https://doi.org/10.15218/zjms.2025.051

# Unusual Lightning Strike Causing Death: A Case report

Received: 04/09/2024 Accepted: 31/10/2024

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## Abstract

In daily autopsies, lightning-related deaths are an uncommon occurrence. Lightning-related deaths are more common in mountainous, wet regions, although they are uncommon in and around Erbil city. Lightning is typically connected to rain, and while lightning-related injuries may be distinguished from electrocution, the latter is also frequently observed. The majority of lightning-related injuries to adults and the elderly are not lethal, but if an individual's strong strike is involved, there may be a tragic outcome. These factors should be investigated in cases of adult fatal lightning deaths. Lightning fatalities are infrequently discussed in medical literature, but since many outdoor workers are implicated, there is a need for more research in this area. Research on lightning deaths in Iraq, a country with a continental, semi-arid, and subtropical climate, needs to focus more on factors of human fatality prevention and treatment. Though more prevalent in adults than in children, an adult death by lightning is documented here. The autopsy results and scene investigation were vital in ascertaining the cause of death.

**Keywords**: Unusual Lightening Strike, Burn.

## Introduction

Lightning strikes may cause catastrophic injuries, making them an intriguing and erratic natural phenomenon. An estimated 1800 thunderstorms are active at any given time in the world, and up to 44,000 of those thunderstorms can produce up to 8 million lightning strikes every day.(1)

One may classify lightning as a type of high -voltage direct current. It is the movement of an electrical charge from the ground to polarized positive and negative charges inside a storm cloud.(2) It is caused by a high electric potential difference between the surplus negative charges at the thundercloud bottoms and the freely flowing electrons at the earth's underlying surface, which positively charges the ground by induction. The electrical resistance of air must finally be surpassed for a lightning discharge to occur.(3)

A large-scale electrical circuit is created by the physical processes inside and surrounding a thundercloud, which produces static electricity between individual water droplets or ice particles. These processes then include conspicuous surfaces or structures on the ground below. The electrons from the cloud travel in a zigzag pattern toward the ground before the actual bolt, branching at several points.(4) This phenomenon, referred to as a stepped leader, causes the charges that are present on the surface of the earth to be drawn upward, creating a structure known as a streamer.(5) Their contact takes place between 150 and 200 meters above the surface. The course of electrons down the path of least electrical resistance at intervals of 50 meters. This occurs in an ionized channel with a diameter ranging from a few millimeters to 20 cm.(6)

The phenomenon is so quick that it seems continuous to the human eye, which is not able to distinguish between individual light flashes occurring at speeds faster than

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https://doi.org/10.15218/zjms.2025.051

a tenth of a second.[7] Lightning flashes, which are electrical discharges between clouds with varying potential, can happen. The actual Lightning has the following characteristics: an electrical potential of several million volts, an intensity that oscillates between 10,000 and 110,000 A, a temperature of 8000°C, a spatial discharge length that fluctuates between 8 and 10 k, and an average discharge diameter of 20cm.[8]

The lightning strike victim's harm is mostly caused by electrothermal processes, although there are some minor mechanical side effects as well. The majority of lightning-related fatalities are caused by electrothermal injuries or cardiac arrest.[9]

While most lighting strikes occasionally occurrences take place outside. The authors describe a lightning-strike death of the middle-aged man who had been in good condition before being struck while working outdoors in Erbil City, Iraq. The autopsy results and scene investigation were vital in ascertaining the cause of death.

## Case report

A 39-year-old man was on duty as a peshmerga force outside Erbil City, was alone in his palace. In the early morning, at 4.5 Am, after a lightning strike his friends resorted to calling the ambulance then to the West Erbil Emergency Hospital. Upon their arrival, he passed away. According to the witness the victim was outside at his duty night time security shift when a big strong strike happened at that place, after they saw him lying on his right side. Tetany was determined because, around one hour after the occurrence, the corpse displayed an extraordinary stiffness that could not be overcome by physical effort. This was discovered during the scene investigation. However, there was no sign of a fire in the immediate vicinity. His private phone was all over the place, and there were no fire marks on the strike location. But his gun was not included in any fire or self-firing due to the strike.

A man who was 175 cm tall and 88 kg in weight was found to have many indicators of lightning-strike injuries on his body during the autopsy. First-, second-and third -degree burns were noted in the chest, abdomen, and genitalia, and these burned areas made up around 25% of the total surface area of the body (Figure 1).


**Figure 1 A:** Inlet of the Clothes may burn even if it is not on the current's path as the above case due to the flame resulted from the spark. **B:** Inlet to the left chest wall, there is burn of the soft tissues, burn of the clothes also noticed.

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The scalp, head hairs, and beard were burned (Figure 2), while the surrounding skin remained unharmed. The left occipital area was injured and burned 2cm longitudinally to the lower head with blackening. Furthermore, another injured burn 7cm in diameter was seen on the left side of the chest area exactly at the breast area, with many injured and mini burns also recorded on the right side of the chest (Figure 3).

**Figure 2** The scalp, head hairs, and beard were burned

**Figure 3** Injured and mini burns also recorded on the right side of the chest

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Two longitudinal injured burns with the blackening area were seen in the abdominal region and were parallel measured around 7cm (Figure 4).

After a postmortem examination, the meningitis appeared with some hemorrhages and the oral cavity and teeth are normal. In the bronchus, trachea, plural, and lungs many point hemorrhages were noted. Petechial hemorrhages are seen in the pericardium and myocardium with the accumulation of blood inside heart chambers.

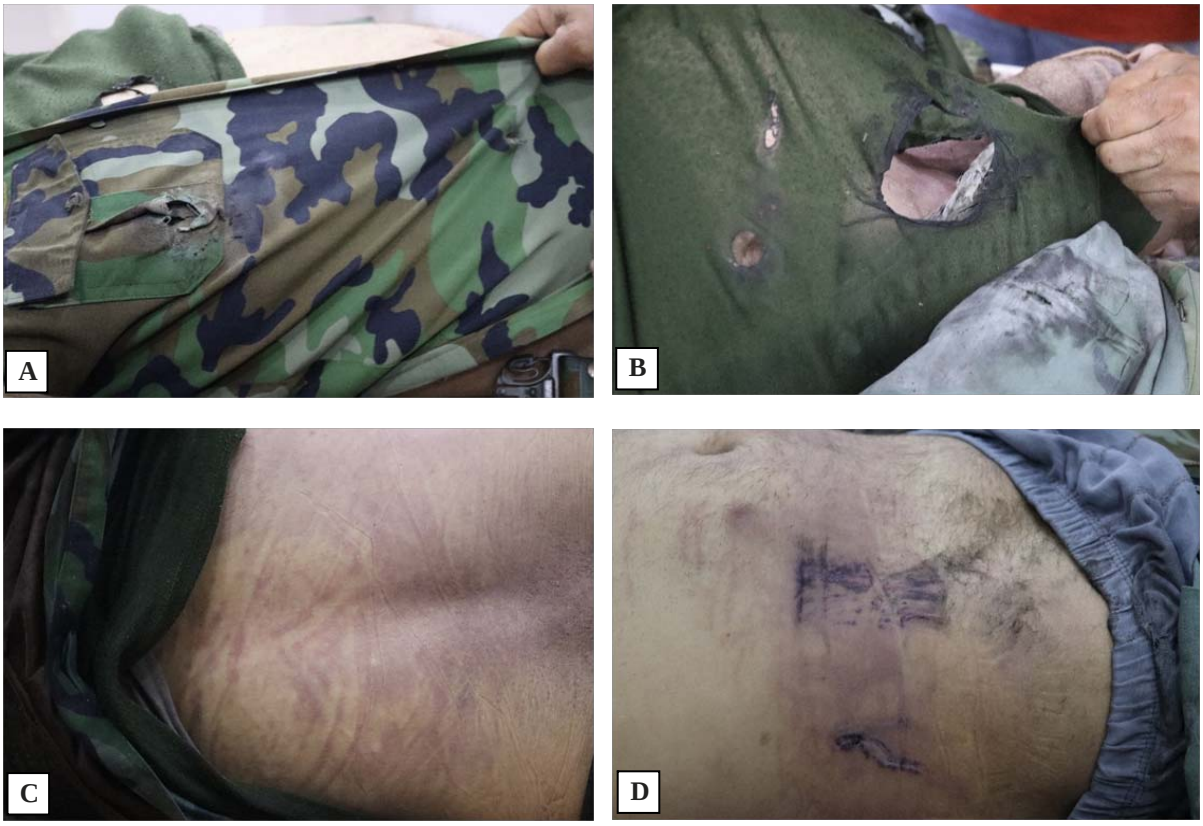


**Figure 4** A,B-Inlet of the first and second clothing Same, wide burns over the body from high voltage current. C- Burn of back of body, Same previous case, wide burns over the body from high voltage current. D- Burn of right thoracic wall

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## Discussion

Estimated that over 100 lightning strikes occur on Earth per second, or 8 million times a day.[10] This condition results in about 300 accidents and 100 fatalities annually in the United States. As of right now, the United States National Weather Service estimates a 10 percent mortality rate or 70 fatalities annually.[11]

Moreover, many believe that city inhabitants are less vulnerable than people who live in rural regions. People, almost without exception, were struck by lightning while taking part in outdoor activities. Particularly vulnerable groups include people who play golf, go fishing, swimming, camping, or work in agriculture or construction. Between September and May, fatal lightning strikes occur more frequently in the winter and fall, usually in the early afternoon and nighttime, while less happen during summer. Lightning is one of the rare causes of unnatural deaths. This case report describes an unfortunate event in which a 50 year old male was struck by a lightning while riding a bike. A complete autopsy and a thorough examination of the place of incidence were carried out .[12]

Trauma injuries incurred due to lightning strikes should be treated appropriately as deemed fit by the provider. Those with neurological symptoms will need repeat evaluation, and if symptoms persist, they will need evaluation and treatment by a neurologist. Burns should be treated appropriately per standard guidelines.[13]

Death due to lightning is an infrequent event with an incidence varying greatly in relation to the climatic conditions; despite the lack of data for Europe and Asia, this phenomenon seems to be relevant in the United States. An analysis of lightning deaths in USA between 2006 and 2019 reported that 418 people were struck and killed; in almost two thirds of these cases, the accident involved people during outdoor leisure activities.[14]

The lightning strike is one of leading cases of weather-related death worldwide. We present an unusual case of four fatality -lightning strike with various pathological manifestations.[15]

## Conclusion

The autopsy results and scene investigation were vital in ascertaining the cause of death. Since the outdoor lightning strike occurred in an extraordinarily common scenario and there were interpretive challenges throughout the scene investigation, the case at hand seems to be of particular medical-legal importance. In actuality, the corpses carbonized and injuries in the victim's body are other scenarios of such cases. Therefore, forensic pathologists should take note of the case depicted, in addition to the unusual nature of this death. It emphasizes how crucial it is to accurately interpret the information gleaned from autoptic exams, as well as from the witness, to determine the cause and manner of death.

## Competing interests

The author declares that he has no competing interests.

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