Knight's Forensic Pathology

CHAPTER 12

# Electrical Fatalities



The passage of a substantial electrical current through the tissues can cause skin lesions, organ damage and death. This injury is commonly called 'electrocution', though some would use this term only if death occurs. Fatalities are usually accidental, in both a domestic and industrial environment. They are more common in developing than in industrialized countries. Suicides from electricity are relatively rare. Homicide is rare but is recorded and, in the USA, electricity has again become a means of judicial execution since 1976, and was in 2010 in use in nine states.[1]

## Physical factors

The severity of tissue damage 'including death' is directly related to a number of physical factors, which include current, voltage, resistance and time. For biological damage to occur, the body must be incorporated into an electrical circuit, so that there is a passage of electrons through the tissues. A mere accumulation of electrons in the form of a static charge can do no harm; scientists in the ball of a Van de Graaf static generator may be at a potential of more than a million volts (V), but experience nothing other than their hair standing on end. Similarly, a person outdoors in a thunderstorm may accumulate a high charge from the capacitance effect of an overhead cloud but, unless the insulation of the air breaks down to allow a lightning strike at or near the person, no ill-effects will occur.

In electrocution there must be a pathway for electrons across part of the body which, in fatal cases, contains vital structures. The current enters at one point (most often a hand being used to hold, touch or manipulate some electrical device) and then leaves the body at an exit point, usually to the earth or the neutral conductor of the electricity supply. The pathway of the current will depend mainly on the relative resistance of various potential exit points. It tends to take the shortest route between entry and best exit, irrespective of the varying conductivity of different internal tissues. If a person places a finger on a 240 V conductor while standing with damp shoes on a wet concrete floor, then an appreciable current will pass from hand to feet, with possibly fatal results. If, however, the person is standing on a carpeted upstairs wooden floor, the poor earth return will allow only a small current to flow and all that may be suffered is a painful muscular spasm.

In another variant of the upstairs scene, should the neutral wire of the supply be touching the skin of the same finger a few centimetres away from the live conductor, a severe local burn may occur but no danger to life, because the high resistance through the feet to earth will prevent any significant current flow passing through the thorax.

Should the person upstairs happen to be turning a bath tap with the other hand, the contact with the opposite finger would allow a current to pass to earth via the tap and metal water-pipes from hand to hand across the thorax – an extremely dangerous position.