

Lightning Strike: Multisystem Trauma**Komal Gharsangi¹, Pratibha Himral², Gurpreet Sharma³**¹Assistant Professor, Department of General Medicine, SLBSGMCH, Nerchowk, Mandi (HP)-175008²Associate Professor, Department of General Medicine, SLBSGMCH, Nerchowk, Mandi (HP)-175008³Junior Resident, Department of General Medicine, SLBSGMCH, Nerchowk, Mandi (HP)-175008

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Abstract:

Lightning is a common natural disaster in India which causes casualties every year. It rarely causes serious internal injuries but can cause life threatening tissue damage due to high voltages, high temperatures and blast waves which have to be addressed immediately. It can lead to cardiac, respiratory, nervous system trauma, rhabdomyolysis, ear and eye injury which can have immediate or long term sequelae. Therefore it is important to understand the pattern of injuries which can facilitate early recognition and treatment.

Keywords: Lightning, burns, cardiac injury, rhabdomyolysis.

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Introduction

Lightning is a natural phenomenon in which the electrical charges generated within the storm clouds is rapidly discharged to the Earth. It is a common geophysical phenomenon in Asian, many African and South American countries. Lightning strike can be from mild to being highly fatal. Global mortality due to lightning is estimated at 0.2–1.7 deaths per 1 million.[1]

In India average 2000 to 2500 people die of lightning strikes in a year as compared to just 45 in United states. Lightning can expose the body to over 1000,000 Vs and 10,000–200,000 As, which is classified as a high voltage injury.[2] A person's exposure to lightning is very short, typically lasting from 1/1000 s to 1/10 s so only a small amount of energy is transferred internally, while the majority of the energy flows externally over the victim's body, which is known as the “flashover” effect.

Still lightning strike can cause serious internal injuries which can lead to morbidity and mortality.[3,4] Here we will discuss a countryside case of lightning burn which presented with multi-organ insult.

Case History

A 43 year old male presented to the casualty after being struck by lightning while coming back home from his farm in nearby village. He complained of burns on the back and the calf region. He was conscious, oriented and haemodynamically stable but complained of severe pain over the back and right leg region. Patient was evaluated by surgeon for the burn injuries who diagnosed it as first degree burn involving 7-8% of total body surface area (fig 1 and 2).



Figure 1: Superficial burns on the back



Figure 2: Superficial burns on the flexor aspect of leg

The baseline blood investigations were all normal except hypocalcemia (serum level=8.7mg%) and slight rise in aspartate transaminase levels(AST=65U/L). His electrocardiogram(ECG) at admission was normal but on repeating next day there were T wave inversions in leads II,III,AVF and V2-V5 (fig 3)which gradually became deeper (fig 4) on the next few days.

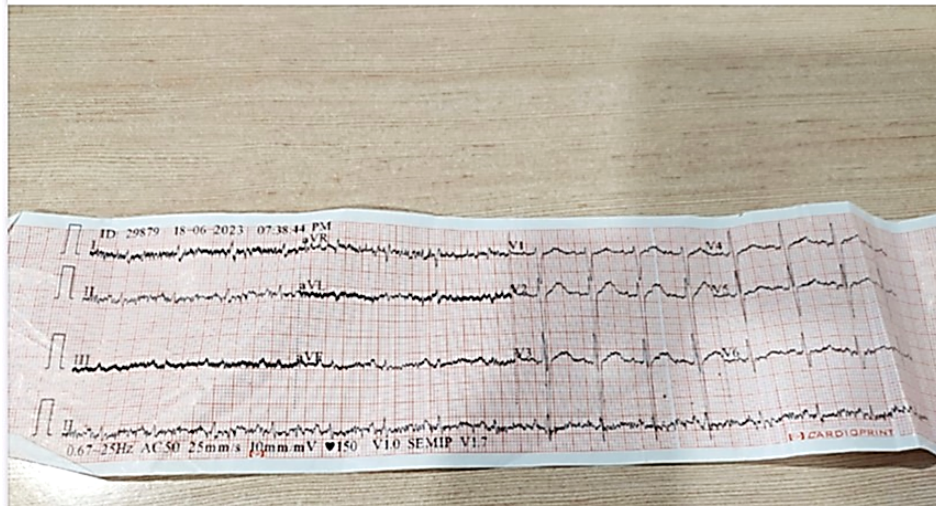


Figure 3: First ECG showing baseline artifacts

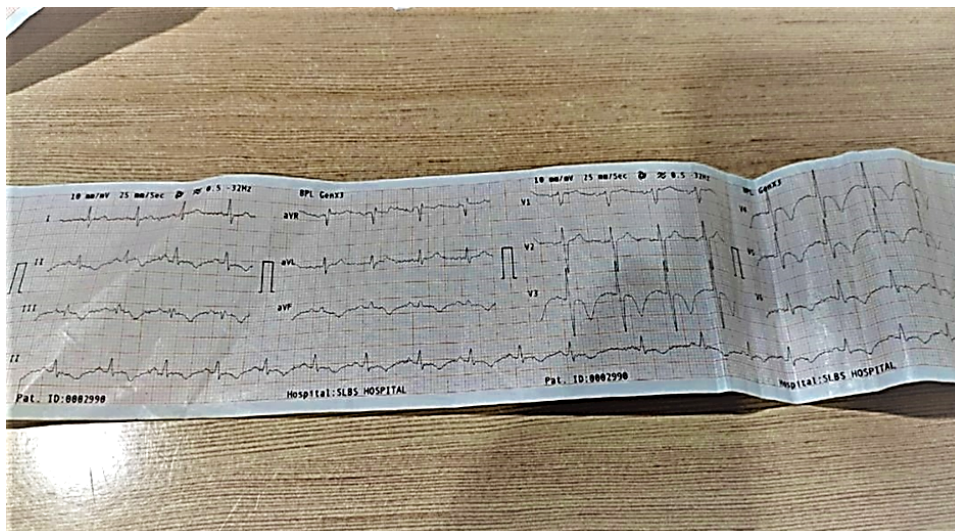


Figure 4: ECG showing deep T wave inversion in limb and precordial leads

But the troponin level was not raised. Echocardiography was also done which showed normal left ventricular function. His computerized tomography head was normal study. In view of severe bodyaches and darkening of urine possibility of rhabdomyolysis was kept and CPK and urine myoglobin were sent which both came out raised (CPK=6293 U/L, myoglobin= 1.4 ng/ml)but the renal parameters remained normal as patient was aggressively hydrated and maintained adequate urine output. Attendant complained of frequent episodes of amnesia in the patient since the day of incidence. After 7 days of admission patients pain had improved, burn injuries were taken care of with daily dressing, blood parameters repeated were all normal after which patient was discharged. Patient was followed up in outpatient basis after 14 days

where his ECG showed non specific ST segment changes, while T waves were upright and memory disturbances had now improved.

Discussion

Lightning can cause harm by several mechanisms like burns over the body due to the conversion of electrical to thermal energy. There can be sudden death following a lightning strike due to simultaneous cardiac and respiratory arrest. Cardiac arrest is due to an immediate and simultaneous depolarization of all myocardial cells. Ventricular dysrhythmias can also take place but less commonly seen. Involvement of the medullary respiratorycenter may occur and lead to sudden respiratory arrest. Lightning can also cause damage to the central and peripheral nervous system. It can

cause intracranial hemorrhage mostly in the basal ganglia, brainstem and can damage peripheral nervous system via direct damage to nerve cells. Ocular injury can occur from blunt or blast trauma, vasoconstriction, or heat. Cataracts, hyphema, vitreous hemorrhage, and optic nerve injury can also occur. Many victims struck by lightning will also have an injury to the audio-vestibular system due to either blast trauma or electrical injury. A rupture of tympanic membrane is common and can be found in 50-80% of lightning injuries.² At least 3% to 15% of those suffering major lightning strike injury may develop acute kidney injury.⁵ Rhabdomyolysis characterized by damage of the sarcolemma of skeletal muscle leading to release of creatine phosphokinase (CPK) and myoglobin, frequently accompanied by myoglobinuria causing acute kidney injury.⁶ The risk of renal failure increases with CPK levels of 5,000 to 6,000 IU/L. It is therefore important that the patient are triaged properly and after that evaluated for the possibility of other organ injuries. In lightning strike we follow reverse triage i.e the person who comes in cardiac or respiratory arrest is resuscitated first as these are the immediate lifethreatening injuries.

Conclusion

Lightning is important environmental hazard which can be avoided with proper knowledge and awareness among people. People also need to be more forthcoming in relation to the urgent medical need of such patients which are hampered by superstitions associated with the lightning injuries.

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Informed Consent: Taken from patient

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