

SPECTRUM OF RADIOLOGICAL MANIFESTATIONS IN SEVERE SCRUB TYPHUS DISEASE



Radiodiagnosis

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ABSTRACT

PURPOSE-Himachal Pradesh, the sub Himalayan state is an endemic state for scrub typhus. Scrub typhus has a wide spectrum of presentation with propensity to involve any system/ organ. Scrub typhus clinically has been categorised into two classes i.e. mild and severe. We did a prospective study on severe scrub typhus cases.

MATERIAL & METHOD-50 patients with positive serology underwent chest radiograph and USG abdomen pelvis. Then CT thorax was done in patients having positive findings on chest radiograph in the form of pleural effusion, airspace consolidation, reticulonodular opacities etc. MRI brain was done in patients presented with altered sensorium, headache or loss of consciousness.

RESULTS-Out of 50 patients splenomegaly was detected in 24 patients, hepatomegaly in 22, gall bladder wall thickening in 21, pleural effusion in 21, ascites in 16 patients. On CT thorax ground glass opacity in 10 patients, consolidation in 08, centrilobular nodules in 06, septal thickening in 03 patients. On MRI brain leptomeningeal enhancement with cerebral venous thrombosis seen in one patient only, out of 5 patients who underwent MRI brain.

CONCLUSION - Hepatosplenomegaly(23), GB thickening(22) & ascites(12) were main findings in abdomen. Pleural effusion (21), ground glass opacity (10), consolidation(8) & septal thickening(3) were the main findings in chest. Thus, radiology aides in eliciting the spectrum of pathological findings involving multiple systems in serological positive cases. USG & chest radiograph followed by CT thorax are mainstay of radiological procedure in scrub typhus disease.

KEYWORDS

Tsutsugamushi, Gall bladder thickening, Ground glass opacity

INTRODUCTION

Scrub typhus, also known as tsutsugamushi disease, is an acute febrile illness caused by infection with *Orientia tsutsugamushi* reported in all the geographical regions of Southeast Pacific.

The causative agent affects the endothelial lining resulting in perivascular cellular infiltrates leading to vasculitis. The disease has a wide spectrum and can involve the lungs, heart, liver, spleen, and central nervous system. In some cases it can result in severe complications.

In an endemic area for scrub typhus, patient presented with acute febrile illness awareness of the imaging findings of scrub typhus can facilitate to reach early and accurate diagnosis.

SUBJECT AND METHODS

A prospective cross sectional study was conducted over a period of one year involving 50 patients who were positive for IgM antibodies for scrub typhus and followed the criteria for severe scrub typhus disease. Detailed history for clinical complaints was taken.

Chest Radiograph and Ultrasonography of abdomen were done in all cases.

INCLUSION CRITERIA

1. A patient with clinical features like fever, rash and eschar consistent with scrub typhus.
2. A positive case of IgM antibodies by ELISA for scrub typhus.
3. The patient fulfilling the criteria of severe scrub typhus diseases.

Operational Definitions

Severe Disease

A case of scrub typhus with severe sepsis or septic shock or evidence of organ system failure are defined as severe disease and a case of scrub typhus leading to mortality are defined as a poor outcome.

Sepsis (or severe sepsis)

The harmful host response to infection; systemic response to proven or suspected infection plus some degree of organ hypo function i.e.

1. Cardiovascular: Arterial systolic blood pressure ≤ 90 mm Hg or mean arterial pressure ≤ 70 mm Hg that responds to administration of IV fluid.

2. Renal: Urine output < 0.5 ml/kg per hour for 1 h despite adequate fluid resuscitation.
3. Respiratory: $Pao_2/FiO_2 \leq 250$ or, if lung is the only dysfunctional organ, ≤ 200 .
4. Hematologic: Platelet count $< 80,000/\mu l$ or 50% decrease in platelet count from highest value recorded over previous 3 days.

Neurologic: - Glasgow Coma Score < 6 (in absence of sedation) (Glasgow Coma Score: Sum of best eye opening, verbal, and motor response)

Cardiovascular:

Heart rate < 54 beats per min

Mean arterial blood pressure < 49 mm Hg (systolic blood pressure < 60 mm Hg)

Ventricular tachycardia, ventricular fibrillation, or both – Serum pH < 7.24 with a $PaCO_2$ of < 49 mm Hg

Pulmonary:

$PaCO_2 > 50$ mm Hg (acutely)

$(A-a) DO_2 > 350$ mm (Hg $(A-a) DO_2 = [713 \times FiO_2 - (PaCO_2/RQ) - PaO_2]$)

Ventilator or continuous positive airway pressure dependence on the second day of organ dysfunction

Hepatic:

Jaundice (bilirubin > 6 mg/100 dL)

Coagulopathy (prothrombin time, 4 sec greater than control, in the absence of anticoagulation)

Renal:

Urine output < 479 mL/24 hr or < 159 mL/8 hr

Serum BUN > 100 mg/100 dL

Serum creatinine > 3.5 mg/100 dL

Hematologic:

White blood count $< 1,000$ cells/mm³

Platelets $< 20,000$ platelets/mm³

Hematocrit $< 20\%$.

Definitions :- On USG abdomen

Hepatomegaly – A craniocaudal dimensions more than 15 cm in mid clavicular line.

Splenomegaly- A craniocaudal dimension more than 12 cm in mid

clavicular line or anteroposterior diameter more than 8cm.

Thickened wall of Gall Bladder - If wall thickness of gall bladder is more than 3.5 mm²⁴.

ETHICS-The procedures followed were in accordance with the ethical standards and Helsinki Declaration of 1975.

STATISTICS – Descriptive statistics were used in the study.

RESULTS

A total of 50 patients were evaluated who were positive for IgM antibodies underwent for X-ray and Ultrasound abdomen examination first and then depending upon the further indication, CT thorax, CECT abdomen or MRI brain were done. Age of patients ranged from 6 to 79 years with mean age was 46.0 years. Out of 50 patients, 30 patients (60%) were males and 20 patients (40%) were females.

CHEST RADIOGRAPH FINDINGS

On Chest X-ray the most common pulmonary abnormalities were pleural effusion (n=16, 32%), consolidation (n=8, 16%), alveolar opacities (n=8, 16%), reticulonodular opacities (n=3, 6%) and hilar lymphadenopathy (n=3, 6%). Diffuse bilateral pulmonary edema suggestive of acute respiratory distress syndrome (n=3, 6%) was also seen (Table I)

Pleural effusion	16
Reticulonodular opacity	3
Alveolar / consolidation	8
ARDS	3
Lymphadenopathy	3



Fig. 1 CXR showing ill defined fluffy opacities scattered randomly in bilateral lung fields/o ARDS

USG FINDINGS

USG findings of abdominopelvic involvement were as follow splenomegaly (n=24, 48%) was the most common finding, followed by hepatomegaly (n=22, 44%), gall bladder wall thickening (> 3mm) (n=21, 42%), pleural effusion (n=21, 42%) ascites (n=16, 32%), echogenic kidneys (n=6, 12%) and lymphadenopathy (n=2, 4%). One patient had periportal cuffing (2%) and urinary bladder wall thickening (2%) (Table II).

Splenomegaly	24
Hepatomegaly	22
GB wall thickening	21
Ascites	16
Pleural effusion	21
Echogenic kidney	6
Lymphadenopathy	2

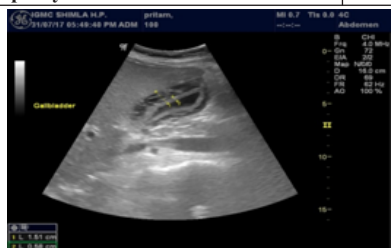


Fig. 1 USG showing Thick walled gall bladder with surrounding wall edema and hepatomegaly.

CT THORAX FINDINGS

CT thorax was done in 11 patients (22%) out of 50 patients. On CT thorax, most common radiological finding was ground glass opacity (n=10, 90%) followed by consolidation (n=8, 72.7%), pleural effusion (72%), centrilobular nodules (n=6, 54%), inter/intralobular septal thickening (n=3, 27.2%) and cardiomegaly (n=1, 9%). Three patients had features of acute respiratory distress syndrome on HRCT (27%) (Table III).

G.G.O	10
Consolidation	08
Pleural effusion	08
Inter/ intra lobular septal thickening	03
Nodules	06
ARDS	03
LAP	03
Cardiomegaly	01



Fig. 1 Axial lung window image shows ground glass opacities bilateral lung fields with patches of consolidation more so in perihilar location.

NEUROLOGICAL FINDINGS

Five patients had neurological complaints in the form of altered sensorium or headache. MRI brain was done in these 5 (10%) patients. Out of these five patients one patient (20%) had pachymeningeal enhancement along left cerebral convexity along with cerebromeningeal thrombosis of left transverse sinus and left internal jugular vein.

MRI brain was normal in remaining 4 patients.

DISCUSSION

Scrub typhus is an acute febrile illness with multi system involvement. It results in significant morbidity and mortality in Asia-Pacific region including India. It is one of the major causes of undifferentiated febrile illness in endemic areas such as Himachal Pradesh.

PULMONARY MANIFESTATIONS

In our study, more than half of the patients had normal chest radiographs (n=28, 56%) and 22 (44%) patients had abnormal findings on chest radiograph. Common pulmonary radiological findings in our study were pleural effusion, ground glass opacities, consolidation/alveolar opacities, reticulonodular opacities, inter/intralobular septal thickening and acute respiratory distress syndrome. Mediastinal lymphadenopathy was also seen in 3 patients.

In our study most common finding on Chest X-ray was pleural effusion seen in 16 patients (32%). In study conducted by Wu et al (2009), pleural effusion was also most common finding seen in 42% patients¹. However, in the study conducted by Abhilash et al. (Sample size 398) et al pleural effusion were seen only in 14.6% patients² and in study done by Song et al. (2004) on 52 patients, the most common finding on chest radiograph was pleural effusion seen in 60% of the patients³. Reticulonodular opacities were seen in 6% (n=3) patients. In a study conducted by Abhilash et al., reticulonodular opacities were seen in 10% patients², while in study done by Wu et al. reticulonodular opacities were seen in 20% patients¹. Eight patients (16%) had airspace consolidation which was comparable with study done by Choi et al. (1999) on 75 patients in which 19% of patients had airspace consolidation on chest radiographs⁴. In study done by Kashyap et al on 564 patients, 22% patients had air space consolidation⁴.

CT thorax was done in 11 patients (22%) out of 50 patients. The most common findings on HRCT were ground glass opacity (90%),

consolidation(72%), pleural effusion(72%), centrilobular nodules(54%), septal thickening(27%), mediastinal lymphadenopathy(27%) and acute respiratory distress(27%).In study conducted by Jeong et al (2007) ground glass opacity⁶ was seen in 91%, which was similar to our study, however in their study pleural effusion was seen in 55% patients, consolidation in 36% patients, centrilobular nodules in 27% patients, mediastinal lymphadenopathy in 91% patients.

In study conducted by Choi et al(1999) in which they did HRCT on 19 patients out of 75 patients⁵, Ground glass opacity was seen in 89%, centrilobular nodules and septal thickening in 47%, consolidation in 21% and nodules in 47% patients.

Acute respiratory distress syndrome on chest X ray was seen in 3 patients(6%) which was comparable to study conducted by Wu et al(2009) in which ARDS was seen in 6.3%¹.

In our study, on CT scan of thorax there was middle and lower lobe predominance.

ABDOMINOPELVIC MANIFESTATIONS

On Ultrasonography most common findings were splenomegaly (n=24, 48%,), hepatomegaly (n=22, 44), gall bladder wall thickening more than 3mm (n=21, 42%), ascites (n=16, 32%) and echogenic kidneys (n=6, 12%).In a study conducted by Jeong et al (2007), in which they did CT scan of abdomen in 19 patients with scrub typhus, splenomegaly was the most common finding seen in 79% of patients followed by gall bladder thickening (47%), lymphadenopathy (47%), periportal area of low attenuation(47%), splenic infarct(16%) and ascites(11%)⁷.

Park et al(2015) did abdominopelvic CT Scan on 94 patients out of 349 patients with scrub typhus, findings were enlarged lymph node (53%), inhomogeneous enhancement of liver(47%), splenomegaly(46%), ascites(28%), low attenuation of periportal areas(27%), gallbladder wall thickening (17%), and splenic infarct (6%)⁷.

In our study ultrasound was done on all patients. However, CECT abdomen was done only in one patient. Most of studies have been done on CT regarding abdominopelvic manifestations. Not much data is available in English language literature regarding abdominopelvic manifestations on Ultrasonography.

NEUROLOGICAL MANIFESTATIONS

Only one patient (20%) had pachymeningeal enhancement along left cerebral convexity with cerebrovenous thrombosis of left transverse sinus and internal jugular vein. There was also e/o effacement of adjacent sulci s/o cerebral edema. Four patients (80%) had normal study on MRI brain. Mahajan et al (2015) reported a case of 22 old patient presented with altered sensorium and seizure. MRI brain was done which showed pachymeningitis along with cerebellar edema⁸.

CONCLUSION

In this study of spectrum of radiological manifestations in patients suffering from severe scrub typhus disease hepatosplenomegaly, gall bladder thickening and ascites were main findings in abdomen. Pleural effusion, Ground glass opacity, consolidation and septal thickening were main findings in chest. Thus, radiology aides in eliciting the spectrum of pathological findings involving multiple systems in patients of severe scrub typhus disease. USG of abdomen and CT scan of thorax are mainstay of radiological procedure in scrub typhus disease. USG abdomen can however obviate the need of CT abdomen in most of the cases, preventing unnecessary radiation exposure. Thus, in a patient presented with fever having flaccid gall bladder thickening along with hepatomegaly and splenomegaly in an endemic area should raise high suspicion for scrub typhus.

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