

H63 Widespread Polyvisceral Vascular Angiectasias in an Electrocution Victim: A Case Report

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Learning Overview: The goal of this presentation is to show that the combination of particular pathological mechanisms may have been the cause of angiectasias. This histological finding is particularly rare and can provide a valuable aid to determine the true cause of death in victims where electrocution is suspected, but there are no detectable body marks or circumstantial data.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by illustrating that, from a forensic point of view, such a case demonstrates once again that a thorough forensic investigation is mandatory in order to reach a correct cause of death by electrocution. In particular, a histological analysis is always required to highlight infrequent but useful findings.

The aim of this report is to present a case of electrocution death, confirmed by skin electric marks, circumstances, and histological findings showing widespread polyvisceral vascular angiectasias. These findings have rarely been described in literature.

A 57-year-old male, in good health and without any known cardiovascular disease, was hit in the chest by a cable carrying 230 volts while he was working with a colleague inside an electrical substation. The colleague heard a sudden gasp and saw the man slumped on the ground. As the colleague tried to drag the man out of the cabin, the colleague was also hit by the current. The colleague was finally able to remove the man from the location of the incident by pushing him with his feet.

Evidence showed the man was working in the absence of appropriate personal protective equipment and before the fatal event was in a kneeling position, working on the lower part of an electrical cabinet. Emergency medical services came quickly, but the doctor could only ascertain that the death was due to “electric shock.”

The external examination revealed fixed, red-wine-colored hypostases in the posterior regions, conjunctival injection, and cyanosis of the face and the neck. On the left parasternal line, at the height of the sternal handlebar, there was a purplish excoriation with a reddish parchment-like halo, slightly raised, measuring 4.5 x 3cm, compatible with an electrical mark. On the lower limbs, two slightly curvilinear, brown-black, hard, and parchment-like excoriations were also evident, about 10cm to the right and 6cm to the left, compatible with exit lesions.

At the autopsy, numerous sub-pleural petechiae were found bilaterally. The lungs were heavily congested and markedly edematous. Polyvisceral congestion was observed. There were no other macroscopic pathological findings.

Histological examinations documented widespread polyvisceral vascular angiectasia of all the organs. The lungs showed edema, focal atelectasis, vascular congestion, rupture of the septa, and intra-alveolar hemorrhage. The brain parenchyma was markedly edematous. The electrical mark had widespread dermal homogenization with compaction/elongation of the fibroblastic cells and the disappearance of nuclear and cytoplasmic detail. The exit lesions showed large areas of ulceration with disruption of the epidermis and neutrophil infiltrations.

Investigations concluded that the cause of death was an acute cardiorespiratory failure secondary to electrocution.

It is well known that electric current flows along a circuit loop with minimal electric resistance. In the living body, the electric resistance of blood, neural, and muscular tissue is relatively low. According to the scientific literature, electrocution causes endothelial lesions; specifically, it causes the formation of pores in the membranes of the cell bilayer due to a strong increase in transmembrane potentials.¹ Other studies explain how the passage of electricity through tissues causes the release of free radicals, which would damage the tissues themselves, in particular the heart and vessels.² Further studies show that the electrical damage causes a complete loss of endothelial cells, and that the muscle fibers of the media are particularly sensitive to electrical current. As a result, the vessels lose their elasticity and aneurysms could form.³

The combination of these pathological mechanisms may have been the cause of angiectasias. This histological finding is particularly rare and can provide a valuable aid to determine the true cause of death in victims where electrocution is suspected, but there are no detectable body marks or circumstantial data.

To conclude, from a forensic point of view, such a case demonstrates once again that a thorough forensic investigation is mandatory in order to find that the correct cause of death was by electrocution. In particular, the histological analysis is always required to highlight infrequent but useful findings.

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