



CLINICAL PRACTICE

When thunder roars – go indoors!

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Lightning is a serious danger, and constitutes one of our country's deadliest weather phenomena. A review of the southern African medical literature shows a paucity of published data on lightning fatalities, with most reports coming from the lay press. A retrospective descriptive study for the period 1997 - 2000 of lightning fatalities on the South African Highveld¹ has shown that area to have a lightning ground-flash density of 6 - 9 flashes/km²/year, with a high incidence of thunderstorm days per year (some 40 - 70) (Tracey Gill, South African Weather Service – personal communication). The mean annual lightning death rate in our country ranges from 1.5 to 8.8 deaths per million inhabitants,² which represents one of the highest rates in the world.^{3,4} When lightning deaths are witnessed, the medico-legal examination is greatly facilitated. However, when such deaths are not witnessed the investigation can be extremely difficult.⁵ In South Africa many non-specialist medical practitioners perform autopsies on lightning-related fatalities, with a resultant lack of uniformity in the medico-legal reporting. A call is therefore made for greater attention to detail in the medico-legal investigation and reporting of lightning-associated deaths. The following autopsy guidelines are suggested.^{1,6-8}

Case history

If a witness is available it is important to ascertain the following: (i) was there a storm?; (ii) was there lightning?; (iii) did the witness actually see the lightning strike the victim?; (iv) was death immediate or not?; (v) where was the deceased at the time of the strike? (e.g. under a tree, on a golf course); (vi) was resuscitation attempted? (vii) what was the activity of the deceased before death?; (viii) a meticulous description of the lightning event must be given; (ix) how many people were involved?; (x) were there any survivors, and if so where are they? (xi) a medical history of the deceased must be taken, specifically any cardiac problems, etc.; and (xii) a history of electrical storm activity should be ascertained from the South African Weather Service, as their recently procured Vaisala state-of-the-art lightning network detection and location

system⁹ should be able to assist with the exact time and location of the strike.

Scene investigation

The following features may be present at the scene: (i) there may be damage to nearby trees, such as splitting or removal of bark; (ii) arc marks may be present on walls or nearby structures; (iii) the ground may display a fern-like pattern; and (iv) the soil may show fulgarite formation, i.e. bore or tube-like structures formed in sand or rock by lightning.

In order to record the case for scientific purposes, a relevant academic institution or other expert in the field should if possible be advised of the incident, especially if there is any suggestion of litigation by a surviving party.

Postmortem examination

A complete postmortem examination should be performed. Special attention should be paid to the following:

1. The external examination should include a meticulous description of the clothing and any evidence of attempted resuscitation.
2. Metal objects may have burned the underlying skin, or may have been marked by the heat of electrical arcing. Metal objects may show signs of fusing, zincification, cuprification and/or magnetisation. Metallic objects such as tooth fillings, spectacles, belts, buckles, coins and pacemakers should be specifically commented on.
3. The type, pattern and distribution of any cutaneous thermal injuries should be noted, including clusters of punctate burns, blisters or charred burns.
4. Rupture of tympanic membranes (use an otoscope) should be noted.
5. Mention should be made of singed and/or scorched hair.
6. Eye signs, such as retinal detachment, should be noted (cataracts can be difficult to demonstrate postmortem).
7. Unique arborescent or fern-like injuries (Lichtenburg figures) should be noted.
8. The procedure for internal examination should be identical to that of any careful forensic autopsy.

Special procedures

The following special procedures may be undertaken: (i) diagrams should be constructed where possible, as graphic

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documentation of electrical injury patterns assists visualisation; (ii) close-up and distance photographs should be taken; (iii) X-ray examination may be helpful;¹⁰ (iv) histological examination may be of assistance;¹¹ (v) toxicology may be useful; and (vi) evidence/specimens should be collected and preserved as equivocal cases may require electrical testing by an electrical expert.

Conclusion

Compared with other parts of the world, South Africa has a relatively high lightning fatality rate.^{4,5} An improved medico-legal investigation will not only facilitate the judicial process, but will also facilitate research, which will hopefully lead to an improved understanding and knowledge of keraunomedicine.^{12,13}

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