

Research Article

Validation of TWIST (Testicular Workup for Ischemia and Suspected Torsion) Score System for Differential Diagnosis in Acute Scrotum in Tertiary Teaching Hospital

Validitas Sistem Skor TWIST (Testicular Workup for Ischemia and Suspected Torsion) dalam Mendiagnosis Banding Pasien Akut Skrotum di Rumah Sakit Rujukan Tersier

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ABSTRACT

The acute scrotum is a common urological emergency and has a broad differential diagnosis. There is no clear consensus on a particular algorithm to follow in the diagnosis of testicular torsion. Testicular Workup for Ischemia and Suspected Torsion (TWIST) Score, a risk scoring system based on signs and symptoms, can be invaluable in managing patients with the acute scrotum, specifically testicular torsion. This study aimed to evaluate the effectiveness of the TWIST scoring system for differential diagnosis of acute scrotal patients. The study was conducted using secondary data, medical records from 111 male patients diagnosed with acute scrotum in Saiful Anwar General Hospital Malang between January 2015 and December 2018. Data about the onset of pain, first contact, history, physical examination findings, any adjunct test performed, and intra-operative findings were collected. The effectiveness of the TWIST score in diagnosing testicular torsion was determined by calculating the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV). Of the 111 patients, 43 patients (38.7%) had testicular torsion. The mean age was 17.49 (6.69) years. A total of 39 patients were classified as high risk as per the TWIST Score with cut point 5 had 83.7% sensitivity, 95.6% specificity, 92.3% positive predictive value (PPV), and 90.3% negative predictive value (NPV). The area under the curve was 0.93. The use of the TWIST Score in clinical practice can accurately determine high-risk patients who can proceed straight to the operating theatre without the need for an ultrasound.

Keywords: Acute scrotum, diagnostic, testicular torsion, TWIST score

ABSTRAK

Akut skrotum merupakan suatu keadaan darurat urologis dan memiliki diagnosis banding yang luas. Tidak ada konsensus yang jelas tentang algoritma tertentu yang harus diikuti dalam diagnosis akut skrotum terutama torsio testis. Penggunaan skor *Testicular Workup for Ischemia and Suspected Torsion* (TWIST), yang merupakan sistem penilaian risiko berdasarkan tanda dan gejala, dapat sangat berguna dalam manajemen waktu pada pasien akut skrotum terutama torsio testis. Studi ini dilakukan untuk mengevaluasi akurasi skor TWIST dalam mendiagnosis akut skrotum. Penelitian dilakukan menggunakan data sekunder rekam medis dari 111 pasien pria yang menderita akut skrotum di rumah sakit yang datang di Rumah Sakit Umum Saiful Anwar Malang dari Januari 2015 hingga Oktober 2018. Data yang dikumpulkan berupa waktu timbulnya nyeri, kontak pertama, riwayat, dan temuan pemeriksaan fisik, tes tambahan yang dilakukan dan temuan intra-operatif. Keefektifan skor TWIST dalam mendiagnosis torsio testis ditentukan dengan menghitung sensitivitas, spesifisitas, nilai prediktif positif (PPV) dan nilai prediktif negatif (NPV). Dari 111 pasien, 43 pasien (38.7%) memiliki torsi testis. Usia rata-rata adalah 17.49 (6.69) tahun. Sebanyak 39 pasien diklasifikasikan sebagai risiko tinggi dengan nilai cut point 5 memiliki sensitivitas 83.7% spesifisitas 95.6%, nilai prediktif positif (PPV) 92.3% dan nilai prediktif negatif (NPV) 90.3%. Kurva Receiver Operating Characteristic (ROC) didapatkan nilai 0.93. Tingkat penyelamatan testis sangatlah rendah yaitu 18%. Penggunaan Skor TWIST dalam praktik dapat menentukan pasien berisiko tinggi yang dapat langsung menuju ruang operasi tanpa perlu dilakukan USG.

Kata Kunci: Akurasi diagnosis, akut skrotum, torsio testis, skor TWIST

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INTRODUCTION

Males with testicular torsion most commonly present with acute scrotal/testicular pain and swelling (the acute scrotum), which can also be the presenting symptoms for epididymitis orchitis, torsion of the appendix testis, and scrotal trauma (1–4). Testicular torsion is caused by the twisting of the spermatic cord along with the vasculature of the testicle and requires prompt surgical intervention to prevent testicular loss from ischemia. Testicular torsion requires timely and accurate diagnosis and surgical exploration is recommended in patients with high clinical suspicion. Acute testicular pain is the most common presenting symptom; on physical examination, findings would include swelling, absent cremasteric reflex, and horizontal line (1).

In the diagnosis of testicular torsion, there is no clear consensus on a particular algorithm to be followed. Traditionally, clinical examination followed by surgical exploration was the usual practice but this resulted in unnecessary surgery and hence increased costs and morbidity (5). Thus many investigative methods have been introduced to assist in forming a diagnosis however, there is no gold standard investigation with 100% sensitivity, specificity, and accuracy.

However, the clinical overlap between testicular torsion and other common etiology being epididymal-orchitis has to be diagnosed, for which color Doppler is considered investigation of choice. Intervention before 6 hours is critical to prevent permanent testicular loss or atrophy from compromised testicular arterial flow (2). Thereafter, the testicle is often unsalvageable, resulting in orchiectomy rates of 35%–40% (3). A diagnostic tool to help physicians in the clinical evaluation of acute scrotum could potentially decrease ischemic time in testicular torsion and reduce the cost of treatment

Barbosa et al. created Testicular Workup for Ischemia and Suspected Torsion (TWIST) score based on clinical parameters, however, it has never been validated in the Indonesian population either by urologists or non-clinic emergency service providers with satisfactory results (6). This tool can assist general physicians and urologic surgeons in managing the acute scrotum and thus reduce ischaemic times in testicular torsion, reduce costs of treatment and increase salvage rates (5). Therefore, this study aimed to validate the TWIST scoring system for differentiating testicular torsion and nontesticular torsion of acute scrotal patients in our hospital.

METHODS

This study was a cross-sectional study with a population of all male patients suffering from acute scrotum at Saiful Anwar General Hospital Malang between January 2015 and December 2018. The acute scrotum is an onset of pain and swelling in the scrotum and its contents that are sudden and accompanied by local and systemic symptoms. Patients were excluded from the study if they had a history of testicular torsion or acute scrotal symptoms of more than one week or scrotal pain due to trauma.

Testicular torsion can be diagnosed by history taking and physical examination such as nausea or vomiting, absent cremasteric reflex, abnormal testicular lie, testicular swelling, and/or hard testicle, from imaging studies we

can use high-resolution scrotal duplex ultrasonography, and has become the standard imaging technique. However, the diagnosis can be confirmed by testicular exploration. The TWIST score consists of five physical examination items to help diagnose testicular torsion (6). The Chi-square analyses were used to assess differences in prevalence between TWIST score groups. We perform sensitivity, specificity, predictive value tests, and SROC analysis. Data were managed using MS Excel and analyzed using SPSS version 20.0

RESULTS

As many as 111 acute scrotal patients during a period of three years (January 2015 to December 2018) who met the criteria were selected as study subjects. The results show that 43 patients (38.7%) were diagnosed with torsion testis, with the highest degree of torsion being 360° to medial (10 patients). The mean age of patients was 17.49 (6.69) years or early adolescence in the torsion testis group, while the mean age of the non-torsion group was 25.16 (12.73) years, which is in the adult group (>21 years). The pain was felt most on the left side in both groups, 31 patients in the torsion group and 42 patients in the non-torsion group. The average complaint was felt at 19.35 (17.29) hours in the torsion group and 33.87 (30.62) hours in the non-torsion group.

In all subjects, regardless of torsion status, the most frequent complaints were found in the group >24 hours (44.2%) and <3 days (38.2%). A history of fever complaints was primarily found in the non-torsion group, 31 patients (45.6%). Saiful Anwar General Hospital became a tertiary referral facility and was the first point of contact for 62 patients (55.9%), while 49 patients (44.7%) came to other health care facilities before coming to Saiful Anwar General Hospital. History of physical activity was only obtained in 14 patients (12.6%) of the total patients studied.

Table 1. Basic characteristics of acute scrotum patients

Category	Torsion	No Torsion	Total
Age			
Early Childhood (2-5 yo)	0 (0.0%)	3 (4.4%)	3 (3.1%)
Middle Childhood (6-11 yo)	3 (7.0%)	8 (11.8%)	11 (9.9%)
Early Adolescence (12-18 yo)	27 (62.8%)	11 (16.2%)	38 (34.2%)
Late Adolescence (19-21 yo)	7 (16.3%)	7 (10.3%)	14 (12.6%)
Adult (>21 yo)	6 (14.0%)	39 (57.4%)	45 (40.5%)
Age, mean (SD)	17.49 (6.69)	25.16 (12.73)	22.19 (11.39)
Pain location			
Right	12 (27.9%)	26 (38.2%)	38 (34.2%)
Left	31 (72.1%)	42 (61.8%)	73 (65.8%)
Duration of pain			
< 6 hours	8 (18.6%)	7 (10.3%)	15 (13.5%)
6-12 hours	11 (25.6%)	21 (30.9%)	32 (28.8%)
12-24 hours	5 (11.6%)	0 (0.0%)	5 (4.5%)
> 24 hours and < 3 days	19 (44.2%)	23 (33.8%)	45 (40.5%)
> 3 days	0 (0.0%)	17 (25.0%)	14 (12.6%)
Prehn test			
Persistent	36 (83.7%)	12 (17.6%)	48 (43.2%)
Decreasing	7 (16.3%)	56 (82.4%)	63 (56.8%)
History of fever	3 (7.0%)	31 (45.6%)	34 (30.6%)
First contact			
Saiful Anwar Hospital	23 (53.5%)	39 (57.4%)	62 (55.9%)
Other (Referral)	20 (46.5%)	29 (42.6%)	49 (44.7%)
Total	43 (100%)	68 (100%)	111 (100%)

Of the 111 patients evaluated, 39 were categorized as high risk according to the TWIST Score, 36 patients of which had torsion testis, and the remaining 3 patients had other diagnoses, such as epididymorchitis, which was confirmed during the surgery. From a total of 24 patients categorized in the moderate group, 7 patients in this group had torsion testis. A number of 48 patients categorized as a low group were without torsion testis after the ultrasound examination (Table 2). Of the 24 patients in the moderate group, 10 patients underwent surgery, 7 patients had testicular torsion, and 3 patients had an intraoperative diagnosis of epididymo-orchitis. The remaining 14 patients were treated for epididymo-orchitis.

Table 2. TWIST score based acute scrotum etiology

Category TWIST score	Torsion (N: 43)	No Torsion (N: 68)	Total (N: 111)
Low (0-2 Point)	0	48	48
Moderate (3-4 Point)	7	17	24
High (5-7 Point)	36	3	39

We perform SROC (Summary Receiver Operating Characteristic Curve) analysis. Result show 93% in AUC with sensitivity of 83.7% and a specificity of 95.6% using TWIST Score with high cut off point (6-8). The TWIST score with cut point 5 has a sensitivity of 83.7% with a specificity of 95.6%, a positive predictive value (PPV) of 92.3%, and a negative predictive value (NPV) of 90.3%.

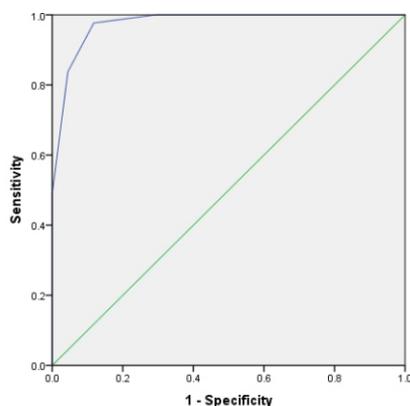


Figure 1. ROC curves for TWIST score

Note: AUC=0.93

For cut point 7, a sensitivity value of 9.3% was obtained, a specificity of 100%, and a PPV value of 100% (Table 3).

Table 3. Performance of TWIST score to predict testicular torsion

TWIST Cut Point	Sensitivity	Specificity	PPV	NPV	P Value
5	83.70%	95.60%	92.30%	90.30%	<0.001
6	48.80%	100%	100%	75.60%	<0.001
7	9.30%	100%	100%	63.60%	0.010

Patients with testicular torsion have higher mean TWIST scores than the no torsion group. There is a higher possibility for all components of each TWIST score with a diagnosis of testicular torsion. The purpose of this table is to compare the significance of the TWIST score component in torsion and nontorsion. The components of edema, hard consistency, the absence of cremaster reflexes, and horizontal testicular position show a significant relationship to the occurrence of testicular torsion. In contrast, the history of nausea and vomiting is not significant (Table 4).

Table 4. TWIST score of components in torsion and non torsion

TWIST Score Components	Torsion	No Torsion	P Value
Scrotal swelling	37 (86.0%)	39 (57.4%)	0.002
Hard testicular	34 (79.1%)	8 (11.8%)	<0.001
Absent cremasteric reflex	40 (93.0%)	20 (29.4%)	<0.001
History of nausea	11 (25.6%)	14 (20.6%)	0.540
High-riding testicle	35 (81.4%)	4 (5.9%)	<0.001

DISCUSSION

In this study, the TWIST score was a potential diagnostic tool in diagnosing torsion testis, which is equal to other studies. Overall, the TWIST score performed well for diagnosing late torsion testis with an AUC of 0.96 that is similar to the study by Kunj et al., obtaining an AUC of 0.95 (10). According to the research of Frohlich et al., there is a high dependence on ultrasound to make a diagnosis of testicular torsion; about 86.7% of patients receiving doppler testis ultrasound, 56.7% of the patients received an ultrasound to confirm the diagnosis, while 30% of the patients were just for investigative purposes (9). Different from this study, the USG examination, which is around 64.9%, is now switched to using the TWIST score to diagnose torsion testis. The acute scrotum is one of the urological emergencies where torsion of the testis is a common cause (1). Early recognition of symptoms and management is significant for testicular torsion management. Therefore, using TWIST scores is important to reduce definitive management time and reduce the waste of resources for both patients and health care providers (5,6,9,10).

Incorrect use of history taking and physical examination to diagnose torsion testis can prolong the delay and cost, and depend on imaging requirements (11-13). According to Moosaje et al., of the 60 patients studied, 43 patients with torsion testis were found at a cut point value of 5 with a sensitivity value of 97.7% and a PPV of 95.6% (5). In this study, the TWIST score with a cut point of 5 had a sensitivity of 83.7%, a specificity of 95.6%, a positive predictive value (PPV) of 92.3%, and a negative predictive value (NPV) of 90.3%. However, it should be noted that this figure is low for making definitive conclusions on the NPV. In this present study, a high-risk group with a cut-off of 7 would result in PPV of 100% with a specificity of 100%, similar to a study by Frohlich et al., that a TWIST score with cut point 7 obtained 100% specificity and 100% PPV (9).

The TWIST score aims to categorize acute scrotum patients who need ultrasounds (12-14). All low-risk and high-risk patients, a total of 80%, can avoid using ultrasonography (14). In a study conducted by Barbosa et al., about 80% of

patients underwent improper ultrasound examinations (6). Testicular torsion level in patients with acute scrotal in Saiful Anwar General Hospital was found 63%, with a very low rescue rate (18%). In comparison, Magoha et al. found a rate of 86.36% with a rescue rate of 21% (11). It must be noted that the time to come to our facilities and the average complaint time (19 hours) found in this study is relatively high, and this may also contribute to the poor level of testicular salvage.

The main limitation in this study is the use of single center study in our hospital, however it could be a first step to assess the bigger potential of this score to distinguish torsio and non-torsio. This selective population may bias the NPV value and high sensitivity. This condition may be because many low-risk patients may go to peripheral facilities and not be referred to Saiful Anwar General Hospital. Another limitation in this study is that many patients come to clinics or primary health centers far from Saiful Anwar General Hospital, so little can be done to save the testes.

This study has shown that the TWIST score is a very useful tool in diagnosing testicular torsion. TWIST scores with a

cut point of 5 or high-risk TWIST scores can identify testicular torsion with high sensitivity of 83.7% and PPV of 92.3%. Based on these results, the TWIST score can be used as part of decision making in an acute scrotum evaluation, especially for patients with a TWIST score higher than five (high risk) who can proceed straight to the operating theatre and no need for another imaging. Moreover, the TWIST score can be used easily by general physician even in the primary care setting that has no ultrasound modality.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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