

Ultrasonographic Findings in Dengue Fever : A Retrospective study

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ABSTRACT

Background: Dengue fever is endemic in many countries of Asian, Pacific, American, African and Caribbean region. This study examines the role of ultrasonography in diagnosis and management of dengue fever.

Methods: This study includes 66 patients with serologically confirmed dengue fever. Ultrasonography was done in all the patients and was correlated with the duration of fever and the platelet count at presentation. ed by surgery and adjuvant radiotherapy with or without chemotherapy and hormonal replacement.

Results: Of the 66 patients 28 patients presented within 3 days of fever and all of them had gall bladder wall thickening and pericholecystic fluid (100%). Other findings were hepatomegaly (21%), pleural effusion (11 %) and ascites (14%). 38 patients presented between 4th and 7th day of fever, Gall bladder pathology was noted in all patients, rest other findings were same but the frequency increased with the duration of fever. As the platelet count decreased the severity of capillary leak increased and patients presented more often with pleural effusion and ascites.

Conclusion: Ultrasonographic findings seen in Dengue fever are non-specific. But when correlated with clinical and laboratory findings, ultrasonography was useful in assessing disease severity. The degree of capillary leak and hence the frequency of third space fluid accumulation was directly proportional to the duration of fever and inversely proportional to platelet count.

Key words: Gall bladder wall edema, dengue fever, ultrasonography

Abbreviations: **DHF** – Dengue hemorrhagic fever; **NS-1** - Non-structural protein-1; **USG** - Ultrasonography;
WHO – World Health Organization

Introduction

Dengue viral illness is caused by one of the four closely related serotypes of dengue virus viz. serotype 1, 2, 3 and 4. Infection of one serotype does not confer immunity against the other serotypes, and subsequent infection with other serotypes leads to severe disease. Dengue fever has been classified on the basis of clinical features as, dengue fever, dengue fever with warning signs and severe dengue; the last mentioned also encompasses dengue shock syndrome. [1]

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Today about 40% of the world's population, live in areas where there is a risk of dengue transmission and there are about 50-100 million cases per year leading to major cause of morbidity and mortality as per the WHO estimates.[2] Dengue is endemic in at least 100 countries in Asia, the Pacific, the Americas, Africa, and the Caribbean. An estimated 500,000 people with severe dengue require hospitalization each year and about 2.5% of those affected die.[2] In the last few years, dengue has re-emerged in the United States of America and Europe.[3] In India, dengue is widespread and endemic in most major cities.[4]

Presently, about 40% of the world's population is at risk and there are 50–100 million cases every year. Recent data from National vector-borne disease control programme (NVBDCP) [4] and publications of National Institute of Virology (NIV) [5] shows that dengue is

endemic in 16 states viz: Andhra Pradesh, Goa, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal, Chandigarh, Delhi and Puduchery. [6] Until 2003, the predominant serotype found in Delhi region was serotype-2 (genotype IV) but in 2003, all four dengue virus subtypes were found to co-circulate in Delhi, for the first time, thus changing it to a hyperendemic state.

Ultrasonographic findings appear to help in the diagnosis of dengue fever especially when correlated with clinical and laboratory findings. The present study was done to characterize ultrasonographic findings in dengue fever and their correlation, if any, with the duration of fever.

Material and methods

In this retrospective hospital-based study, 66 patients who presented between July 2015 and October 2015 with dengue fever were included. The inclusion criterion of the subject was serological confirmation of dengue fever. The serological tests for dengue included NS-1 antigen test and dengue immunoglobulin M / immunoglobulin G tests. NS-1 undergoes least antigenic variation and is a glycoprotein present in high concentration in the serum of dengue infected patients. Blood counts were done in all the patients.

Ultrasound scanning of the abdomen and thorax was done in all the patients using Philips HD machine and 3.5 MHz and 5 MHz probes. Gallbladder wall thickening was measured by placing the calipers between the two layers of its anterior wall. Thoracic scanning was done in either sitting or supine posture. Both the pleural spaces were evaluated through an intercostal approach. Hepatomegaly was defined as liver span more than 15 cm and spleen measuring more than 12 cm in its longest dimension was defined as splenomegaly. For each patient, scanning was performed only once by a sonologist. The ultrasound findings were correlated with the duration of fever and the platelet count at presentation to the hospital.

Results

The mean age of the study population was 38 ± 10.3 years. The male-to-female ratio was 3:1. Among them 28 patients (early group) presented within 3 days of fever while 38 patients (delayed group) presented between 4 to 7 days of fever. Chief presenting symptom was fever (100%) followed by abdominal pain (91%) and vomiting (61%).

USG findings of the 2 groups are summarized in table-1. (Fig.1,2) When the subjects were compared with respect to platelet count on presentation, it was seen that as the platelet count decreased the severity of capillary leak increased and patients more often presented with pleural

effusion and ascites. (Table 2). Our study demonstrated that thickening of the gall bladder wall and pericholecystic fluid were the most common initial finding in all the 66 serologically positive cases (100%) followed by ascites (53%), pleural effusion, hepatomegaly and splenomegaly in that order.

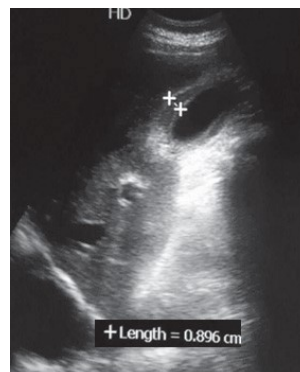


Fig.1: USG showing edema of gall bladder wall edema and pericholecystic fluid

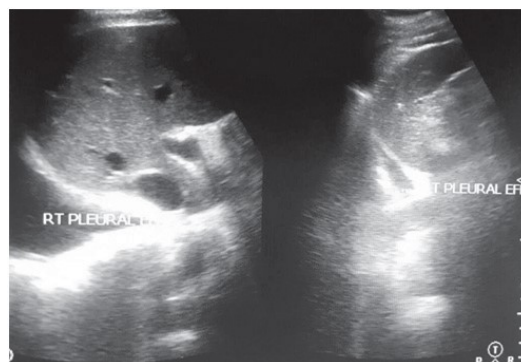


Fig.2: USG showing pleural effusion

Discussion

Dengue fever is one of the most important emerging diseases of tropical and sub-tropical areas. The WHO has estimated that 50 to 100 million infections occur yearly, including 500,000 cases of DHF and 22,000 deaths, mostly in children. [7]. During the 1998 pandemic, 1.2 million cases of dengue fever and DHF were reported from 56 countries. In recent years, rapid urbanization, life-style changes and poor water management have increased the risk of dengue fever in India. There is a lack of awareness among the general public about the breeding of mosquitoes and protection from their bites.[8] During 2011-12, dengue was endemic in 23 Indian states.[9] In 2009, about 15,509 cases and 89 deaths were reported. In 2010, 28,292 cases and 110 deaths were reported. In 2011, 17,273 cases and 112 deaths were reported. [10]. Most of the dengue patients are seen in post-monsoon period between August and November, when the breeding of the vector, *Aedes* mosquito is abundant.[11]

Table 1: Sonographic findings of Dengue fever in early and late of presentation

Sonographic findings	0-3 days of fever (n=28)	4-7 days of fever (n=38)
GB Abnormality*	28 (100%)	38 (100%)
Hepatomegaly	6 (21.4%)	9 (23.7%)
Ascites	4 (14.3%)	26 (68.4%)
Pleural effusion	3 (10.7%)	13 (34.2%)
Splenomegaly	0 (0%)	2 (5.2%)

*Gall bladder abnormality includes Gall bladder wall thickness and peri-cholecystic fluid

Table 2: Sonographic findings in relation to platelet count

Sonographic findings	Platelet count per mm ³			
	150,000 to 100,000 (n=11)	100,000 to 50,000 (n=34)	20,000 to 50,000 (n=16)	<20,000 (n=5)
GB Abnormality*	11 (100%)	34 (100%)	16 (100%)	5 (100%)
Hepatomegaly	2 (18%)	6 (18%)	4 (25%)	3 (60%)
Ascites	0 (0%)	9 (26%)	16 (100%)	5 (100%)
Pleural effusion	0 (0%)	2 (6%)	9 (56%)	5 (100%)
Splenomegaly	0 (0%)	1 (3%)	1(6%)	0 (0%)

*Gall bladder abnormality includes Gall bladder wall thickness and peri-cholecystic fluid

In resonance with other studies [12,13] the most frequent USG finding noted in the present study was edema of gall bladder wall and peri-cholecystic fluid collection. However, Joshi et al, have reported right-sided pleural effusion as the commonest feature. During this study we noted that honeycomb pattern of the gall bladder due to wall edema is a useful sign for detecting DHF.[14]

Ascites is the second most common finding as it was too in the study of Joshi et al [15]; but other have reported frequency of ascites to be as high as 65%. [13]

The predominant finding in the initial few days of illness (first 3 days) is gall bladder wall edema. This is endorsed by another study done in south India.[12] As the illness progresses, later in the course of disease, the other findings such as ascites and pleural effusion which are suggestive of capillary leak become evident. Such findings are seen in majority of patients between 4- 7 days of illness. [12]

Decrease in the platelet count is a major manifestation of dengue fever. USG findings appear to correlate well with platelet counts. With a drop in platelet count, signs of capillary leak such as ascites and pleural effusion become more frequent. They are present in majority of patients

when platelet counts fall below 20,000/mm³. Santosh et al have also reported a similar correlation. [13] Splenomegaly was not a significant finding in our study; but other studies have shown splenomegaly as a major finding. [13]

Ultrasound findings reported in early and milder form of dengue fever includes thickening of gall bladder wall, ascites, hepato-splenomegaly and pleural effusion. Collection of fluid in the peri- and para- renal regions, hepatic and splenic subcapsular regions, pericardial effusion, pancreatic enlargement and hepato-splenomegaly are usually seen in severe disease. Altered echo texture of the liver has also been reported due to intra-parenchymal and subcapsular hemorrhages;[12,15] but we did not find any of them. Gall bladder wall thickening is a highly non-specific finding and hence is of limited diagnostic value when considered in isolation. However, when this finding is interpreted in combination with other imaging features such ascites, pleural effusion, and Hepatomegaly the diagnostic accuracy of USG is increased. Although serological tests are confirmatory in the diagnosis of dengue fever, ultrasound can be of value in the assessment of severity.

Conflicts of Interest : Nil

Ethics : Since it was a retrospective review of hospital records ethical issues do not arise

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