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Suicidal electrocution: a report of three unusual cases

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SUMMARY

Electricity is a modern technology that can be used as method of suicide. Authors presents three cases of suicidal electrocution. The first case is a 55-year-old man who wrapped his chest and arms with electrically active wires connected to a timer. In second case, a 69-year-old man constructed electric mechanism from a disassembled extension cord. The last case describes a 53-year-old woman who was found dead in a water-filled bathtub.

Keywords: electric current – suicide – electrical marks – electricity

Samovražedné úmrtia elektrinou: tri neobvyklé kazuistiky

SÚHRN

Smrť spôsobená účinkom elektrického prúdu sa v súdnolekárskom kontexte objavuje najčastejšie v súvislosti s náhodnými úrazmi v domácnosti alebo v pracovnom prostredí. Neodbornou manipuláciou s elektricky aktívnym vodičom, prístrojom či vodivou časťou predmetu dochádza po prekonaní odporu kože a tkanív v mieste vstupu ku prechodu telom pozdĺž periférnych nervov a ciev. V mieste vstupu a výstupu prúdu dochádza vplyvom termického pôsobenia ku vzniku tzv. "prúdových známok". Najnebezpečnejší je striedavý prúd s frekvenciou 50 – 300 Hz, bežne prítomný v elektrických zásuvkách. Napriek dostupnosti elektrického prúdu takmer v každej nehnuteľnosti je využitie elektriny ako spôsobu samovraždy raritné. Autori prezentujú tri prípady raritnej samovraždy s pomocou elektrického prúdu. Prvý prípad dokumentuje úmyselnú smrť 55-ročného muža, ktorý si omotal elektrické drôty napojené na časovač okolo trupu a hornej končatiny. V druhom prípade 69-ročný muž skonštruoval z predlžovacieho kábla samovražedný mechanizmus s vyvedením elektricky aktívnych drôtov pripojených na hrudník. Kombinácia samovraždy a elektriny je u žien špecifická pre jej využitie v kúpeľňovej vani. To potvrdzuje posledný prípad 53-ročnej ženy, ktorá ukončila svoj život práve týmto spôsobom. Autori poukazujú na skutočnosť, že osoba môže byť v čase nálezu súčasťou elektrického okruhu, čo môže byť nebezpečné aj pre súdneho lekára či vyšetrovací tím polície. Prítomnosť odborníka z oblasti elektrotechniky pre zabezpečenie miesta nálezu a jeho profesionálne vyjadrenie sú dôležité súčasti vyšetrovania okolnosti smrti jedinca.

Kľúčové slová: elektrický prúd – samovražda – prúdové známky – elektrina

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Electrocution constitutes a specific part in forensic pathology (owing to the technical background of the electricity). Fatalities caused by electrocution are usually accidental, happened in both domestic and industrial environments. These situations are more common in developing countries than in industrialized ones. Nevertheless, death due to electrocution is considered infrequent in forensic autopsy practice (1). The determination of death due to the passage of the electric current through the human body might be difficult task even for experienced professionals (2,3). Autopsy findings resulting from electrocution are rather non-specific and fatal electrocution may occur with no skin mark whatsoever (e. g. electrocution in water) (4,1). In cases in which the electrodes are fixed in the genital, anal region or to the nipples, the possibility of an accident within the autoerotic practices also must be considered (5). In such fatalities ("electrophilia"), pornographic material might be found at the scene and, naturally, an electrical mark may not be externally pronounced or is located on intimate body parts (6,1). Homicide and suicide attempts are also occasionally committed by electricity. In cases of suicides, circumstances and sophisticated mechanisms confirm electricity as method of suicides. However, suicidal electrocution in water-filled bathtub can sometimes arouse suspicion of accidental insult or even a murder (1). In the presented paper, authors present three unique cases of suicidal electrocution with different types of used mechanisms. The first case describes a 55-year-old man who was found dead with his chest and left arm encircled in electrically active wires connected to timer. In second case, a 69-year-old man constructed deadly electric mechanism from a disassembled extension cord. Two electric wires connected with aluminum pieces of sheet metal were attached to the skin of his chest (placement as AED electrodes). The last case describes a 53-years-old woman founded in a filled bathtub with a hairdryer on.

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CASE REPORTS

Case 1

The body of a 55-year-old man was found in the living room. The naked chest of the deceased was wrapped around with bare ("naked") electric cable which was electrically active even

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Fig. 1. The body scene of 55-year-old man. **A:** Position of the deceased at the death scene. **B:** Electric wires connected to timer. **C:** Burns caused by bare electric wire. **D:** Left arm and chest wrapped with electric wire.

during the body discovery, while the cable lead to standard electric plug in the garden (Fig. 1A). Another wire was plugged in the room where the body was found. These two electric wires were attached to the body and connected to timer (set on time which was not corresponding with the real time) (Fig. 1B). The deceased was psychiatrically ill and refused any treatment. It was reported that in the past he threatened to take his life. Blood alcohol concentration of 1.08 g/kg was established using gas chromatography. No other significant substances were detected by postmortem toxicology. Due developed *postmortem* changes, estimated time of death was established to seven to nine days prior to the autopsy. During the autopsy, apart from edematous eyelids, petechial hemorrhages in interlobar lung spaces and burn marks on the skin (Fig. 1C,1D), no other specific pathological changes in visceral organs or tissues were observed or recorded. histological samples were taken from skin lesions, necrotization of the keratin layer of skin and necrotic homogenization in all layers of skin were found. The epidermal nuclear elongation and pyknotic tightly packed epidermal nuclei in skin current marks were visible.

Case 2

A 69-year-old homeless man spent his last money on a rental guest-house week before Christmas. On the day of his planned departure, his body was found with no signs of life lying on the floor. Two electric wires connected with aluminum pieces of sheet metal were attached to the skin of his chest (Fig. 2A,2D). Electrically active wires were excluded from a disassembled extension cord (Fig. 2C). The electric current had flowed through the body for a considerable time - almost all night. According to witnesses, the man allegedly attempted suicide during his stay by electric wires from Christmas tree lights but was caught. His suicide note was found in his rented bedroom (Fig. 2B). Toxicology did not confirm presence of any toxic substances. Under the self-created "electrodes", crater-like skin lesions with the necrotic basis were found. Internal examination displayed subpleural hemorrhages, dilated right part of the heart and pulmonary edema due to lethal ventricular fibrillation.

Case 3

The deceased was a 53-year-old woman (Fig. 3A), who was found lying in a bathtub filled with water with a hairdryer under active electric current, submerged in the water. The deceased was found dressed (underpants and T-shirt) by her husband, who tried to provide first aid, despite the risk of being electrocuted. Electrical contact wounds were situated on the right hand from holding the hairdryer as fatal house appliance. Exit wounds were multiple, located on the chest wall, the left lower limb and in the sacral and lumbar area (Fig. 3B). At autopsy, two chronic duodenal ulcers and pancreatic bleeding with focal necrosis were observed. Chronic gastrointestinal disease with appropriate symptoms (e. g. abdominal pain, loss of appetite, weight loss, wasting organism) could lead to depressive state and be most likely the motive of suicide. Her depressive mood and thoughts were also expressed in her suicide note that was found in her bedroom. The result of toxicological examination was negative.

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Fig. 2. The body scene of 69-year-old man. **A:** Position of the deceased at the death scene. **B:** Suicide note written by deceased. **C:** The electric mechanism constructed by the deceased. **D:** Skin burnt from the attached electrically active aluminum pieces of sheet metal.



Fig. 3. An external examination of the deceased woman. **A:** A 53-year-old deceased woman. **B:** Exit wounds located in the sacral and lumbar area.

DISCUSSION

In the nowadays society, the suicides have become an almost-everyday phenomenon in forensic practice. According to the Slovak National Health Information Center, the rate of completed suicides in 2020 was 489, while the most affected age groups were middle-age men (50 – 59-year-old) and adult women (40 – 49-year-old). There was a significant predomination of male suicides (83.6 %). The most frequent methods of suicide in Slovakia are hanging and jumps/falls from height (7), while suicidal electrocution fatality occurs sporadically. Despite Slovakia being considered a developed country with good availability of electricity, in almost every household, the number of attempted suicides by electrocution has not exceeded the limit of 1% of suicides per year in last 10 years (7). Rarely documented are combined suicides, where electrocution attempt has failed, and another mean of suicide was used afterwards (8). In cases of fatal electrocution, the possibility of an accident in the context of autoerotic practices (electrophilia) must be considered (9).

According to the literature review, individuals committing suicide via direct connection to an electrical outlet are in majority of cases middle-aged male adults and supposed male-to-female ratio is 7:1 (10). There is preponderance of bathtub electrocution associated with females (10). Thanks to moist atmosphere,

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ample water, good earthing through metal taps and pipes, and a wet unclothed body, is a bathroom a common site for electrical tragedies. In less sophisticated cases, it could be difficult to assess whether it a was suicide, an accident or even a murder (1). In Case 3 was suicidal intention confirmed by goodbye letter and third-party involvement was excluded by careful investigation of circumstances and an autopsy performed in detailed way.

The route of electric current in human body is a significant factor for electric shock effect. Most often, electric current enters the body through a hand touching an electrical plug or electrically active appliance, crosses the thorax, which may lead to ventricular fibrillation followed by cardiac arrest (11) and leaves the body via the foot or other hand. The most dangerous pathway is considered to be from right hand to feet, as on this pathway current passes obliquely along the axis of the heart (1). Less common is a situation in which an electric current pass through the chest, therefore the death occurs when the intercostal muscles and diaphragm are contracted and constricted. Infrequent death due to respiratory failure was described in Case 1 and 2. Paralysis of the heart and respiratory center is more often associated with high voltage electrocution (e. g. lightning strike, high voltage overhead line) (11,12,13,14).

Suicidal electrocutions may occur opportunistically by a simplistic contact of the body with the electric current (no complicated electronic circuits involved – Case 3). By contrast, some individuals with certain professional background (occupation) and technical knowledge may construct more sophisticated electrical traps and use specific electrical gadgets (Case 1 and 2). In such cases, the usage of specific appliances (e. g. timer, power switch) or methods for electric effect amplification such as shaving hair in electrocuted region, moistening the skin underneath the electrode are not unusual (14,15,16,17). The use of the time switch (timer) in Case 1 together with assembly of circuit (one wire with stripped insulation, second wire used for grounding) suggest some level of knowledge and technical background of deceased. Sometimes schematic drawings or notes about circuit (16) may be found at the crime scene. In Case 2, disassembled extension cord with two electric wires connected with aluminum pieces of sheet metal, attached to the skin of his chest, suggested at least basic understanding of electrical circuits.

The diagnosis of death caused by electrocution could be determined in some cases only *per exclusionem*. The reason is an uncharacteristic autopsy finding, and the possibility of missing "electrical marks". Histological and histochemical examination may be inconclusive in the case of manual workers due to the thermal or mechanical damage from work (e. g. smiths, mechanics etc.) (18). The essence of the correct determination of the cause of death is a thorough autopsy, examination and documentation of the circumstances by police, and considering the statement of an expert from the field of electrical engineering.

CONCLUSION

To establish suicidal electrocution as a cause of death is always a challenging task. The first step in satisfactorily solving such cases is the cooperation with technical experts on the crime scene. The danger at the body scene may be reversed by disconnecting the electrically active circuit. The demand for examination and analysis of crime scene with professional/expert testimony is indispensable in suspicious electrocutions. Information about the deceased, especially about his/her occupation and leisure time activities can assist to narrow down the options. Detailed autopsy can provide invaluable information about the circumstances of individual's death and can be helpful in further police investigation.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this paper.

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