G33 Killer Hairdryer

Francesco Introna, MD, PhD, Section of Legal Medicine (Di.M.I.M.P.), University of Bari, Policlinico - P.zza Giulio Cesare, 11, Bari, 70124, Italy; Simona Corrado, MD, Section of Legal Medicine (Di.M.I.M.P.), Bari University, Policlinico - Piazza G. Cesare, 11, Bari, 70124, Italy; and Vitantonio Amoruso, Dipartimento di Elettrotecnica ed Elettronica, Politecnico di Bari, Via Orabona, 4, Bari, 70125, Italy*

After attending this presentation, attendees will learn about the silent and invisible nature of electric current injury that requires a thorough investigation of the death scene, to aid in accurately determining the cause of death. In a suspected electrocution in water, if the autopsy fails to reveal indications for an electrocution, a check of the bathtub or pool's electrical system is still in order.

This presentation will impact the forensic community and/or humanity by assisting the forensic community in understanding the important reasons for vigorous investigations of these deaths in bathtub to prevent further injury.

This case consists of the tragic death of a perfectly healthy 9-year-old girl (Proc. N. 2172 / 2004 Court of Trani), with no history of illnesses, congenital or otherwise, who was found dead by her mother, in the bathtub filled of water. The parents reported to the Judicial Authority that it was an unexpected death, excluding the possibility of an electrocution. The findings of the following forensic investigations were unprecedented, both from a legal perspective, as well as from the point of view of the postmortem and histological data gathered.

The external examination of the child's body revealed no traces of traumatic or violent wounds, although two small unusual areas of skin were detected in the lumbar region, which, when substantially enlarged, appeared to be pale and irregular compared with the surrounding skin. The internal examination revealed only a small myocardial dyschromic area under pericardium, a small area of haemorrhage at the level of the lower part of the uterus and a reddish area in region of the vagina.

The histological examinations excluded acute or chronic pathology, revealing indications for an electrocution on the lumbar skin specimens where a palisade-type appearance of the malpighian layer was noted. Furthermore, in the myocardium specimen's bands of contractions and fragmentation and coagulative haemorrhagic intramyocardial necrosis were observed.

This suspicion of an electrocution was not related with the historical and circumstantial facts of the case. The authors suggested that the Judicial Authority obtain a specialist in electrical engineering to perform an examination of the child's home.

The survey of the bathroom revealed the presence of a glazed metal bath and a hairdryer. The examination of the hairdryer revealed that some of internal parts oxidized. The electrical plant of the house was protected only by a thermomagnetic circuit breaker and there was no differential circuit breaker.

In addition to these findings, suspicion for an electrocution was supported by the results obtained by a finite element method simulation, aiming at determining the electric current distribution inside a human body immersed in a bathtub when an electrically connected hairdryer came into contact with the bath water. The simulation showed that when the water came in contact with the electrical part of the hairdryer, the current lines permeate the bath water and go across the human body. The current flows until the thermomagnetic circuit breaker intervenes (i.e. when the total current reaches about 90 A). On the basis of this study, the authors suggest that a lethal fraction of this current went across the little girl body, and therefore across her heart, resulting in a fatal ventricular fibrillation.

Our investigation having been completed, the judicial authority summoned the parents of the child. The parents withdrew their previous statements, and replaced them with a circumstantial and specific reconstruction of the sequence of events immediately preceding the death, which revealed strong indications of fault. Indeed, the parents of the little girl confessed that her one-year-old brother, who had been left alone with his sister in the bathroom, had thrown the hairdryer into the bath in which his sister was immersed.

The JA therefore asked us to establish the cause or the contributory cause of the lack of differential circuit breaker in the electrical plant. The computer simulation allowed us to confirm that the presence of a differential circuit breaker (i.e. when the electrical plant is in compliance with the law) would not have prevented the death of the little girl, since she was immersed in a highly conductive medium.

In conclusion, the case established a grave 'negligence in supervision' by the parents. The fact that the electrical plant did not meet the Standard requirements did not account either for the cause and / or contributory cause of death. In similar cases the use of hairdryers having a full immersion protection plug against contact with water (either in the "on" or "off" position) should be mandatory. The authors also recommend that hairdryers which are not provided with a full immersion protection device be recalled.

Electrocution, Death in Bathtub, Electric Mark

 ** Presenting Author*