CASE REPORT

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An Unusual Case of Death by Lightning

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ABSTRACT: Lightning-related deaths are relatively uncommon, especially indoors. Some cases, involving unusual circumstances, may be of medicolegal relevance. We report a highly infrequent case of fulguration occurring inside a house in a country area. The deceased, a 55-year-old man, was struck by lightning while he was in his bed. Scene investigation and autopsy findings were equally important in finding out the cause of death. We think that the present case is of interest to forensic pathologists because what occurred might be difficult to clarify.

KEYWORDS: forensic science, forensic pathology, lightning death, fulguration indoors

Electrical fatalities are relatively uncommon with only 100–200 cases each year related to lightning in the U.S. and five in England and Wales (1,2). When they are not witnessed, there may be questions about the cause of death. This is especially true when death occurs in unusual circumstances, as it is indoors. In these cases the analysis of scene, circumstances of the death, and electrical equipment, together with ancillary studies to supplement the autopsy, are very useful. We report an unusual case of the lightning-related death of a man while he was in bed, involving the production of a spark between an electric wire and the body through the bed-head.

Case Report

Scene Investigation

The body was found in an isolated house in a country area which was located upon a wolfram mine (mineral deposit). It had already been struck by lightning two years ago. There was a TV aerial, 8-m high, upon the roof (Fig. 1).

The event took place on a late July day. At about 4:00 a.m. that morning there had been a storm with heavy rain and lightning. The majority of the installations in these rural dwellings consist of rubber coated copper conduction wires which are exposed (i.e., not hidden within the walls) as well as some sections of wire which are covered by a plastic pipe (as seen in the photo).

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FIG. 1—*General view of the house with the TV aerial located in the front yard.*

Most of these houses (like the one described) possess a simple fuse-box. The electrical installations of various rooms in the house (kitchen and other bedrooms) were damaged. However, the installations in the room where the accident occurred remained intact. Some electrical appliances (TV and water-heater circuits) were partially burned.

The corpse was lying in a bed in a tidy room. The bed-head was 10 cm away from a wall which had an electric wire, near the surface of the wall but with plastic insulation (Fig. 2).

The wooden bed-head was 2 cm thick and it had an irregular orifice traversing it completely, level with the wire. Some burns were found on the pillow, sheets and mattress (Fig. 3).

Autopsy Findings

External examination showed a superficial injury (abrasion) in the right shoulder, 1 cm in its largest dimension. "Fern-like" cutaneous marks were found in the upper chest wall and, more intensely around the injury on the right shoulder (Fig. 4). When we examined the corpse, rigor mortis had not been established, but the muscles of both arms were vigorously contracted. Internal examination only revealed visceral congestion, but no other relevant findings were found, including evidence of recent or past cardiac disease. Toxicological investigation was negative.

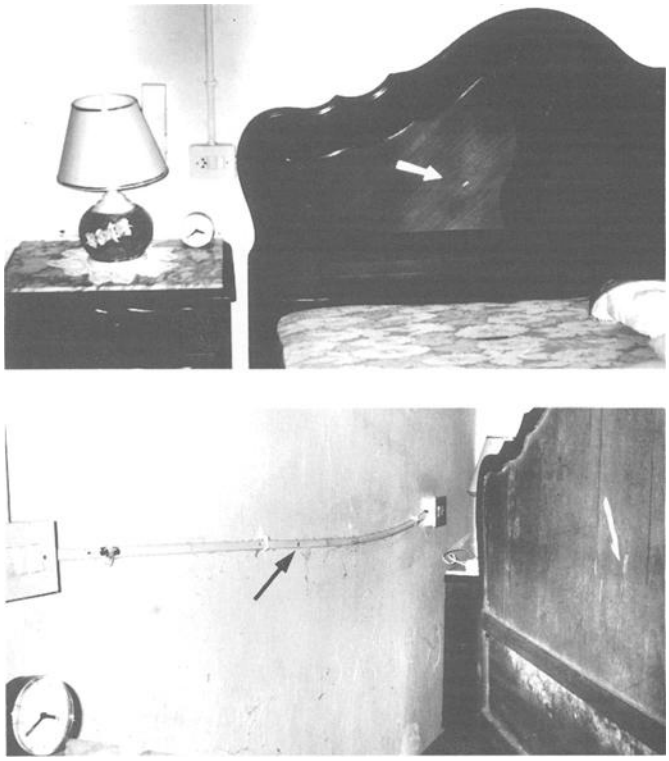

FIG. 2—*Above: white arrow pointing to the orifice in front of the bed-head. Below: This was perforated and the orifice in the back (white arrow) was related to a defect in the plastic insulation (black arrow).*

Comments

Sometimes pathologists use the statistics to put lightning deaths into a remote risk category. However, the statistics should be used carefully, because lightning strikes are common in certain countries and may have medicolegal significance, especially indoors.

Most indoor deaths are related to energization of a house's structure causing current to flow through the victim (3). TV or radio aerials are especially prone to lightning strike because they are usually at a higher level and isolated (4). Some cases have been published concerning individuals who were reached through the telephone (5,6).

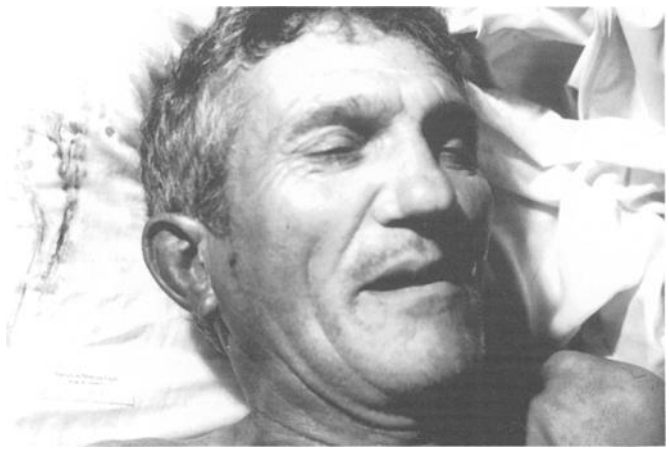

FIG. 3—*Burns in the pillow, at the right of the head, were aligned with the hole in the bed-head and the lesion in the shoulder.*

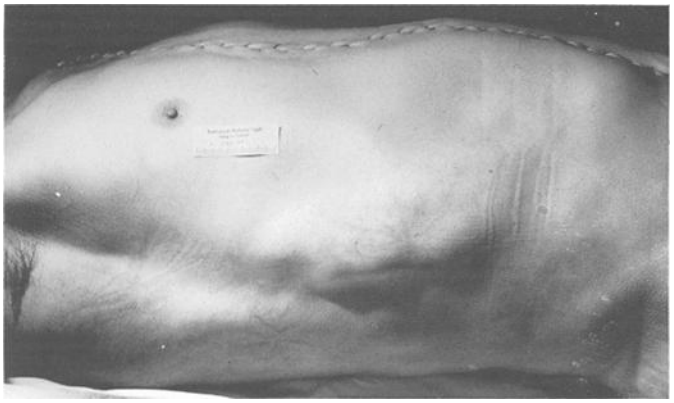

FIG. 4—*"Fern-like" marks in the skin of the right chest wall.*

In our case autopsy findings and scene investigation are equally important. Examination of the scene of death revealed the body lying in bed in a tidy room inducing the pathologist to consider a natural cause of death. Nevertheless, closer examination of the corpse showed a "fern-like" cutaneous mark in the upper anterior chest wall and, especially around the superficial injury at the back of the right shoulder. The muscles of both arms were vigorously contracted, though rigor mortis was not present.

These findings together with the knowledge of the storm at dawn aroused the suspicions of a lightning related death, especially when the house is in a field (7) and as this house had been struck two years previously (8). Considering the possibility that the skin injury on the shoulder was related to the discharge, it was important to relate it to the path followed by the lightning in the room.

Carefully examination of the bed-head showed a perforation of about 1 cm in diameter at the level of the electric wire in the wall. This was interpreted as being caused by the lightning penetrating through the wooden bed-head. We had to hypothesize the formation of a "voltaic arc" from the electric wire to the shoulder through the bed-head, burning the pillow and the mattress.

Because the right shoulder was in the line drawn by the burns on the bed, we think that the injury was caused by the discharge and thus should be considered the point of current entry. Under normal conditions, as in over the desert or the sea, electrical current when rising from ground level, increases in the order of 100 V/m. In extreme conditions such as electrical storms, conditions modify enormously causing a dramatic increase in electrical potential. This potential can sometimes reach electrical break (ray) producing highly elevated currents (in the order of 10.000 or more amps) (9). This situation, which matches a pattern of transitory discharge (10) is very dangerous for any person caught under the influence of such highly charged fields, because currents which exceed the threshold permissible for a human being may be induced into the body. Thus, with regard to the subject in question: He became a "floating" potential in the isolated bed, which in it self implies an increase in the existing electrical field (by a factor of 3 or more). Also, the close proximity of the subject to the earth potential (conducting cables which pass behind the headboard of the bed) allowed the induction of an electrical "break" between the individual and the earth potential (spark) as seen in the photographs, hence, a transitory current capable of reaching considerable intensity was produced. This would have been sufficient to cause death in any case.

Apart from the data described above, autopsy showed no other pathological findings. In the same way, toxicological investigation

was negative. Considering all the above mentioned, the most satisfactory interpretation we can come to is that the death was due to a lightning strike. Concerning the mechanism of death in lightning discharges, both cardiac arrhythmia and respiratory arrest might be considered, the autopsy being of little help in establishing which was involved in this particular case (11).

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