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CASE REPORT

Extensive Cortical Infarctions Post-acute Meningoencephalitis: A Case Report with Literature Review

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ABSTRACT

Background: Central nervous infections can present with or be complicated by acute infarctions similar to those seen in acute ischaemic stroke. Multiple and extensive cortical infarctions is an uncommon complication of acute bacterial meningitis in the young adult population and is associated with a poor prognosis.

Findings: We present a case of a 41year old male bar attendant with extensive cortical infarctions post-acute meningoencephalitis. He was referred to our facility with a history of sore throat, fever, headache, neck pain and irrational behaviour. Initial Brain Computerised Tomography scan (CT) at presentation was normal, however a throat swab had revealed non-haemolytic streptococci and Cerebrospinal fluid analysis showed growth of streptococcal species (spp.). He was commenced on empirical intravenous antibiotics. A repeat brain CT scan ordered for after a week on admission due to patient's deteriorating state showed extensive multiple cortical and subcortical infarctions bilaterally involving the pons, cerebellar, and cerebral cortex. Despite intensive management, we lost the patient after eighteen (18) days on admission.

Conclusion: The presence of multiple infarctions portends a worse prognosis and should prompt more vigilance in the management of such patients.

Keywords: Sore Throat; Meningoencephalitis; Non-Haemolytic Streptococci; Cortical Infarctions; Brain CT

INTRODUCTION

Infections of the central nervous system (CNS) result in high morbidity and mortality in case of bacterial meningitis.[1] Infections of the CNS include meningitis, encephalitis and meningoencephalitis. Meningitis refers to inflammation of the meninges with involvement of the pia mater, arachnoid and subarachnoid space. Encephalitis is an inflammation of the brain parenchyma associated with neurological dysfunction, due to infectious or immune-mediated causes. It is a clinical diagnosis in which the guiding symptom is alteration in the mental status, which can present as a decrease or alteration in the state of consciousness, lethargy or personality changes. Mening-oencephalitis is a clinical syndrome characterized by signs and symptoms consisting of inflammation of the meninges and brain parenchyma.[1-4] The introduction of conjugate vaccines has resulted in a decrease in the incidence of adult bacterial meningitis primarily because of falls in pneumococcal and meningococcal meningitis. Incidence decreased most sharply among pneumococcal serotypes included in the sevenvalent and ten-valent conjugate vaccines.[3]

Cerebral infarction may occur and is a severe complication in adults with community-acquired bacterial meningitis.[5] The occurrence of cerebrovascular complications (CVC) in meningitis have been reported in literature to range from 10-29% and has an influence over patients' morbidity and mortality.[5-8] The patho-physiological mechanism of CVC is predominantly due to localized cerebral vasculitis,[6-8] resulting in the activation of coagulation and inhibition of fibrinolysis,

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resulting in thrombosis, infarction and / or hemorrhage.[5,9-11] Vasospasms, or disseminated cerebral intravascular coagulation; septic emboli in patients having both meningitis and endocarditis are rarer mechanisms which have also been reported.[12-14]

We present a young adult male in whom bacterial meningoencephalitis ran a fulminant course with development of multiple extensive cortical infarctions.

CASE REPORT

A 41 year old male bar attendant was referred to our facility from a private service with complaints of a febrile illness with pharyngitis, and abrupt onset of headache, confusion, irrational talk, dysphagia and neck stiffness.

The first symptoms were fever and sore throat of a week duration, but he subsequently developed neurologic symptoms despite a week course of intravenous ciprofloxacin for throat swab culture of non- haemolytic streptococcal species(spp), this necessitated the referral. Subject has been without ill health in the past, although 3 months back, he sustained a stab injury to the scalp following a brawl at the Bar. The site of scalp injury had not healed at presentation. He was not a known diabetic nor hypertensive, neither was there a family history of hypertension or diabetes. There was no history suggestive of diabetes in this patient. He was married with a child in a monogamous setting, he consumed about 21units of alcohol per week, no other relevant social history, no use of psychoactive substances.

On examination, he was confused restless and occasionally agitated, febrile with temperature ranging (38.1–40.10C), dehydrated, no peripheral lymphadenopathy, with two 2x2 cm and 2x3 cm discharging scalp ulcerations. He had bilateral swollen hyperaemic slough laden tonsils. Nervous system examination revealed a Glasgow Coma Score (GCS) of 14 (eye opening 4, best verbal response 4, and best motor response of 6). Cognitive assessment deferred due to confusion, normal pupillary responses, bilateral Abducent nerve palsy, symmetrical facial expression, nuchal rigidity with positive Kernig and Brudzinski signs, normal tone, with a gross motor power estimated to be 5 on the MRC scale. Normal reflexes and pin prick sensation, coordination assessment was deferred due to confusion but a normal Gait was observed.

Admitting pulse rate was 104 bpm regular bounding, Blood Pressure ranged from 113–170 mmHg systolic and 69 –88 mmHg diastolic. He was tachypneic with respiratory rate of 22 cycles/min, SpO2 ranged 97 – 99% on room air with vesicular breath sounds. Other systemic examinations were not contributory. Neuroimaging included serial Brain Computed Tomography Scans done on day 1 and day 8 when his GCS deteriorated by 4 points, the initial neuroimaging was a normal study, subsequent neuroimaging showed widespread cortical and subcortical cerebellar and brainstem infarctions (Figures 1 and 2).

The Random Blood Sugar (RBS) at presentation was 115 mg/dL (80-140). The Cerebrospinal Fluid (CSF) analysis revealed the CSF to be cloudy and under pressure at collection with Glucose of 20 mg/dL (45 – 80), Protein of 27 mg/dL (15 – 45), Red Blood Cell (RBC) count of 10 – 11 per high power field (hpf) and many pus cells. Culture showed moderate growth of Streptococcal spp. Sensitive to Ceftriaxone, Erythromycin, Streptomycin, Gentamicin, with resistance to Cloxacillin, Lincoccin, Chloramphenicol, Clindamycin, and Ampicillin. Sepsis Workup: Throat swab which was positive for non hemolytic streptococci, on day 8, the Blood culture was negative for microbial agents, Scalp Wound Swab showed pus cells of a gram-positive cocci which yielded no growth after 48 hours of incubation, Blood film for malarial parasite was negative, Chest Radiograph was normal with a CTR of 43% and no active parenchymal disease.

Blood counts were unremarkable except for anaemia with Hematocrit of 29%, white blood cell count of 7.8 x 10 9 with neutrophilia of 82%, platelet count 386,000/mm3, Erythrocyte Sedimentation Rate was elevated at 128 mm fall per hour, Serum electrolytes at presentation showed Hyponatremia 131 mmol/L with other electrolytes being normal, Viral screen for retroviral disease (HIV I and II), Hepatitis B and C were not reactive. Urinalysis showed a pH of 6.0 SG 1.025; Other parameters of protein, glucose, blood were negative; fasting serum lipid profile showed Total Cholesterol 188 mg/dL, LDL – 128mg/dL, TG – 98mg/dL, HDL – 40mg/dL, LFT showed AST – 66 units, ALT – 31 units, ALP 29 units, and elevated GGT – 210 units. Total Bilirubin 0.6 mg/dL, Direct Bilirubin – 0.4mg/dL, total protein of 5.9 g/dL, albumin 3.7 g/dL. The working assessment was an Acute Meningoencephalitis secondary to tonsillitis, complicated by Hyperactive Delirium, Cerebral oedema, and multiple acute Infarctions. The patient was comanaged with the Ear-Nose-Throat (ENT), Plastic and Intensive Care Unit (ICU) Teams, he was commenced immediately on intravenous Dexamethasone, Ceftriaxone and Metronidazole. He also received Mannitol, Furosemide, fluid hydration, antipyretics, supportive care, pressure mattress nursing, compression stockings, physiotherapy and counselling.

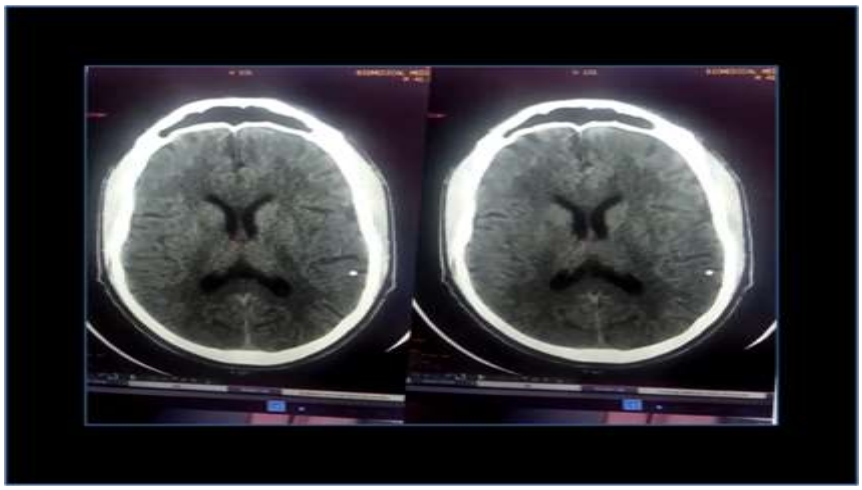

Figure 1. Normal Brain CT of patient at presentation

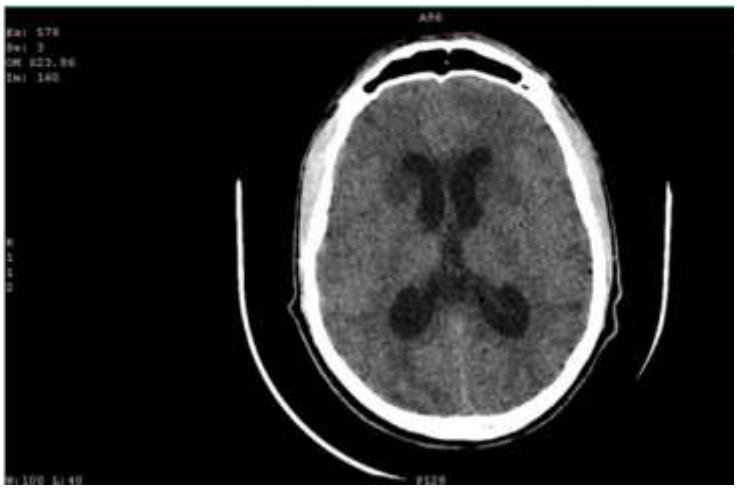

Figure 2. Repeat Brain CT of patient on admission day 8 at the level of the lateral ventricles showing multiple ischaemic infarcts involving the parietal cortices, the heads of cordate nuclei and both internal capsules.

His GCS gradually deteriorated from 14 to 11 points within 7 days, despite branded Ceftriaxone and Metronidazole, at which point a second brain tomography scan was insisted for which confirmed widespread cortical infarctions. Patient consciousness level continued to deteriorate with frequent desaturations (SpO2 = 81 – 89%) on room air and oxygen dependence. He was constantly reassessed for Intensive Care, unfortunately, he met his demise from overwhelming neurosepsis and cardiopulmonary arrest. He was in our care for a total of 18 days.

DISCUSSION

Meningoencephalitis is an infectious neurological emergency and refers to the inflammation of the meninges and brain. The presence of fever, altered sensorium and seizures characterises this condition, and the diagnosis confirmed on cerebrospinal fluid (CSF) analysis. Our patient presented with fever, nuchal rigidity, cerebral oedema, and altered sensorium. Acute meningoencephalitis is usually complicated by long term neurological sequelae, hence rapid diagnosis and the use of antibiotics or antiviral in its treatment, depending on the causative organism, is key.[15] Decision making is usually made based on thorough history, examination, laboratory analysis, and neuroimaging.[15] The CSF analysis in our patient demonstrated Streptococcus spp. on culture, hence the use of intravenous ceftriaxone.

Adjunctive therapies have been shown to improve outcome in bacterial meningitis.[16] In the treatment of moderate-to-severe acute bacterial meningitis caused by S. pneumoniae, intravenous dexamethasone has been shown to be a safe and beneficial adjunctive therapy.[17-19] Intravenous dexamethasone was administered in our patient, however male patients have been found to have less response than female patients.[20] This might explain the poor response in our patient. Cerebrovascular complications (such as brain oedema, ischaemic infarction, hydrocephalus and septic sinus or venous thrombosis) or systemic complications (e.g.

septic shock, disseminated intravascular coagulation and adult respiratory distress syndrome) are the main causes of death in bacterial meningitis.[5,21,22] In an observational cross-sectional study from a prospective nationwide cohort of community-acquired bacterial meningitis over a 14year period by Schut et al, 174(25%) of the 696 patients had cerebral infarction confirmed by culture of cerebral spinal fluid (CSF) in patients aged over 16 years. The presence of infarction was determined independently by two investigators.[5]

Benadji et al in a study, assessed the prevalence of CVC in patients with community-acquired bacterial meningitis and determined the factors associated with CVC within the first 48hours. CVC was found to have occurred in 128 (25.3%) of the 506 patients in the COMBAT cohort which consisted of 78 (29.4%) of the 265 patients with pneumococcal meningitis, 17 (15.3%) of the 111 patients with meningococcal meningitis, and 29 (24.8%) of the 117 patients with meningitis caused by other bacteria. There was no statistical difference between patients with and without CVC (p = 0.84) among the proportion of patients receiving adjunctive dexamethasone. Multivariate analysis revealed factors which were independently associated with CVC such as advanced age (OR = 1.01 [1.00-1.03], p = 0.03), altered mental status at admission (OR = 2.23 [1.21–4.10], p = 0.01) and seizure during the first 48 hrs from admission (OR = 1.90 [1.01–3.52], p = 0.04).[6] The COMBAT was a prospective, multicentre cohort study in France between February 2013 and July 2015, that enrolled consecutive adults with community-acquired bacterial meningitis (CABM) in 69 participating centres and followed them up for 1 year.[23]

Bacterial meningitis often has an unfavorable outcome in patients who are alcoholic, due to a high rate of systemic complications, mainly respiratory failure. Seizures are common in alcoholic patients and they may develope an alcohol withdrawal syndrome.[24] In a study on clinical features and outcome of community-acquired bacterial meningitis in 88 alcoholic patients, 18% of the alcoholic patients had seizures as the presenting symptom, and 23% presented with co-existing pneumonia. Causative organisms in these patients were Streptococcus pneumoniae (76%), Listeria monocytogenes (8%), and Neisseria meningitidis (6%). Systemic complications in these patients included respiratory failure (40%) and endocarditis (9%). There was unfavourable outcome in 58% of the alcoholic patients, with a mortality of 25%. In a multivariate analysis, Alcoholism was associated with unfavorable outcome (OR 1.96; 95% CI 1.12-3.46; P = 0.019), but not with death (OR 0.76; 95% CI 0.35-1.68; P = 0.762).[24] Our patient, though not termed alcoholic, worked in a bar and had significant alcohol intake.

Chekrouni et al in a study, provided Class II evidence that CSF neurofilament light chain concentrations were moderate predictors of outcome in bacterial meningitis with higher levels having poorer outcome.[25] CSF neurofilament light chain was not assayed in our patient due to lack of such diagnostic tool in our center. Our patient had cerebral oedema and extensive multiple cortical and subcortical infarctions bilaterally involving the pons, cerebellar, and cerebral cortex. Koelman et al. in a 20-year prospective study demonstrated that bacterial meningitis was still associated with high morbidity and mortality despite changes in epidemiology and treatment modalities.[26] van de Beek et al in another study, found community-acquired bacterial meningitis to have a high rate of unfavourable outcome in adults (34%). A multi-variate model identified several unfavourable prognostic factors, most of which pointed to systemic compromise. Such unfavourable prognostic factors include a low level of consciousness on admission, as well as a low cerebrospinal fluid white-cell count. Finally, factors predictive of pneumococcal infection were associated with an unfavorable outcome (advanced age; presence of otitis or sinusitis, pneumonia, or immunocompromised status; and absence of rash). Patients with pneumococcal meningitis were at risk for an unfavorable outcome, even after correction for other clinical predictors.

Our index patient presented with multiple risk factors of untreated penetrating scalp injury and acute tonsillitis. Although he did not have any obvious immunosuppressive state, his condition ran a fulminant course until his demise without any obvious improvement despite branded intravenous antibiotics and use of intravenous dexamethasone.

Conclusion: Streptococcal meningoencephalitis may be complicated by brain infarctions mimicking ischaemic stroke. The presence of multiple infarctions portends a worse prognosis and should prompt more vigilance in the management of such patients.

Authors' contributions: OEM: Corresponding author, Co-managed the patient and wrote the manuscript; KN: Reviewed neuro-images and reviewed the manuscript; E-NN: Co-managed the patient and reviewed the manuscript; ESO: Co-managed the patient and summarised the case for reporting.

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