A heroine addict with focal weakness

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A 24-year-old female with 5 year history of heroin abuse experienced painless stiffness of elbow joints and weakness of shoulder and upper limb muscles. She was injecting herself 4-6 times daily alternatively in the upper extremities, sparing the lower limbs. Electromyography (EMG) showed myopathic changes in clinically affected and unaffected muscles. Magnetic resonance imaging (MRI) revealed muscle fibrosis in directly injected muscles, whereas in subcutaneous fat and within muscles of anterior and posterior compartments of both thighs, not directly injected, there were signal changes supportive of oedema and inflammation. EMG and MRI were congruent in showing abnormalities in muscles not directly injected, suggesting long distant effects of heroin or adulterants with a mechanism either toxic or immunologically mediated.

Key words: Heroin myopathy, focal myopathy, muscle fibrosis

The earliest reports of muscle fibrosis at sites of intramuscular opioid injection involved pentazocine; a proposed mechanism was focal precipitation of acidic drug (1, 2). Human and animal studies demonstrated that heroin may cause fibrotic myopathy, similarly to pethidine, pirimidamide, and meperidine (1, 2) in muscles chronically injected.

Case report

A 24-year-old female with unremarkable personal and family history who experienced over 6 years painless stiffness of elbow joints, weakness of shoulder and upper limb muscles. The patient was injecting heroin 4-6 times daily in her upper extremity muscles alternatively, from the age of 16 to 21 years. She denied injections in lower extremities, alcohol or oral drug consumption. Neurological examination revealed normal cranial nerves, bilateral scapular winging, compensatory hypermobility of scapulo-thoracic joints, wasting and stiffness of rhomboid, pectoralis, deltoid, biceps, and triceps muscles with strength graded 0-1 bilaterally (MRC scale). Hand and lower extremity muscle strength was normal (Fig. 1A, B). The patient could not bend elbows due to joint contractures. Deep reflexes were weakened; sensibility and coordination were normal. Negative laboratory results included blood cell count, sedimentation rate, thyroid function, B12 levels, serum protein, HIV1-2, anti-nuclear antibody, extractable nuclear antibody, complement C3, C4, chest X-ray. The patient refused muscle biopsy. Genetic tests for Facio-scapulo-humeral, Becker and limb-girdle muscular dystrophy 2A were negative. On electromyography (EMG), the infraspinatus, rhomboid, deltoid, biceps and triceps muscles showed fibrillations, reduced recruitment pattern on effort, polyphasic motor unit potentials (MUPs) of short duration, often not approachable due to fibrous resistance to needling. Medial, lateral vastus, rectus femoris and soleus EMG showed spontaneous activity at rest, complex MUPs of small amplitude and short duration, poor recruitment on effort. Ulnar, peroneal, tibial, sural conductions were normal. Magnetic resonance imaging (MRI) of upper limb muscles revealed, as expected, areas of low signal intensity on T1-weighted images due to fibrous replacement of muscle (2-4). In subcutaneous fat, within and around muscles of anterior and posterior compartments of both thighs, there were on T2-weighted and short-tau inversion recovery images (STIR) areas of increased signal intensity, in keeping with muscle edema and inflammation (5) (Fig. 1C, D, E, F). Oral prednisone (1 mg/kg/daily) given for 8 weeks had no effect. A second EMG on previously tested muscles confirmed, at 24 months, the presence of small, brief polyphasic MUPs, reduced recruitment pattern, in absence of spontaneous activity.

Discussion

Focal upper limb muscle weakness and atrophy beginning in adulthood has broad differential diagnosis, that includes limb-girdle dystrophies, spinal muscular...
Atrophy, polymyositis (1, 2). Previous reports (1, 2) described a myopathic pattern in two heroin addicts, likely related to repeated intramuscular injections. The alcoholic, HIV positive patient, reported by Louis et al. (1), developed after 43 years an atrophic fibrotic myopathy, affecting selectively shoulder muscles. The case reported by Weber et al. (2) exhibited over 6 months a biopsy proven myopathy, responsive to steroids and penicillamine; in the biopsy there were atrophic fibers, lymphocytes, macrophage perivascular endomysial infiltrates, endomysial fibrosis, ongoing regeneration during recovery phase. In both cases (1, 2) there were joint contractures, minimal muscle weakness, mildly elevated or normal CK; the muscles distant from sites of injection were clinically unaffected or not examined. Leading signs of our patient were selected upper limb weakness and stiffness, minimal muscle weakness, mildly elevated or normal CK; the muscles distant from sites of injection were clinically unaffected or not examined. Leading signs of our patient were selected upper limb weakness and stiffness, normal CK, myopathic EMG changes also in muscles distant from sites of injection. EMG and MRI were congruent in showing abnormalities in lower limbs, suggesting long distance effects of circulating heroin or adulterants (1, 2).

Acute diffuse rhabdomyolysis, unrelated to coma and to nerve or muscle compression, has followed intravenous self administration of heroin, some times in the same patient (1). Six cases reported by Dabby et al. (6) developed acute peripheral nervous system injury – 5 of them associated with rhabdomyolysis – 4 following intravenous heroin and 2 after intranasal self administration. Four cases of the same series had plexopathy and 2 a symmetric distal sensorimotor axonal neuropathy, noticed 3-36 hours after heroin administration. The AA proposed a toxic mechanism to explain the appearance of such non compression acute neuropathies. Evidence of an immunologic cause has been found in patients reported by Mielke-Ibrahim et al. (7) and by Herdmann et al. (8). The patient described by Gupta et al. (9) presented kidney failure, transverse myelitis, rhabdomyolysis, following naive smoked heroin probably related to hypersensitivity reaction.

It remains uncertain whether the mechanism of muscle injury in heroin abusers is toxic per se or immunologic mediated, a specific consequence of injection, or of heroin itself or of substances added as adulterant (1, 2, 6-9). Opioids may affect the immune system modulating the response of T-lymphocytes and the secretion of interleukins (IL); in heroin-treated mice, the production of IL-1β, IL-12, nitric oxide is enhanced while the level of anti-inflammatory cytokines IL-4 and IL-10 is decreased (3, 4). Opiates act at different levels, directly, through opioid receptors on lymphocytes and macrophages or through the nervous system. Details of pathogenic mechanism by which heroin induces myotoxic effects are still unknown. In experimental animals, the most striking pathological feature was the presence of eosinophils suggesting a hypersensitivity reaction and homogeneous mass of hypercontracted myofibrils in degenerated fibres (3, 4). Heroin myopathy (HM) does not affect equally all muscles. Vulnerability may depend on the amount of regional capillaries and the fiber type predominance (3, 4). Interestingly, rats receiving repeated intraperitoneal injection of pure heroin over several months, developed degenerative and regenerative abnormalities in soleus, mostly composed by type I fibers, but not in the anterior tibialis muscle, composed by type II fibers (1, 3, 4). Peña et al. (3, 4) concluded that HM is caused by an altered cell membrane transport and energy, resulting in a myofibrillar hypercontraction. HM can recover in early stages. It remains unclear whether there is a threshold in number, frequency and lasting of exposures leading to myotoxic effects (1, 4).

References

1. Louis ED, Bodner RA, Challenor YB, et al. Focal myopathy induced by chronic intramuscular heroin injection. Muscle Nerve 1994;17:550-2.

2. Weber M, Diener HC, Voit T, et al. Focal myopathy induced by chronic heroin injection is reversible. Muscle Nerve 2000;23:274-7.
3. Peña J, Luque E, Aranda C, et al. Experimental heroin-induced myopathy: ultrastructural observations. J Submicrosc Cytol Pathol 1993;25:279-84.

4. Peña J, Aranda C, Luque E, et al. Heroin-induced myopathy in rat skeletal muscle. Acta Neuropathol 1990;80:72-6.

5. Costa AF, Di Primio G, Schweitzer ME. Magnetic resonance imaging of muscle disease: a pattern-based approach. Muscle Nerve 2012;46:465-81.

6. Dabby A, Djaldetti R, Gilad R, et al. Acute heroin relate neuropathy. J Periph Nerv Syst 2006;11:304-9.

7. Mielke-Ibrahim R, Deppe W, Lucking CH. Brachial plexus lesions and rhabdomyolysis following heroin abuse. Indication for an immunological cause. Dtsch Med Wochenschr 1995;120:55-9.

8. Herdman J, Benecke R, Meyer BU, Freund HJ. Successful corticoid treatment of lumbosacral plexus neuropathy in heroin abuse. Clinical aspects, electrophysiology, therapy and follow-up. Nervenarzt 1998;59:683-6.

9. Gupta A, Khaira A, Lata S, Argwal SK, Tiwari SC. Rhabdomyolysis, acute kidney injury and transverse myelitis due to naive heroin exposure. Saudi J Kidney Dis Transpl 2011;22:1223-5.
