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Don't put your fingers in the socket

EDITORIAL

CHRISTINA ELISABETH BRUDVIK

christina.brudvik@uib.no
Christina Elisabeth Brudvik, specialist in general medicine and professor at the Department of Clinical Medicine, University of Bergen, affiliated with the Minor Injury Department, Orthopaedic Division, Haukeland University Hospital. She works as a general practitioner at Fana general practice surgery and on-call general practitioner at Bergen Municipality Emergency Clinic.
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Electrical shock should be avoided, even though low-voltage shock is not as dangerous as previously thought.

It is hard to fit your fingers, big or small, in a socket. Even a knitting needle can no longer be easily inserted after the introduction of new child-proof sockets with special barriers. It works if you use two knitting needles at the same time, but even then the earth-leakage circuit breaker will usually shut off the current so you don't notice anything. However, if the earth leakage circuit breaker does not trip, your fingers will clamp around the knitting needles in each hand and conduct the current through your chest. Your body then becomes part of the electrical circuit, with the intensity of the current, exposure time and path of the current determining the severity and location of the injury to your skin, heart, nerve pathways and muscles in your chest and arms.

A distinction is made today between low-voltage and high-voltage electrical systems. The International Electrotechnical Commission (IEC) and the Norwegian Electrotechnical Committee (NEK) define low voltage as up to and including 1,000 volts (V) for alternating current or 1,500 V for direct current (1). The voltage of domestic power sockets in Norway is 230 V. Other European countries use a mains voltage of 400 V and Norway is now making this voltage available in new housing developments. This is the voltage required to charge electric vehicles.

In high-voltage accidents, i.e. at > 1,000 V, from lightning strikes or high-voltage cables, large amounts of energy are transferred in a split second. In low-voltage accidents, the flow of current must last for at least a few seconds to cause serious tissue damage, although cardiac arrhythmias can occur rapidly (1). Superficial skin burns may hide major burns in soft tissue and bone. Seizures, muscle tears, paralysis, compartment syndrome and renal failure due to severe muscle injury (rhabdomyolysis) are other complications requiring treatment (1–4).

«Until recently, hospitalisation was also recommended for low-voltage electrical accidents»

Electrical injuries affect around 3,000 workers each year in Norway (4). Electricians are most at risk, particularly when working with fuse boxes. First aid is given by switching off the current, preferably at the main power switch, and removing the injured person from the power source by pulling them away, grasping them by their dry clothes. In case of high-voltage injuries, this can be risky even if good insulation is provided by rubber gloves and rubber boots (5,6).

Patients exposed to high-voltage current need immediate life-saving first aid and hospital admission. Until recently, hospitalisation was also recommended for low-voltage electrical accidents (2). However, hospitals gave feedback that this would be too resource-intensive and that adequate medical assistance could be provided at a lower treatment level, such as via the emergency medical telephone number, from a general practitioner or the emergency primary care service. Therefore, after conferring with the Norwegian National Institute of Occupational Health, (STAMI), the recommendations were changed so that 'medical assistance' should be sought if the person has been exposed to electric current through the cardiac area/upper body, has lost consciousness, feels dazed or unwell following the accident, burns or signs of paralysis, balance problems or numbness (4–6).

The electrical industry has long been concerned that this relaxation of the requirement for hospitalisation would lead to poorer medical follow-up. This is hardly the case now that intermunicipal emergency primary care services, 24-hour municipal acute care units and prehospital care departments at hospitals are able to observe patients with ECG monitoring and laboratory services.

Svendsen et al. are now publishing a retrospective review of 210 patients with low-voltage electrical injury in the Journal of the Norwegian Medical Association (7). Very few children, elderly patients or patients with comorbidities were included, but nevertheless the study confirms a very low risk of complications. Normal or unchanged ECG findings at an early stage predicted the absence of subsequent arrhythmias. The number of incidental ECG findings was similar to that seen when screening healthy individuals, and resolved spontaneously. Serum creatine kinase levels never reached the thresholds for rhabdomyolysis (10,000 U/L) requiring forced diuresis (3,8) and were equal to levels observed following strenuous weight training (8).

In a busy clinical workday, we perform many unnecessary routine examinations for fear of missing something (9). This is why the study by Svendsen et al. is important. Along with previous review articles and evidence-based recommendations (1,2,5), their article makes us more confident that relatively straightforward examinations and short observations in prehospital settings are adequate for most patients exposed to low-voltage current. However, prevention is always better than cure, and it is still important to avoid electrical shock.

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