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Myopericarditis associated with central European tick-borne encephalitis

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Abstract The case of an 11-year-old child with acute myopericarditis associated with central European tick-borne encephalitis is presented. Cardiac involvement was demonstrated by pericardial effusion, elevated serum concentration of troponin-I and cardiac arrhythmia. Co-infections with enteroviruses, Borrelia burgdorferi or the agent of human granulocytic ehrlichiosis were excluded. Recovery was uneventful.

Conclusion Central European tick-borne encephalitis can be complicated by cardiac involvement.

Key words Myocarditis · Pericarditis · Tick-borne encephalitis

Abbreviations HGE human granulocytic ehrlichiosis · TBE tick-borne encephalitis

Introduction

Central European tick-borne encephalitis (TBE) is caused by a neurotropic virus of the family Flaviviridae. TBE virus is transmitted to humans mainly by the hard tick Ixodes ricinus. Infections occur in wooded areas during spring and summer. Foci of TBE transmission are restricted to ecological microenvironments within geographically stable regions of central Europe. The clinical presentation of TBE in children consists of a biphasic febrile illness with non-specific manifestations during the first phase and CNS disease during the second phase [2]. Meningitis without clinical evidence of parenchymal disease is the most common form of CNS involvement [6]. Severe or persistent neurological manifestations are less frequent than in adult patients [3]. Although the pathogenesis of TBE is thought to comprise two periods of viraemia [2], extracerebral manifestations of TBE have been infrequently reported. Case reports describe the occurrence of hepatitis [7, 12], thrombocytopenia and leucopenia [12], and cardiac involvement indicated by electrocardiographic abnormalities [7, 20]. We describe a case of myopericarditis associated with TBE.

Case report

An 11-year-old, previously healthy Caucasian girl was admitted to hospital on August 19th, 1999, because of a 4-day history of fever (maximum daily temperature 40.0 °C), severe frontal headache, vertigo, confusion, photophobia, noise intolerance, and colicky abdominal pain. Three weeks earlier a similar episode of 4 days duration characterised by fatigue, fever, headache and abdominal pain had been noted. Between these two episodes she had been afebrile but complained of fatigue and malaise. In addition, history was remarkable for several recent tick bites acquired near the town of Belp, Switzerland, an area known to be endemic for TBE [14] and for frequent contacts with various domestic animals. The patient was fully immunised including two doses of a measles-mumps-rubella vaccine.

Physical examination on admission revealed a moderately ill patient in no apparent distress. Axillary temperature was 38.5 °C, heart rate was regular at 54 beats per min, blood pressure was 110/65 mmHg. There were no skin lesions. Cardiac auscultation revealed a high-pitched grade II-III systolic murmur heard best...
over the left lower sternal border. There was no friction rub. Peri-
umbilical and left lower quadrant tenderness without guarding
were noted on abdominal palpation. Signs of meningeal irritation
were not present. The peripheral white blood cell count was
14.3 × 10^3/μl with normal distribution, platelet count was
291 × 10^3/μl. Erythrocyte sedimentation rate was 73 mm/h. C-re-
active protein was 29 mg/l. Plasma alanine aminotransferase, as-
partate aminotransferase, α-amyrase and creatinine concentrations
were within normal limits. Urinary analysis was normal. Serum
troponin-I (Dade Stratus II analyser, Dade Behring, Wilmington,
Del.) was 0.7 μg/l (normal, < 0.6 μg/l). Computerised tomogra-
phy revealed no intracranial abnormalities. CSF analysis was
remarkable for a white blood cell count of 70 × 10^6/l (38 mono-
nuclear, 32 polymorphonuclear, and 0 red blood cells, respec-
tively). CSF and blood glucose were 3.25 mmol/l and 5.14 mmol/
l, respectively. CSF protein was 0.36 g/l. A CSF culture for bac-
teria remained sterile. Reverse transcriptase polymerase chain
reaction of CSF for enteroviral RNA was negative. Serum anti-
bodies directed against Borrelia burgdorferi, Mycoplasma pneu-
moniae, mumps virus, cytomegalovirus, adenovirus or the agent
of human granulocytic ehrlichiosis (HGE) were not detected. How-
ever, serum antibodies directed against TBE virus (Immunozym-
FSME EIA, Immuno GmbH, Heidelberg, Germany) were present
in high titres (IgM index 3.0, cut-off value 0.9; IgG index > 4.0,
cut-off value 0.9).

Bradyarrhythmias despite the presence of fever prompted a cardio-
logical evaluation. A chest radiograph was normal. The ECG
revealed sinus bradycardia (PR interval 140 ms) periodically al-
ternating with a junctional escape rhythm. There were no ST seg-
ment abnormalities. Echocardiography demonstrated a 6 mm
pericardial effusion (Fig. 1). Left ventricular ejection fraction was
normal (77%). The diagnosis of TBE associated with myoperi-
carditis was made. Supportive therapy using oral acetaminophen
and bed rest was instituted. The patient recovered rapidly and was
discharged after 2 days. On follow-up examination 21 days after
admission she complained of a short attention span, but was oth-
erwise asymptomatic. Physical examination was normal. Erythro-
cyte sedimentation rate was 18 mm/h, troponin-I was < 0.6 μg/l. Eletrocardiography demonstrated a resting sinus rhythm of
76 beats per min and resolution of pericardial effusion was docu-
mented echocardiographically. Follow-up serology demonstrated
persistently elevated titres for TBE and negative titres for B.
burgdorferi, M. pneumoniae, mumps virus, cytomegalovirus,
adenovirus and the agent of HGE.

**Discussion**

The simultaneous occurrence of TBE and cardiac dis-
ease in this case, without evidence of co-infection,
strongly suggests that they were causally linked. Infec-
tions caused by enteroviruses or by *B. burgdorferi* were
the main differential diagnoses because of their neuro-
troupism, occasional cardiac involvement and because of
their peak incidence during summer. Enteroviral meni-
ingitis was ruled out by a negative polymerase chain
reaction in CSF. This method is highly reliable because
both its sensitivity and negative predictive value are
greater than 95% [18]. Also, enteroviral meningitis seen
at our institution has been caused predominantly by
ECHO virus type 30 [5] which is less cardiotropic than
other enteroviruses. Nevertheless, concurrent infection
with TBE virus causing meningitis and an enterovirus
causing myopericarditis remains a possibility that would
have required myocardial biopsy for unequivocal diag-
nosis. Co-infection with TBE virus and *B. burgdorferi* was
ruled out because such dual infections have been
documented repeatedly [1, 11, 16]. Similarly, co-infect-
ion with TBE virus and the agent of HGE was excluded
because individuals seropositive for both TBE and HGE
have recently been identified in Switzerland [17]. Se-
quential or simultaneous infection with these two or-
ganisms is thus possible and HGE has been associated
with carditis in at least two patients [4, 9]. Co-infection
with *Babesia* sp. was considered because human babes-
iosis has been reported in Switzerland [13]. However,
meningitis and cardiac involvement are not features of
babesiosis and symptomatic human disease in Europe
has been restricted largely to asplenic individuals.

Cardiac disease in our patient involved both the
myocardium and pericardium. Although only mildly
elevated, the serum troponin-I concentration of 0.7 μg/l
reliably indicated myocardial damage. In a study com-
prising 48 children with congenital heart disease, the
range of serum troponin-I before elective surgery using
the same assay was 0 to 0.5 μg/l (mean 0.06 μg/l) [8].
Arrhythmia may have resulted from myocardial disease
or from a high degree of vagal tone causing a slowing of
the atrial rate below the rate of the junctional pace-
maker. Indeed, autonomic dysregulation has been
reported to complicate the Russian variant of TBE in
children [10]. The presence of an effusion documented
pericardial involvement, although clinical or electrocar-
diographic features of pericarditis were not present. The
only two previous reports on cardiac disturbances as-
associated with central European TBE described electro-
cardiographic abnormalities in adults. In a study from
1966 in which electrocardiographic findings from 53
patients with acute TBE and 53 patients with non-TBE
virus encephalitis were compared, Tesarova-Magrova
and Kroo [20] concluded that myocarditis may have
been present in five TBE cases and three non-TBE cases.
Hofbauer [7] described a 55-year-old patient with TBE,
biospy-proven hepatitis and electrocardiographic

![Fig. 1 Transverse section of the left ventricle (LV) on two-di-
imensional echocardiography with a circular pericardial effusion (PE)
measuring 6.4 mm in diameter](image-url)