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Bilateral scapular fractures following low voltage electrocution

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Abstract

Musculoskeletal injuries following low voltage electrocution are extremely rare. We present the case of a 54-year-old gentleman who had an accident while working with 240-volt live wires. The absence of any associated trauma should not rule out the presence of scapular fractures in such cases.

Keywords

Bilateral scapular fractures; low voltage electricity; electrocution.

Case history

A 54-year-old gentleman was working with 240-volt live wires. He accidentally brushed a wire with his right hand and then tried to free himself with his left. He remained stuck for a moment before stumbling backwards. He denied any direct trauma to his back.

On arrival in the casualty trauma bay his only complaint was of excruciating upper back pain. Initial assessments of airway, breathing and circulation were normal. His vital signs were: pulse 90/min, blood pressure 122/89 (left brachial) and 133/88 (right brachial) mmHg, temperature 37 °C, oxygen saturation 99% with a non-rebreathing mask at 10 l/min oxygen flow. His Glasgow Coma Scale score on arrival was 15 and remained so with no signs of head injury or focal neurological signs.

On further examination he had partial thickness burns to his right hand with full range of movements and sensation. Inspection of his back was unremarkable though it was very tender on palpation in the scapular, interscapular and infrascapular areas. Passive movements of both shoulder joints were extremely painful. Trauma series radiographs of the cervical spine and the pelvis were normal. A portable chest radiograph showed probable scapular discontinuity on one side. A 12-lead electro-cardiogram showed sinus tachycardia. A standard run of blood tests results were all normal apart from the creatine kinase which was elevated at 647 i.u./l.

The patient required large doses of opiates for pain control and later scapular radiographs and CT of his chest (Figs 1 and 2) confirmed bilateral scapular fractures. He was referred to a tertiary centre for definitive management.

Discussion

The effects of electricity on the body are determined by seven factors: (1) type of current; (2) amount of current; (3) pathway of current; (4) duration of contact; (5) area of contact; (6) resistance of the body; and (7) voltage. For a 1 s contact time, a current of 1 milliampere (mA) is the threshold of perception, a current of 10–15 mA causes

Fig. 1. CT of the left shoulder showing fractured scapula.

sustained muscular contraction, a current of 50–100 mA results in respiratory paralysis and ventricular fibrillation, and a current of more than 1000 mA leads to sustained myocardial contractions. The tetanising effect of alternating current on voluntary muscles is most pronounced in the frequency range of 15–150 Hz (associated with 120–240 voltage in commercial use)[5].

Bilateral scapular fractures are seen in victims of major trauma such as road traffic accidents[1]. Case reports in the literature are scarce regarding low voltage electrical injuries and bony injuries. They are thought to arise from the tetanic pull of large

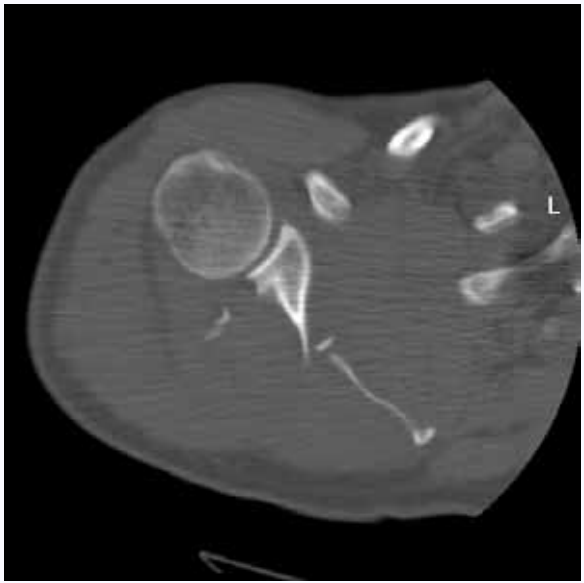

Fig. 2. CT of the right shoulder showing fractured scapula.

muscle bulk and therefore susceptible areas are the proximal femur and humerus, vertebrae and scapulae[3]. The scapulae have multiple muscle attachments, both origins and insertions. Could it be possible that the alternating current (at low voltage and low frequency) causes independent tetanic contractions of these muscles and therefore the fractures? Such isolated electrical injuries were, in fact, more frequently seen as a result of electroconvulsive therapy. Dislocation of the shoulder is a more common form of injury seen after upper limb electrocution and it is not clear why this did not happen in this case.

Teaching points

1. Significant disability has been found in patients with displaced scapular spine and neck fractures, primarily pain at rest in 50–100%[4].
2. The attending physician of a victim of low voltage electrical injury should have a high degree of clinical suspicion with regard to these injuries[2].
3. Pain, bony or soft tissue tenderness and limited degree of mobility are pointers towards fractures[2].

Financial interests

None.

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