G10 Contribution of Histo-Pathological Examination in Electrocutions: Report of Two Cases and Review of Literature

Camille Franchet, 1 Avenue du Professeur Jean Poulhès, Toulouse Cedex 9, 31059, FRANCE; Céline Guilbeau Frugier, MD, Service d'Anatomie Pathologique, Hôpital de Rangueil, 1 avenue du Professeur Jean Poulhès, TSA 50032, Toulouse Cedex 9, 31059, FRANCE; Fabrice Dedouit, PhD, Service de Médecine Légale, Hôpital de Rangueil, 1 Avenue du Professeur Jean Poulhès, TSA 50032, Toulouse Cedex 9, 31059, FRANCE; Norbert Telmon, MD, PhD, Service Medico-Judiciare, CHU Rangueil, 1 Avenue Jean Poulhes, Toulouse, F-31054, FRANCE; Daniel Rouge, PhD, Service de Médecine Légale, CHU Toulouse-Rangueil, 1 avenue Professeur Jean Poulhès, Toulouse, 31059, FRANCE; and Bernadette Delisle, PhD, Service d'ANATOMIE PATHOLOGIQUE, Hôpital de Rangueil, 1 avenue du Professeur Jean Poulhès, TSA 50032, Toulouse Cedex 9, 31059, FRANCE*

After attending this presentation, attendees will learn the most specific features and the role of histo-pathological examination in the cases of high and low voltage electrocutions. Furthermore, each lesion will be compared with their main differential diagnoses, especially for the skin examination.

This presentation will impact the forensic science community by a clarification of the most specific features of histo-pathological examination and its medico-legal relevance in cases of electrocutions.

High-voltage electrocution is an uncommon cause of death. Few articles describe histo-pathological findings in deaths by electrocution and those that do usually focus on a single organ, without medico-legal relevance or interest, because of lack of specificity of histo-pathological signs.

Two cases of electrocutions observed in the Medico-Legal Institute of Toulouse Hospital, France are reported. For each case, this study reports autopsical and histo-pathological findings of viscera and skin. A review of the literature concerning the pathological examination of deaths secondary to electrocutions is performed, and establish the contribution of reported findings to the medico-legal purpose.

In the first case, the victim was found lying in a wet footpath near a 380 volts bare electric cable (low voltage), which was on the ground. The autopsy found several burns consistent with electric burns. The points of contact of electric current were on the abdomen and on the right upper limb. Notes was cyanosis of the head and neck and reddish foam in the airway suggesting asphyxia. Each internal organ appeared congested. The pathological examination found some features of electric current marks, particularly an iron deposition in the abdominal burn (identified by the Perl's Prussian Blue staining). This histological finding confirmed direct contact with the electric cable. The lungs presented some features of mechanical asphyxia suggestive of respiratory spasms in the context. The heart showed no signs of ischemia.

The second case concerned a man who was climbing on a metallic ladder to take down a hornet's nest in a tree. According to the eyewitness account, the ladder felled a power line carrying 20,000 volts (high voltage). The man was given emergency treatment and then was sent to the hospital, where he died. The autopsy found electric current marks on the upper and the lower limbs. The left-ventricular myocardium macroscopic examination revealed full-thickness diffuse circumferential hemorrhagic alterations. The pathological examination found a pseudo-asphyxic aspect of the lungs, an ischemic and hemorrhagic aspect of the heart with features of ventricular fibrillation, and distinctive ischemic liver injury. Since there was no doubt about the mechanism of the skin lesions, the electric current marks were not sampled.

A review of the literature had allowed the clarification of the role of the histo-pathological examination in the diagnosis and medico-legal classification of death by electric shock. The pathology of the skin (electric current marks), heart, lungs, and liver were studied in an effort to establish specific criteria defining death by electrocution. It appears that there is no pathognomonic sign of electrocution for each organ individually. However, we establish a list of arguments which, added to the accident investigation data, are highly suggestive of the cause and mechanism of death by electrocution shock. Pathological findings in high and low voltage electrocutions were compared, differences between direct contact with the electric source, and arcing injuries were discussed. Skin metallization is presented as a particularly useful histopathological feature for the diagnosis of electrical burns.

It appears that the histo-pathological examinations, in association with the investigation data and the autopsy findings, are helpful for clarification and determination of deaths when death secondary to electrocution is evocated.

Electrocution, Pathology, Medico-Legal Relevance

 ** Presenting Author*