

ACCURACY OF TOURNIQUET TEST FOR THE DIAGNOSIS OF DENGUE INFECTION

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ABSTRACT

Objective: This study was carried out to determine the accuracy of tourniquet test for diagnosis of dengue infection in patients with clinically suspected dengue fever, keeping dengue IgM/IgG as gold standard.

Study Design: Cross sectional validation study.

Place and Duration of Study: The study was carried out at Military Hospital Rawalpindi and Combined Military Hospital Malir Cantt Karachi from Jun 2011 to Dec 2013.

Material and Methods: One hundred and sixty cases of undetermined fever of two to seven days duration were enrolled by non-probability convenience sampling to determine the accuracy of tourniquet test. Previously diagnosed patients of chronic liver disease, chronic renal failure and those on anticoagulant /anti-platelet therapy were excluded. The dengue tourniquet test was performed according to the standardized method within 24 hours of admission, and the results of tourniquet test were compared with dengue IgM/IgG as gold standard.

Results: Diagnostic accuracy of tourniquet test for diagnosis of dengue infection in patients with clinically suspected dengue fever, keeping dengue IgM/IgG as gold standard showed 26.88%(95% CI = 20.01- 33.75%) were true positive, 7.5%(95% CI=3.42–11.58%) were false positive, 46.25% (95% CI=38.52–53.98%) were true negative and 19.38% (95% CI =13.26–25.5%) were false negative, whereas sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy was calculated as 58.11%, 86.05%, 78.18%, 70.48%, and 73.12% respectively.

Conclusion: In view of the results of the current study demonstrating high specificity and diagnostic accuracy, the tourniquet test may be used routinely in clinical practice. Comparatively lower sensitivity may be related to time of presentation, which needs to be further evaluated.

Keywords: Dengue, Diagnosis, Tourniquet.

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INTRODUCTION

Dengue infection is an increasing public health problem in tropical and subtropical countries with approximately 50 million symptomatic cases yearly¹. The disease is endemic in more than 100 countries in Africa, America, the Eastern Mediterranean, South East Asian and the Western Pacific regions. During the last five years dengue infection has become a public health concern in Pakistan². In 2013 alone, 31,840 suspected cases were reported of which 20,710 cases were confirmed through serology and resulted in 86 deaths^{3,4}.

Dengue infection has a wide clinical spectrum that includes both severe and non-severe clinical manifestations. Dengue infection is classified as dengue, dengue with warning signs and severe dengue. Dengue Fever (DF) is characterized by sudden onset high grade fever with myalgias and arthralgias. Most cases resolve without specific treatment, however complications include dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS)^{5,6}. DHF is caused by increased vascular permeability and may progress to hypovolemic shock and potentially lethal DSS.

Dengue infection is generally confirmed by serological ELISA tests, which detect specific IgM or IgG antibodies. However these methods are expensive and not routinely available in most

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areas of the country. Hence the diagnosis is generally based on clinical symptoms and signs. The tourniquet test (TT) which reflects capillary fragility and thrombocytopenia was recommended by WHO in 1997 for diagnosis of DHF and DSS, but not for DF. However in the

standard 2.5 cm² square cardboard window, made specifically for the study, was placed on the anterior aspect of forearm distal to the elbow crease and a line was drawn on the skin at the edges of the window using a black ink marker. The mercury sphygmomanometer cuff was

Table: Comparison of tourniquet test results with dengue IgM/IgG (n=160).

Tourniquet test	Dengue IgM/IgG (gold standard)		Total
	Positive	Negative	
Positive	True positive (a) 43 (26.88%)	False positive (b) 12 (7.5%)	a + b 55 (34.37%)
Negative	False negative (c) 31 (19.38%)	True negative (d) 74 (46.25%)	c + d 105 (65.62%)
Total	a + c 74 (46.26%)	b + d 86 (53.75%)	160 (100%)

Sensitivity = 58.11%
 Specificity = 86.05%
 Positive predictive value = 78.18%
 Negative predictive value = 70.48%
 Accuracy rate = 73.12%

revised WHO guidelines, the tourniquet test is listed as a diagnostic criterion for dengue fever, dengue with warning signs, and severe dengue¹.

The rationale of the present study was to determine the accuracy of the tourniquet test for the diagnosis of dengue fever.

MATERIAL AND METHODS

The validation study was conducted in the Department of Medicine, Military Hospital Rawalpindi from Jun 2011 to Sep 2012 and Combined Military Hospital, Malir Cantt, Karachi from Oct 2012 to Dec 2013.

A total of 160 adult patients (aged >15 years) admitted with undifferentiated fever of two to seven days, with a clinical diagnosis of dengue infection were enrolled in the study by non probability convenience sampling. Previously diagnosed patients of chronic liver disease, chronic renal failure and those on anticoagulant/antiplatelet therapy were excluded.

The TT was then performed according to the standardized method within 24 hrs of admission with the patient lying in supine position⁷. A

inflated, to the mean of systolic and diastolic pressures for a timed 5 minutes. After 5 minutes,

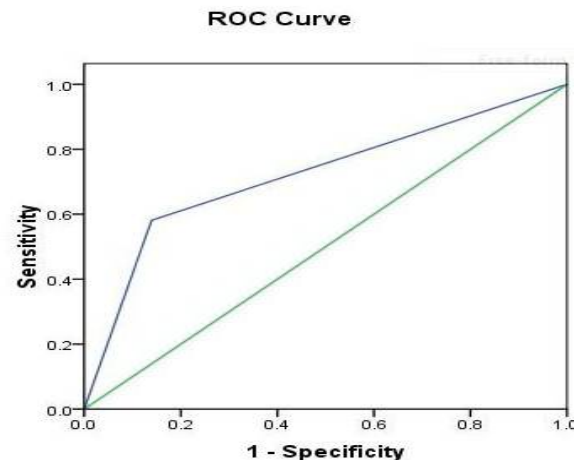


Figure-1: ROC Curve was plotted and area under the curve was calculated to be 0.721 (95% CI=0.639 – 0.802).

the cuff was deflated and the total number of petechiae visible inside the square were counted. The tourniquet test was considered positive when 20 or more petechiae were observed in the 2.5 cm square.

The data were analysed with SPSS version 17. Diagnostic measures were calculated for TT using dengue IgM/IgG as gold standard with 2x2 table. ROC curve was plotted to calculate area under curve.

RESULTS

A total of 160 cases were enrolled to determine the diagnostic accuracy of tourniquet test for diagnosis of dengue infection. Out of 160 cases one hundred and eleven (69.37%) were between 15-40 years and 30.63% (n=49) were between 41-60 years. 71.88% (n=115) were male and 28.12% (n=45) were females. 46.25% (n=74) tested positive for dengue IgM/IgG while 53.75% (n=86) were negative for dengue IgM/IgG.

DISCUSSION

Dengue is an arboviral infection elicited by the dengue virus (DENV) and is present throughout most tropical and subtropical regions. Approximately 2.5 billion people live in endemic areas, and approximately 50 million dengue cases are reported annually. Classifying the different outcomes of DENV infection is complicated, and different systems have been proposed, such as those from the World Health Organization (WHO).

Despite the large number of available tests for diagnosing dengue, many endemic areas cannot afford them, resulting in the need for the development of easy and inexpensive methods to guide clinical diagnosis of dengue. Such is the case of the tourniquet test (TT), indicated by the WHO in 2011 as one of the diagnostic criteria for dengue, in spite of the different clinical outcomes⁸.

This study will sensitize the treating physicians regarding the routine use of tourniquet test in clinical assessment of patients with suspected dengue infection. Our findings are in agreement with a study showing a high specificity (84-91%)⁹ but they recorded only 34% sensitivity which is lower than our findings i.e. 58.11%.

A previous Malaysian study regarding accuracy of repeated tourniquet testing in children with suspected dengue infection reported very different results: a low (23.5%) specificity and a high (83%) sensitivity¹⁰. However, the author himself raised the possibility that such low specificity could be due to weakening of capillary strength, which results from repeatedly testing the same subject with the TT.

Upon analysis of this data, we can recommend that the TT can and should be used as a quick test to screen for diagnosis of dengue infection however the relationship between TT positivity and probability of severe dengue needs to be further evaluated. It is of critical importance to understand that, although the TT is an important tool for aiding in the clinical diagnosis of dengue infection and may also highlight cases that most likely could develop into more severe clinical outcomes, the TT cannot and should not be used alone in diagnosing and classifying dengue infection. It is also important that a positive TT should lead to a more careful look at the patient.

CONCLUSION

Since the current study demonstrated higher specificity and diagnostic accuracy of tourniquet test in local population, this bedside test may be used routinely in clinical practice. However comparatively lower sensitivity may be related to time of presentation, which needs to be further evaluated.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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