

Volvulus of the intrathoracic stomach can precipitate partial or complete obstruction of the stomach, strangulation, and perforation. Acute gastric dilatation can directly impede venous return and cardiac output. Clinical deterioration can be rapid unless halted by rapid resuscitation and urgent surgical correction. After resuscitation plain antero-posterior and lateral radiographs, augmented with contrast studies if necessary, should confirm the diagnosis.

In a solely breast fed infant blood clotting should be checked and vitamin K given if indicated.

Suspicion is the key to successful management. If the presentation is acute there is a high likelihood of volvulus, obstruction, and/or gastric dilatation, and so fluid resuscitation will be required and oral fluids should be withheld. Ideally a nasogastric tube should be passed to attempt deflation of the stomach but if there is a complete gastric volvulus this is unlikely to be successful. The child should then be transferred, without delay, to a specialist centre for surgery to reduce the hernia and repair the defect.

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CONTRIBUTORS

Jacqui Rees, Simon Robertson, and Andrew McNinch all attended the patient. The paper was written by Jacqui Rees who acts as guarantor for the content; the other authors reviewed and advised on the paper.

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Lightning: an unusual cause of cerebellar infarction

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The neurological complications of lightning injury are not infrequent. However, scarce data are available on cerebellar infarction attributable to lightning injury. A 45 year old man was admitted to the emergency department because of lightning injury. The patient had a Glasgow coma scale score of 13/15 on arrival at hospital with accompanying dysarthria and hypotonia. Computed tomography of the head showed only a mild cerebral oedema. Ataxia was recorded on the fourth day. Magnetic resonance imaging of the head showed ischaemia predominantly in the cerebellar hemispheres bilaterally and in the parietal, temporal, and frontal lobes on the right. Anti-oedema treatment was started. The patient was discharged after seven days. After one month the patient was re-examined and found to have minimal ataxia and dysarthria. Lightning injury should not be overlooked in the aetiology and differential diagnosis of acute cerebellar ischaemic insult and relevant clinical findings in adults.

Lightning injury is one of the most frequent injuries by natural phenomenon and often results in a high mortality, ranging from 20% to 30%. The most vulnerable subjects to lightning injuries are those who work in the open fields.¹

Although lightning injuries may involve all organ systems, injuries to the cardiovascular system and central nervous system (CNS) are the most common. Burns, tinnitus,

blindness, and secondary blunt trauma are also reported. Most victims have associated multisystem involvement.²

Several case reports have presented various neurological complications caused by lightning injury. On the other hand, no report related to cerebellar infarction caused by lightning injury was identified.

CASE REPORT

A 45 year old male farmer was admitted to the university based emergency department on a summer night with burns on his face, right gluteal and lumbar regions, and changed mental status after being struck by lightning in his farm. The patient was brought to the hospital about nine hours after the strike, and Glasgow coma scale (GCS) score was recorded as 13/15 (E3, M6, V4). Second degree burns (about 7%, calculated via the rule of a palm size = 1%) were found scattered on the right forehead, chest, and gluteal regions. On arrival, the patient's vital signs were normal. Hypotonia, dysarthria, and bilaterally ruptured tympanic membranes were observed. Cardiac and pulmonary examinations were within normal limits.

The initial electrocardiography (ECG) showed signs of inferolateral ischaemia. Echocardiography showed decreased motions in the apical and lateral wall of left ventricle. Computed tomography (CT) of the head displayed a mild cerebral oedema. The laboratory data obtained on admission were within normal limits except serine creatine kinase (861 U/l) and creatine-kinase muscle band (CK-MB) (75 U/l) values. Medical and family history was unremarkable. Fluid replacement and anti-oedema treatment (mannitol at a dose

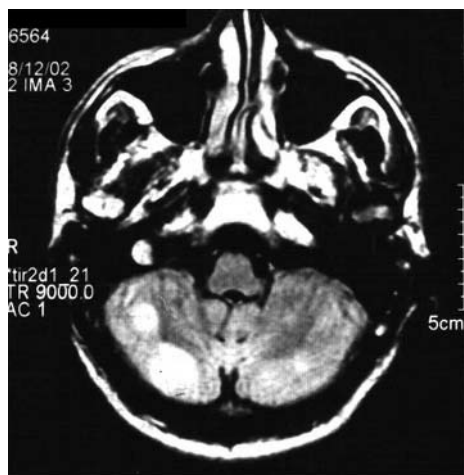


Figure 1 FLAIR weighted MRI scan shows hyperintense areas in the bilateral cerebellar regions.

of 0.5 mg/kg and hyperventilation 100% O₂ via face mask) were started.

On the third day of admission, GCS score was 14/15 (E4, M6, V4) although no difference from the previous CT examination was identified. On the fourth day, the patient was able to walk with support despite a significant ataxia, which led the clinicians to suspect a cerebellar disorder. MRI examination obtained on the fourth day showed an ischaemia predominantly in the right parietal, temporal, and frontal lobes and bilateral cerebellar hemispheres (fig 1). The patient was discharged after seven days. After one month, dysarthria and hypotonia were found to have resolved, but ataxia did not improve completely.

DISCUSSION

Effects of lightning strikes range from minor to life threatening. Only about 20% of people who are struck are killed, the remaining 80% having various degrees of disability.³ Immediate manifestations in survivors of lightning include changed consciousness, disorientation, impaired vision; ruptured ear drums, hearing loss; seizures, paralysis, burns on the skin, internal burns to organs and tissues and finally, cardiac arrest.⁴ Although rare, serious lightning injuries are likely to primarily cause cardiac and neurological injuries. Changes in the cardiac rhythm may occur, although the heart will usually resume its normal rhythm quickly. ECG abnormalities are common, but generally resolve spontaneously.⁵ In this case, signs of inferolateral ischaemia were detected on ECG and decreased motions of apex and lateral wall of left ventricle were identified by two dimensional echocardiography. In combination with neurological symptoms, the isoenzyme of creatine kinase with brain subunits (CK-BB band) may be raised, but this has not been proved to be of major prognostic significance. In this case, both CK and CK-MB were found increased, while the remaining laboratory data were unremarkable. This condition was not a new entity with regard to the literature.⁶

Neurological complications of lightning range from loss of vision to hypoxic encephalopathy.⁷ CT scan of the head is indicated in patients with a loss of consciousness, both to detect any injury directly caused by the lightning strike and to exclude secondary blunt trauma to the head and cerebral tissues. In this case, cerebral oedema was detected on CT examination. Confusion and loss of consciousness found in this case might be as a result of direct passage of the current through the brain.⁸ Nevertheless, these data could not explain the development of ataxia in the victim. Therefore, MRI was performed and ischaemia was identified predominantly on cerebellar hemispheres. CT scan of the head is usually the preferred diagnostic modality in the acute management of neurological complications.⁹ However, Janus *et al*⁷ reported that 10 victims with lightning injury had some neurological complications, but only two of the patients had positive radiological findings on CT examination. Milton *et al*¹⁰ was the first author who reported that early white matter changes were associated with lightning injury on MRI examination. Several mechanisms were alleged to explain this phenomenon: direct electrolytic effect of the electrical charge passing through the brain, heating effect of the electrical current, and mechanical trauma of the lightning stroke.

In conclusion, clinicians should not overlook lightning injury in the management of acute cerebellar ischaemic insult and relevant clinical findings in adults. While CT scan of the head may be insufficient in the establishment of a diagnosis of cerebellar infarction, MRI may prove superior in the diagnosis of such complications.

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