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Case Report

Synchronous Cardio Cerebral Infarction following Leptospirosis: a management challenge

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Abstract

Cardio cerebral infarction (CCI), a rare condition involving the simultaneous or sequential occurrence of acute ischemic stroke and acute myocardial infarction, presents as a clinical conundrum to physicians. Though leptospirosis is an endemic disease, clear guidelines on similar atypical presentations are lacking. A 56-year-old male, managed as leptospirosis (improved with antibiotics) with uneventful recovery, had deteriorated sub acutely with slurred speech and limb weakness after discharge. Then he was diagnosed with non-ST elevation myocardial infarction with heart failure with mildly reduced ejection fraction and simultaneous right-sided parietal and left-sided frontoparietal infarctions. Despite treatment with dual antiplatelets and supportive care, he deteriorated and eventually went into cardiac arrest. CCI involves complex pathophysiology related to thrombotic events, inflammatory responses, endothelial dysfunction, plaque rupture, and cardiogenic embolism, which can exacerbate cardio-cerebral events. This case highlights the unique clinical dilemmas met during the management of CCI in the context of leptospirosis. It's better for clinicians to have heightened awareness and clinical vigilance to diagnose CCIs earlier and initiate multi-disciplinary approaches for favorable outcomes. Preventive strategies are still a matter of evolving research.

***Keywords:** cardio-cerebral infarction, leptospirosis, acute myocardial infarction, acute ischemic stroke

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Background

Cardio cerebral infarction (CCI) is the rare occurrence of acute ischemic stroke and acute myocardial infarction, either at the same time (simultaneous or synchronous) or one after the other (metachronous) [1]. We present here a case of synchronous CCI syndrome following leptospirosis in a previously healthy farmer, as a challenge since there is no consensus on management [2]. Leptospirosis is endemic in Sri Lanka, with paddy farmers commonly affected with high case fatality in complicated cases [3]. Though many leptospirosis patients have cardiovascular involvement, synchronised CCI has never been reported in the literature [4-7].

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Case Presentation

A 56-year-old previously healthy male farmer from a leptospirosis endemic region with significant occupational exposure presented with a three-day history of fever, arthralgia, and headache to a nearby base hospital. He did not report any chest pain, limb weakness, slurred speech, shortness of breath, orthopnea, or paroxysmal nocturnal dyspnea during the admission. Otherwise, the history was unremarkable.

Initial investigations (summarised in Table 1) revealed neutrophilic leucocytosis, thrombocytopenia, mild transaminitis, and elevated inflammatory markers. His electrocardiogram was normal. He was clinically diagnosed with leptospirosis in the absence of molecular diagnostic tests in a resource-poor setting with modified Faines Criteria and was started on intravenous (IV) cefotaxime. Over time, the patient gradually improved with a reduced C-reactive protein, a declining white cell count, rising platelet levels, and fever resolution.

On day six of the illness, he was switched to oral doxycycline due to local antibiotic policy and availability, and he was subsequently discharged with doxycycline for 10 days. Two days post-discharge, the patient developed sudden-onset slurred speech, left-sided upper and lower limb weakness, and a progressively reduced level of consciousness over the following two days. Upon further history taking, it was revealed that the patient had also experienced chest pain, which he had self-treated with painkillers, assuming it was related to the initial illness. However, his condition continued to deteriorate, making his family bring him to National Hospital Kandy nearly 6-12 hours after the worsening of symptoms. Upon presentation, the patient was unstable, with hypotension (84/55 mmHg) and tachycardia (104 bpm) with a regular rhythm. He had bi-basal crepitations, aphasia, mouth deviation, left-sided dense limb weakness, right-sided comparatively less weakness (power was difficult to assess), and bilateral diminished reflexes with upgoing planters. His Glasgow Coma Scale was 10/15, and the National Institutes of Health Stroke Scale scored 19. He required inotropic support for blood pressure maintenance in the initial phase. Serial ECGs [Figure 1] showed new-onset deep T-wave inversions in leads V1 to V6 with evolving changes, and his troponin I levels were elevated to 280 ng/L (20 times the upper limit of normal), suggesting acute coronary syndrome. An urgent non-contrast computerised tomography (NCCT) of the brain revealed a right-sided parietal subacute infarction with a left-sided frontoparietal infarction. A transthoracic echocardiogram confirmed regional wall motion abnormalities with heart failure with mildly reduced ejection fraction with no intracardiac source of thromboembolism.

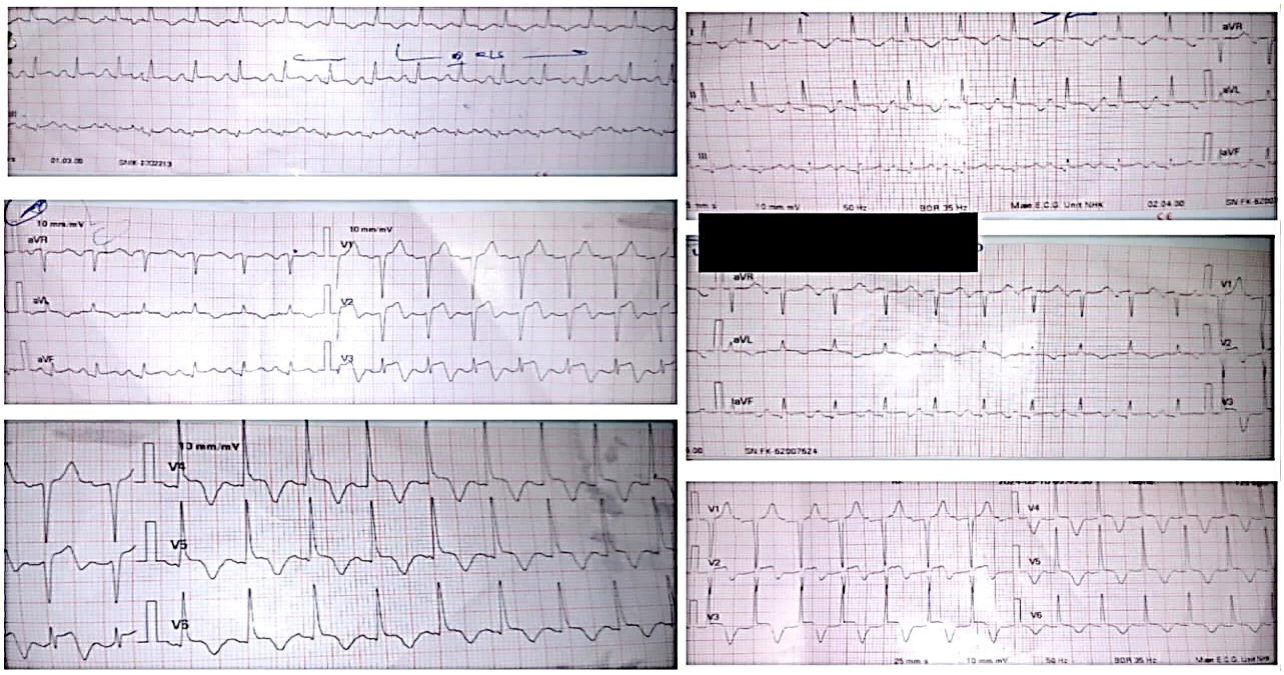

Figure 1: Serial ECGs (Initial one on the left and subsequent one on the right) indicating dynamic changes

Table 1: Summary of the laboratory investigation results.

Investigation (Normal Values)	**Initial Value at the local hospital**	**On discharge from the local hospital**	**On admission to tertiary care**
Hemoglobin (13.0–17.0 g/dL for males)	13.1 g/dL	12.6 g/dL	12.5 g/dL
Platelets (150–400 × 10^9/L)	117 × 10^9/L	168 × 10^9/L	188 × 10^9/L
White cell count (4.0–11.0 × 10^9/L)	13.5 × 10^9/L	7.5 × 10^9/L	7 × 10^9/L
Neutrophils (50-70%)	86%	80%	82%
Lymphocytes (25-35%)	9%	13%	11%
Monocytes (4-6%)	4%	5%	4.8 %
Eosinophils (1-3%)	1%	1%	1.2 %
AST (10–40 IU/L)	No Data	No Data	72 IU/L
ALT (7–56 IU/L)			41 IU/L
Total bilirubin (3–17 µmol/L)			6.5 µmol/L
Direct bilirubin (<3.4 µmol/L)			4.1 µmol/L
Alkaline phosphatase (44–147 IU/L)			130 IU/L
Gamma-GT (8–61 IU/L)			55 IU/L)
Total protein (6.0–8.3 g/dL)			6.63 g/dL
Albumin (3.5–5.0 g/dL)			3.9 g/dL
PT/INR [0.8-1.2]			0.9
APTT: [28-32]			32
CRP (<5 mg/L)	200 mg/L	34 mg/L	42 mg/L
ESR (<20 mm/1st hr)	No Data	No Data	12 mm/1st hr
Serum creatinine: (62–106 µmol/L)	No Data	No Data	98.2 µmol/L
Blood urea (10–50 mg/dL)			31.8 mg/dL
Sodium (135–145 mmol/L)			141 mmol/L
Potassium (3.5–5.0 mmol/L)			4.5 mmol/L
Troponin (<14 ng/L)	11 ng/L	No Data	280 ng/L
Creatine kinase (38–174 IU/L)	110 IU/L		82 IU/L
Total cholesterol (<200 mg/dL)	No Data	No Data	83 mg/dL
Triglyceride (<150 mg/dL)			154 mg/dL
LDL (<100 mg/dL)			39 mg/dL
HDL (>40 mg/dL)			31 mg/dL
Fasting blood sugar (<126 mg/dl)			96 mg/dl
pH (7.35–7.45)	No Data	No Data	7.31
PCO_2 (35–45 mmHg)			45 mmHg
PO_2 (80–100 mmHg)			81 mmHg
HCO_3^- (22–26 mmol/L)			19.0 mmol/L
Lactate (0.5–2.2 mmol/L)			2.1 mmol/L

AST; aspartate amino-transferase, ALT; Alanine amino-transferase, Gamma-GT; Gamma glutamyl-transferase, PT/INR; Prothrombin time/International Normalized Ratio, APTT: Active Partial Thromboplastin Time, CRP; C-Reactive Protein, ESR; Erythrocyte sedimentation rate in 1st hour, LDL; Low Density Lipo-protein, HDL; high Density Lipo-protein, pH; Acidity Quotient in Blood Gas analysis, PCO_2 ;Partial Pressure of Carbon Dioxide, PO_2; Partial pressure of Oxygen, HCO_3-; Bi carbonate Concentration

Unfortunately, due to the high risk of hemorrhagic transformation, anticoagulation could not be administered. Due to the difficulty in determination of the time window, thrombolysis was not considered. Once stabilised, percutaneous coronary intervention, carotid artery duplex, and CT angiography were planned, and the patient was managed with aspirin, clopidogrel, atorvastatin, bisoprolol and omeprazole along with nasogastric feeding, IV fluids, catheterisation, and physiotherapy. Due to the worsening clinical status, repeat NCCT brain was done, which showed multiple new onset infarctions with worsening cerebral oedema [Figure 2]. During his hospital stay, he was also managed for possible aspiration pneumonia, for which he was treated with IV piperacillin-tazobactam. The presence of leptospirosis was confirmed by serological evidence (Positivity of IgM and IgG Leptospira antibodies). Despite these efforts, on day three of admission, the patient suffered a sudden asystole, and extended cardiopulmonary resuscitation was unsuccessful, leading to his death [timeline mentioned in Figure 3].

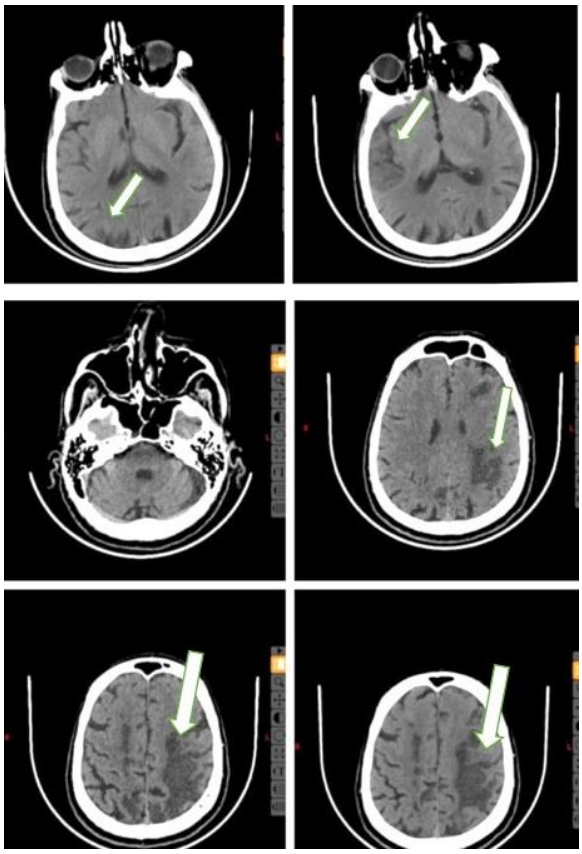

Figure 2: NCCT Brain; showing (Arrows indicate the areas) multiple new onset infarctions involving bilateral fronto-parietal region and left occipital region with worsening cerebral oedema.

Discussion

Understanding the pathophysiology of CCI is crucial for managing and preventing complications. Possible pathophysiological mechanisms are cardiac emboli (conditions like atrial fibrillation can lead to embolic strokes) [8], thrombotic events (where a single clot or multiple clots obstructing the blood flow in both coronary and cerebral vessels, typically due to plaque rupture with endothelial dysfunction), reduced perfusion due to septicaemic shock [9] and inflammatory response due to cytokine storm (inflammatory cascade triggered by myocardial injury can exacerbate endothelial dysfunction, increasing the risk of cerebral ischemia and vascular wall inflammation triggering thrombus formation) [10].

Here we present a case of synchronous CCI presented between 12-24 hours post-event, following clinically diagnosed leptospirosis, which is notorious for causing multiple cardiovascular complications such as myopericarditis, cardiac arrhythmias, cardiogenic shock and coronary events [4,5,6,7]. Due to the lack of awareness of similar complications, late seeking medical attention leads to adverse consequences, as in our case.

Management dilemmas and treatment in a similar scenario that we faced were complicated. In our case, several factors therapeutic dilemmas emerged. Risk of thrombolysis versus invasive strategies, detecting the exact time of stroke, anticoagulation in the cardioembolic stroke and the risk of hemorrhagic transformation, place of steroids for the immune phase of leptospirosis, and the iatrogenic bleeding and thrombotic tendencies were amongst them. It's vital to weigh the risks versus benefits of managing CCI, which was analysed while managing our case.

Conclusion

Cardio-cerebral infarction (CCI) is a rare and challenging condition, primarily when occurring synchronously following leptospirosis, as seen in our case. The complex pathophysiology complicates both diagnosis and management. In regions endemic to leptospirosis, such as Sri Lanka, heightened awareness and early recognition of this syndrome are essential in improving outcomes. Clear, evidence-based guidelines tailored to manage CCI in leptospirosis are urgently needed to reduce associated mortality and morbidity.

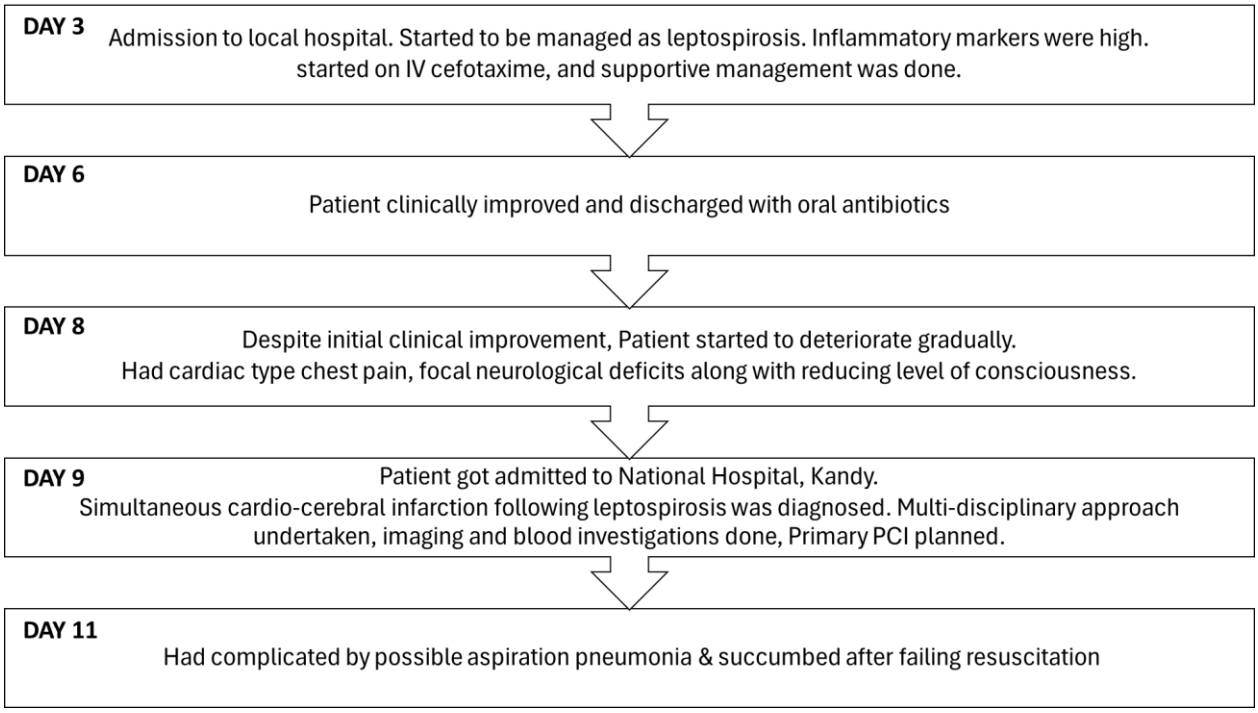

Figure 3: Timeline of the clinical course of the illness, days were numbered from the first day of illness

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Consent: Written informed consent was obtained from the patient's spouse.

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Author Contribution Roles

Conceptualisation: RNMM, Case Management: RNMM, AN, Data Collection and Analysis: RNMM, JKC Manuscript Drafting: RNMM, SJF Critical Review and Final Approval: all authors.

Data availability statement: The data supporting the findings of this case report are available from the corresponding author upon reasonable request. Due to patient confidentiality and privacy concerns, detailed data may be shared in a de-identified format where appropriate and with relevant ethical approval.

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