)	nTT (n 11)	P value	All (n 77)
age (years)	1-29(16)±6SD	10-22(16)±3SD	0.808	1-29(16) ±6 SD
Duration (hours)	2-120(23) ± 27 SD	6-120(32)±34 SD	0.335	2-120(24)±28SD
Pain	64(97%)	11(100%)	0.565	75(97%)
Sudden onset	45(68%)	6(55%)	0.383	51(66%)
Previous similar pain	20(30%)	4(36%)	0.693	24(31%)
Tenderness	48(72%)	9(82%)	0.531	57(74%)
Swelling	41(62%)	8(73%)	0.505	49(64%)
Presence of Nausea/vomiting	15(23%)	1(9%)	0.308	16(21%)
Left side	48(73%)	4(36%)	0.017	52(67%)
High riding testis	52(79%)	2(18%)	0.0002	54(70%)
Neg. ipsilateral cremasteric reflex	49(74%)	2(18%)	0.00017	51(66%)
Orientation abnormal*	20/31(65%)	0/7(0.0%)	0.001	20/38(53%)
Lay abnormal*	30/37(81%)	0/8(0.0%)	0.000001	30/45(67%)
Edema and Loss of boundaries*	32/61(52%)	6/10(60%)	0.663	38/71(54%)
Cord Knot*	15/35(43%)	0/8(0.0%)	0.021	15/43(34%)
Blue dot sign*	1/58(2%)	3/11(27%)	0.001	4/69(5%)
Doppler /decrease vascularity *	27/39(69%)	3/6(50%)	0.364	30/45(67%)
Mass in the ultrasound *	7/39(18%)	2/6(33%)	0.433	9/45(20%)

*Data not recorded to all patient and it percentage was divided by total number of the filled records only.
SD: standard deviation.

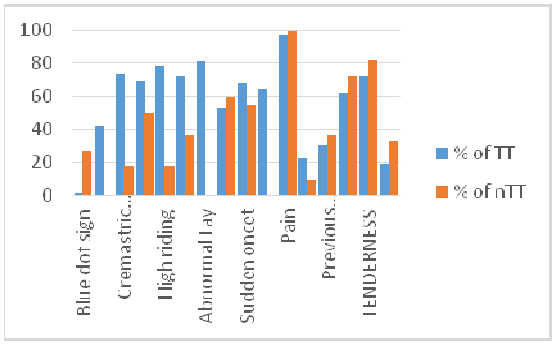

Figure 6: Percentage of clinical findings in TT and nTT patients.

Table III shows statistical comparison between cases of sTT and oTT, using range, mean, standard deviation, percentage, and P value. There was a statistically significant difference between the two groups in duration of symptoms, sudden onset of symptoms, and in scrotal wall edema and loss of boundaries; all were significantly present in cases of oTT than sTT. There is no statistical difference regarding age, presence of pain, abnormal lay, abnormal orientation, absence of cremasteric reflex, high riding testis, left side, cord knotting, blue dot sign, onset, tenderness, previous pain, swelling, nausea of vomiting, decrease perfusion by Doppler, and presence of mass by ultrasound. In cases of sTT, the duration ranged from 2 to 48 hours with mean of 12 hours and 9 hours

standard deviation, while in cases of oTT the range was 3 to 120 hours with mean of 35 hours and 34 hours standard deviation.

Table III: Comparison between sTT (salvaged testicular torsion) and oTT (orchidectomy testicular torsion) patients

Clinical feature	sTT (35)	oTT (31)	P value
age (years)	1-27(16.00) ± 6.32 SD	1-29(16.32) ±6.65 SD	0.841
Duration of symptoms (hours)	2-48(12) ± 9 SD	3-120(35) ± 34 SD	0.0003
Pain	33(94%)	31(100%)	0.182
Sudden onset of symptoms	20(57%)	25(81%)	0.041
Previous similar symptoms	11(31%)	9(29%)	0.836
Presence of tenderness	29(83%)	19(61%)	0.066
Presence of swelling	23(66%)	18(58%)	0.530
Presence of Nausea	9(26%)	6(19%)	0.546
Left side	27(77%)	21(68%)	0.400
High riding testis	29(83%)	23(74%)	0.398
Neg. ipsilateral cremasteric reflex	23(66%)	26(84%)	0.095
Orientation abnormal*	16/25(64%)	4/6(67%)	0.906
Lay abnormal*	24/31(77%)	6/6(100%)	0.207
edema and Loss of boundaries*	11/33(33%)	21/28(75%)	0.001
Cord Knot*	12/25(48%)	3/10(30%)	0.346
Blue dot sign*	1/30(3%)	0/28(0.0%)	0.338
Doppler /decrease vascularity *	15/20(75%)	12/19(63%)	0.437
Mass in the ultrasound *	5/20(25%)	2/17(12%)	0.319

*Data is not filled to all patient record and it percentage is divided by total number of filled records.SD: standard deviation.

In table IV, a univariate analysis for the sensitivity, specificity, positive predictive value, and negative predictive values addressed for each clinical feature. It had been found that the pain is very sensitive 97% but lacks specificity 0%; on the other hand the duration less than 6 hours, abnormal lay, absent cremasteric reflex, high riding, abnormal orientation, presence of cord knot, and nausea and vomiting are highly specific (>80%).

Table IV: Sensitivity, specificity, PPV (positive predictive value), and NPV (negative predictive value) for each clinical feature in the patient of TT

Clinical feature	(Sensitivity)	(Specificity)	(PPV*)	(NPV**)
Pain	(97%)	(0%)	(85%)	(0%)
Duration <6	(12%)	(100%)	(100%)	(16%)
Duration <12	(38%)	(45%)	(81%)	(11%)
Duration <24	(70%)	(9%)	(82%)	(5%)
Lay abnormal	(81%)	(100%)	(100%)	(53%)
Cremasteric asymmetric	(74%)	(82%)	(96%)	(35%)
High riding	(79%)	(82%)	(96%)	(39%)
Orientation abnormal	(65%)	(100%)	(100%)	(39%)
Left side	(73%)	(64%)	(92%)	(28%)
Cord Knot	(43%)	(100%)	(100%)	(29%)
Blue dot sign	(2%)	(73%)	(25%)	(12%)
Loss of boundaries	(52%)	(40%)	(84%)	(12%)
Sudden onset	(68%)	(45%)	(88%)	(19%)
tenderness	(73%)	(18%)	(84%)	(10%)
Previous similar symptoms	(30%)	(64%)	(83%)	(13%)
Swelling	(62%)	(27%)	(84%)	(11%)
Presence of Nausea	(23%)	(91%)	(94%)	(16%)
Doppler /decrease vascularity	(69%)	(50%)	(90%)	(20%)
Mass in the ultrasound	(19%)	(67%)	(78%)	(12%)

PPV: positive predictive value. NPV: negative predictive value.

The multivariate analysis then repeated for combination of four high specific and reliable clinical features; these chosen clinical features are presence of nausea and vomiting, high riding testis, abnormal lay, and absence cremasteric reflex. The duration and the abnormal orientation excluded because their presence when added to the analysis did not affect the results, table V. It shown that there was no any combination had 100% sensitivity, but the presence of three and more of the four clinical features have 100% specificity and 100% PPV.

Table V: Sensitivity, specificity, PPV (positive predictive value), and NPV (negative predictive value) for combination of the four most specific features (nausea and vomiting, high riding, abnormal lay, and absence cremasteric).

Test	presence of one feature	presence of two feature	presence of three feature	presence of four feature
sensitivity	98%	79%	35%	9%
specificity	64%	91%	100%	100%
PPV	94%	98%	100%	100%
NPV	88%	42%	20%	15%

Discussion

The diagnosis and treatment of patients presenting with acute scrotum continues to be one of the most challenging issues in urology[12].

Before the widespread availability of advanced imaging techniques, most boys with acute scrotal pain were taken to the operating room for scrotal exploration based on clinical examination alone, although this was an effective strategy, it resulted in unnecessary surgical interventions in two thirds of patients with acute scrotum[29,30].

The need for urgent exploration of the twisted testis is to salvage the affected testis, and to fix the contralateral testis (anatomical deformity is usually bilateral), and to remove the non-viable testis (if a twisted testis is not removed, a reduced sperm count is not uncommon)[31-33].

In this study the percentage of torsion was 85% in the explored cases, while the incidence of TT among the various causes of acute scrotum has varied largely in published articles, from 17%–72%[4,34-36], this discrepancy may attributed to the exclusion of the non-operated cases in this study. In the current study, the unnecessary surgery rate was 15% from all the explored cases of acute scrotum. While Tadtayev and Mazaris found that the rate of unnecessary exploration is up to 73%, this may attributed to that our doctor practice effectively exclude cases of non-torsion or they may have high threshold for exploration that may increase the missed torsion rate[37].

Epididymo-orchitis comprises 7% of the explored cases; it was nearly similar rate about 4% in Mushtaq et al. study[4].

Overall, the testis salvage rate was 53% in the current study whereas it was 70% in Mushtaq et al. study[4], and 62%–85% in Anderson et al. study[38]. This low rate may be due to overall late presentation time of the patients.

The mean duration of symptoms was 27 hours; salvageability rate decline with duration of symptoms it was 71% for less than 6 hours, 66% at less than 12 hours, 65% at less than 24 hours, and 13% for more than 24 hours. This result slightly differ from Scheldon's who found testicular viability at 90%, 80%, 40%, 10%, if symptoms have been present for less than 6, 12, 24 hours respectively. While this study result comes in harmony with Scheldon's when the symptom last more than 24 hours in which he found the salvageability was 10%[39].

In this study some patient has salvageable testis presented with more than 24 hours duration this may be due to either incomplete torsion i.e. less degree of twist, or torsion detorsion phenomenon.

The contralateral bell clapper deformity rate in explored cases found to be 77%, this is similar to Martin's result in which the rate was 78%[40].

In this study it have been found that a median of 180-degree of torsion was found in the salvaged group and a median of 360-degree of torsion found in the orchiectomy group. While Sessions and associates noted a more twist degrees at exploration, was a median of 540 degrees of torsion noted in the orchiectomy cases, and a median of 360 degrees noted in the salvaged testes (62%)[41].

In this study, there was no significant age difference between the TT and nTT groups (p=0.808). This comes in contradict to Ciftci et al., in which they found that patients with TT were the eldest in comparison with the non-torsion patients. This may be caused by less patients outside the expected torsion age range is suspected to have torsion by the treating doctor[42].

In this result the mean patient age for the development of spermatic cord torsion were 16 years, this were consistent with that in other studies that report the spermatic cord torsion mean ages range from 12 to 17 years[29,43,44], in this study 67% of the children with spermatic cord torsion were 10-22 year age.

Of the patients with torsion 68% presented in the period from October to April in which the lowest atmospheric temperature in the city of Basrah did not exceeded 18 Celsius according to the weather forecast[45]. This result was nearly similar to Arun's study in which they found that 81% of torsion occur in temperature less than 15 Celsius[46].

In this study the left side predominance was found to be 73% of all torted cases, this result differ from the result of Sessions's et al., in which they found that left torsion is 52% from all the torted explored cases[41].

It found clearly that no single clinical feature found 100% specific and sensitive at same time. This result was pretty much the same of Arun Srinivasan et al. result in which they found that it was important to emphasize that spermatic cord torsion cannot be diagnosed with one clinical surrogate marker that were accurate in every instance. Thus, it is essential to identify the constellation of symptoms in whose presence of spermatic cord torsion can be diagnosed accurately to eliminate unnecessary imaging and unnecessary delay before operation[47].

On other hand, in this study it was found that if three of the four features (absent cremasteric reflex, high riding testis, abnormal lay of testis, presence of nausea and vomiting) is present on the history and examination will result in a 100% specificity. In another word, if these four parameters were absent in the acute scrotal pain you may be 100% safe to rule out torsion and switch to conservative management and spare the patient unnecessary exploration.

Beni-Israel T. et al., found nearly similar result in that presence of nausea and vomiting, duration of pain of less than 24 hours, high-lying testis, and abnormal cremasteric reflex were associated with a higher incidence of TT[48].

The studies of Jefferson et al., Kadish et al., and Ciftci et al., found the absence of cremasteric reflex, presence of nausea and vomiting, and age were important predictors of spermatic cord torsion, however, these studies were retrospective, not in agreement and lacked statistical analysis[18,49,42]. Arun et al., evaluate three parameters (nausea/vomiting, ipsilateral scrotal skin changes and absence of ipsilateral cremasteric reflex) and found that the presence of all three variables makes the diagnosis in all patients with spermatic cord torsion, and the absence of all three variables suggests another

etiology is responsible for their acute scrotal pain[47].

In this study, it was found that the salvageability rate was dependent on duration of presenting symptom and the presence of scrotal wall induration and edema. This was similar to Marcello C. et al., in their study, they found the salvageability depend on a longer history of pain more than 10 hours[50-52].

This study was unique because it was a prospective study and the examination and case sheet filling was done by single doctor, and the bias eliminated by doing the records prior to the surgical exploration. The operated cases were selected only in this study, this lead to the inability to document the total torsion cases that because the non-operated cases may include a missed torsion cases.

Other limitations to this study, was the cohort is too small to reliably determine the differences among acute scrotum patients; this is an important point that will require a larger study to be taken in consideration.

While these points of evaluation were identified, others features may exist that were not elicited and which may have changed the outcome.

In conclusion, proper history and physical examination of patients with acute scrotum remain a corner stone for the diagnosis of spermatic cord torsion. In this study, we conclude that no clinical sign and symptom were 100% specific and sensitive in the diagnosis of spermatic cord torsion. In addition, we also conclude that presence of positive ipsilateral cremasteric reflex, normal testis lay, low testis location, and absence of nausea and vomiting in pediatric and young adult male patient whom present with acute scrotal pain and swelling can rule out spermatic cord torsion.

We also found that intravaginal spermatic cord torsion commonly present between 10-22 years of age, in low atmospheric temperatures in winter season, and with left side predominance.

Recommendations: Further larger studies to evaluate the results in a prospective control way that including all cases of acute scrotum and to evaluate it management protocols.

In addition, the result of this study and the subsequent studies can be distributed to the continuous medical education programs to all the doctors of various positions and specialties whom may deal with acute scrotum patients.

There is a need for public enlightenment on the dangers that are associated with scrotal pain; this topic can be incorporated into the school health programs with respect to the age group that is the most vulnerable one. This may have the potential for reducing the response time to the acute scrotal pain.

The use of the standardized questionnaire in hospital emergency department facilitated examination technique and may focused the examiners attention on important aspects of history and physical examination in cases of acute scrotal pain. Toward this goal, it is an obligation to teach the junior doctors the art of clinical examination and provide them with the tools to appropriately evaluate the patients.

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