G49 Wrist Fracture Resulting From an Accidental Electric Shock in a 6-Year-Old Girl

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After attending this presentation, attendees will be aware that low-voltage current exposure may cause radius fractures in children, due to a tetanic contraction of the forearm muscles.

This presentation will impact the forensic science community by raising awareness of the need of a radiographic evaluation in a victim who has been exposed to a low-voltage electric shock and who's complaining of a bony or a joint pain, even in the absence of a direct blunt trauma or a fall.

A 6-year-old girl was admitted to the emergency room with right wrist pain about one hour after sustaining an electric shock. She reported getting a shock associated with a burning sensation as she touched, with her right hand, a street lamp supplied by a 230V alternating current, while she was holding onto a metal bicycle rack with her left hand. Both hands were wet. Her father, who witnessed the scene, said she had managed to pull her hands free within seconds of the shock and that she had not fallen or lost consciousness. A few minutes after the accident, the child began to complain of pain in her right distal forearm.

The patient was evaluated by a pediatric physician and an orthopedic surgeon. She was conscious and had normal vital signs. Small, whitish, round and indurated skin lesions with a darker central depression were noted on the palmar aspect of the fingers of her right hand. They were consistent with electrical burns, and especially with entry points of the current, also known as "electric marks of Jellinek." Examination also revealed a right swollen and tender wrist with a normal range of movement. There was no open wound or bruising of the wrist. No anomaly was found after a complete physical exam, including a careful examination of the rest of her skin and extremities, looking for an exit point of the current.

The electrocardiogram and the biological check-up, including cardiac enzymes, were normal. However, X-rays showed an incomplete fracture of the distal metaphysis of the right radius with an anterior displacement. A circular forearm plaster cast was applied for three weeks. The girl was monitored and observed for 24 hours in the hospital before being discharged.

Because bones have high resistance compared to surrounding tissues, fractures are usually seen with high-voltage current exposure (over 1000V) or with additional traumas, such as falls. However, some cases of fractures resulting from electric shocks without any direct trauma and involving low-voltages have been reported in the literature. They usually involve bones of the proximal appendicular skeleton like the scapula, the proximal humerus (sometimes associated with a posterior luxation), or the femoral neck, which are surrounded by large muscle bulk. Vertebral fractures have also been described. These fractures occur as a result of a violent and involuntary muscle contraction. In this case, the torus (or buckle) fracture was caused by a spasm of the forearm flexor muscle group.

Interestingly, only four cases of radius fracture resulting from accidental electric shock have previously been reported in the literature, all of them involving pediatric patients.[1-4] This case is the youngest ever reported. Children's vulnerability to this type of fracture may be explained by low bone strength close to the epiphyseal growth plate.

Even if rare, the possibility of a radius fracture should always be considered and a radiographic evaluation be recommended in a child who has been exposed to a low-voltage electric shock and who's complaining of a pain in his forearm, even in the absence of a fall.

References:

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