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Veterinary and industrial high pressure injection injuries

Need swift diagnosis and decompression

Injuries to the hands caused by industrial high pressure injections have been reported since the 1930s. Rees first described the condition in 1937, the injury seen arising from a diesel engine injector system.¹ Only in the late 1950s, however, did the widespread use of high pressure paint sprays and hydraulic systems increase the incidence of these types of injury. Veterinary high pressure injection injuries have received less attention, although many pose similar problems to those caused by industrial high pressure equipment.

When a high pressure injection injury occurs the kinetic energy absorbed by the tissues is substantial and the toxic material is often driven from fingertip to palm: 45% of patients seen over a five year period at our centre required a decompression that extended proximal to the carpal tunnel at the wrist. Injuries in which an irritant material (such as oil based paint) is injected have a particularly poor prognosis even with prompt exploration and debridement. Amputation of the finger is often required in these cases.²

The most common veterinary injuries involve chicken vaccine, in which the dose of inoculant is small (0.5 ml). Larger animals require larger doses (2 ml for pigs), and injuries involving such volumes can be difficult to manage. Animal vaccines often contain an oil base which prevents their rapid absorption into the surrounding soft tissues after inoculation and thus allows for a greater antibody response. When injected into a confined space, however-for example, a tendon sheath or pulp space-the inoculant may not be readily absorbed. An overwhelming inflammatory reaction to the chemicals may also occur and result in the formation of an abscess. The chemicals may also cause acute vasoconstriction of the surrounding vessels. Together, these factors can cause ischaemia and chemical necrosis. If the hand is accidentally inoculated it is easy to see how a local overwhelming inflammatory response may cause necrosis distally. The key to these injuries is swift managing diagnosis and decompression,³⁴ but delays remain common. Fortunately, workers using high pressure systems are now much more aware of the hazards of injection injury than in the past and may present to an accident and emergency department with literature relating to the injected material.

The diagnosis is usually evident in veterinary cases, but diagnostic problems may arise in industrial injuries when the patient does not appreciate that an injection has occurred. If the pressure from a leaking hydraulic system is high enough, intact skin can be penetrated even without direct contact between hand and hose. The injected part usually becomes swollen and inflamed within hours. A pinhole injury to a finger or hand that may exude fluid will give a clue to the cause of injury. A careful history will usually reveal the diagnosis in these cases.

Urgent exploration is required in all industrial cases, with the exploration extended as widely as necessary. The doctor usually has no measure of the volume of material injected in industrial cases, though that information is available in veterinary inoculation injuries. Because of the small volume injected, injuries caused by injection of chicken vaccine sometimes resolve satisfactorily without exploration and are simply treated with anti-inflammatory drugs or corticosteroids.⁵ If this option is considered the patient will require close observation in hospital and will need swift local decompression if swelling and inflammation extend. Alternatively, immediate local decompression may be preferred, with removal of necrotic fat and some of the mineral oil. The wound should be loosely sutured to permit discharge of serum and oil into the dressings. The hand must be elevated on a volar slab in the position of function (metacarpophalangeal joint flexion and interphalangeal joint extension). Physiotherapy should be started early.

Clinical studies are not extensive, but our review of industrial injection injuries suggests that prompt diagnosis and early decompression offer the best prospects of digit survival. Experience of injuries caused by the high pressure injection of vaccines for larger animals is even more limited, but our experience suggests that these cases should be managed in a similar way to industrial injuries involving an oil based material. A 2 ml dose of vaccine injected into the finger at high pressure may spread widely, so early extensive decompression and debridement is required, with postoperative management similar to that for more local debridement.

Amputation, however, may still be necessary in some cases. In a recent case swift exploration and debridement failed to control the damage to a farm worker's non-dominant thumb caused by injection of 2 ml of oil based parvovirus vaccine. In the following months the patient suffered repeated episodes of inflammation that were not controlled by further debridement. No organism was implicated, and the inflammation was thought to be a response to the mineral oil. Amputation at the carpometacarpal joint was required several months after the injury to control the pain and recurrent inflammation.

Those who have experience of injuries caused by high pressure injection of animal inoculants are encouraged to share their knowledge of the treatment and outcome of their cases with the Veterinary Medicines Directorate (Woodham Lane, New Haw, Addlestone, Surrey KT15 3NB), which is interested in gaining a broader knowledge of these problems.

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