Postgraduate Medical Journal (February 1984) **60**, 143–144

Progressive muscular atrophy and posterior dislocation of the humerus following electric shock

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Summary

A case of progressive muscular atrophy of one limb and posterior dislocation of the humerus following electric shock is described.

KEY WORDS: electrocution, myelopathy.

Introduction

The hands are frequent sites of contact in electrical accidents and when the current travels from one hand to the other, spinal cord damage with radiculopathy may occur (Farrell and Starr, 1968).

The case reported illustrates an unusual form of spinal involvement and an uncommon skeletal complication following electrocution.

Case report

A 34-year-old man received an electric shock (240 volts A.C.) in his right hand from a faulty domestic power drill, the current earthing through his left hand. Tetanic muscle spasm prevented him from releasing the drill for approximately 15 sec, causing severe pain in his neck and left shoulder. For several days he experienced muscle spasms throughout his left arm and neuralgic pain radiating down the lateral aspect of his left forearm and into his thumb. After 3 weeks, progressive weakness with muscle wasting developed in this limb and movement of his left shoulder became painfully restricted.

On the day of the accident, he attended a Casualty Department where no clinical deficit was found. Re-examination 5 weeks later revealed weakness and wasting of the spinati, deltoid, triceps, biceps and brachioradialis muscles with exaggerated tendon reflexes in the left arm and a positive left Hoffman's reflex in his left hand. There were no long tract signs in the lower limbs. Passive movements of his left shoulder were restricted, particularly internal and external rotation.

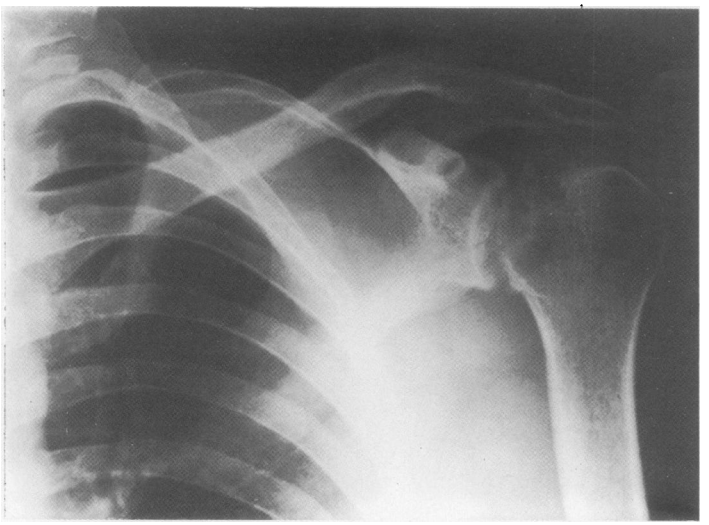

FIG. 1. Compression fracture of head of humerus following electric shock.

An X-ray of his left shoulder showed an unreduced posterior dislocation of the glenohumeral joint with a resultant compression fracture of the humeral head (Fig. 1). Electromyography demonstrated widespread denervation in the wasted muscles of his left arm. Sensory and motor nerve conduction velocities were normal in the median and ulnar nerves.

Four months after the accident his neurological deficit remains unchanged. Because of the delay between the injury and the subsequent diagnosis of his shoulder dislocation, he required open surgical reduction to return functional alignment of this joint.

Discussion

When an electric current passes from limb to limb, injury to the spinal cord may induce the syndromes of progressive muscular atrophy, amyotrophic lateral sclerosis or transverse myelitis (Farrell and Starr, 1968). Current passing from one hand to the other typically affects the fourth to eighth cervical spinal cord segments and wasting of muscle groups supplied by the upper segments follows after a latent period which varies from a few days to several months (Vincent, 1981). The wasting is usually in the electrocuted limb, but may occasionally develop bilaterally (Vincent, 1981). Restriction to the 'opposite' limb, as in this case, has not been reported previously.

The mechanism by which electrical current causes neurological injury remote from the site of contact is not clear. Nervous tissue offers the least resistance to the passage of electricity from an extremity and pathological studies in such cases have demonstrated that, when damage occurs in the spinal cord, there is preferential destruction of the anterior horn cells and less severe degeneration in the spinal tracts (Levin *et al.*, 1975). An increase in blood pressure during tetanic muscular contraction has been advanced as a cause of rupture of small spinal vessels with associated ischaemic lesions in the cord (Christensen *et al.*, 1980). An alternative explanation is that vascular endothelial cell damage, which follows electric shock, impedes blood flow in the affected spinal segments (Farrell and Starr, 1968).

Bone fractures and joint dislocations including posterior dislocation of the humerus (McLaughlin, 1952) are known to occur as a result of forceful muscle contractions during electrocution. Posterior dislocation of the humerus is frequently missed in the initial examination because the anatomical displacement maintains a 'normal' shoulder alignment both clinically and radiologically. In these circumstances axillary radiographs are diagnostic (McLaughlin, 1952).

It is important that doctors involved in the primary assessment of such patients should be aware of this skeletal complication and of the need for its early treatment.

Acknowledgments

We are grateful to Mr W. M. Steel, F.R.C.S., for advice on orthopaedic management and operative treatment.

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(*Accepted* 9 *March* 1983)