



## Help! I've shot myself... with a paint gun!

Jane Anne Howard, PGY1; and Bijon Das MD, CCFP(EM)

### Rick's case:

- A 49-year-old, right-hand-dominant man, who works aboard a passenger ship, presents to the ED almost 20 hours after accidentally firing a 2,000 lbs/inch<sup>2</sup> pressure paint gun into the tip of his right index finger. The paint loaded in the paint gun was a non-lead-based paint
- The accident occurred at 3 p.m. the day prior to his ED visit. Rick rated the pain as 6/10 in intensity and described it as radiating down his right index finger
- Initially, he soaked his finger in salt water and felt some relief. The pain persisted overnight and his finger now feels stiff and numb
- The patient's tetanus status is up to date. He is a 60 pack/year smoker, with a medical history remarkable for mild chronic obstructive pulmonary disease

For more on Rick, see page 4.

### Questions & Answers

#### 1. How should this patient be assessed in the ED?

The major concern in a patient with a high-pressure injection injury is that the innocent appearance of his wound may hide the severity of the injury. A high-pressure injection injury should be considered a potential surgical emergency.

The patient assessment should include:

- a detailed history of the event,
- a thorough physical exam to determine the degree of edema and
- an exam of the patient's neurovascular status.

#### 2. What is the mechanism of injury in high-pressure injection?

In the acute setting, injury is caused by the introduction of a foreign substance under high-pressure into poorly expandable digital tissue. There is acute and chronic inflammation and granuloma formation as a result of the foreign material. Tissue damage results from:

- direct impact,
- chemical inflammation and
- ischemia, secondary to vascular decompression.

Patients will complain of intense pain for four hours to six hours post-injury. Tissue necrosis and distension with vascular compression will inevitably develop in the next 24 hours, resulting in ischemic necrosis and gangrene. The ensuing pain can be unbearable.

Within several days to several weeks, the injected foreign material causes a granulomatous response. Nodules and fibrosis form around the injection site. In time, skin may break down, leading to cutaneous ulceration with the expulsion of debris and injected materials. Bacterial superinfection with skin flora is a common development at this point.



Figure 1 and Figure 2. X-rays of the right index finger revealed paint in the distal phalanx, with no proximal extension. There was no evidence of subcutaneous emphysema.

Dr. Howard is a Student, Dalhousie University; and an Intern (PGY1), Northumberland Family Medicine Teaching Unit, Moncton Hospital, Halifax, Nova Scotia.

Dr. Das is an Emergency Physician, St. Paul's Hospital, Vancouver, British Columbia.

### Rick's case cont'd:

- On examination, the patient was afebrile, his vital signs were stable and he appeared mildly distressed
- The right index finger showed evidence of the injection site at the tip, with a slight gray discoloration surrounding the pinpoint injection site. The index finger was swollen
- The finger was neurovascularly intact, but with some decreased light touch sensation at the tip and global decreased range of motion. There was no evidence of injury extending to the hand or lower arm

### Next steps...

- The plastic surgery department was consulted
- A digital block was used to anesthetize the finger. A Brunner incision was made from the injection site to the metacarpal flexion crease. The wound was explored, irrigated and debrided
- The paint coursed along the ulnar neurovascular bundle to the distal interphalangeal joint. The radial neurovascular bundle was not involved. As much paint as possible was removed from the wound in the ED
- Rick was admitted to the Plastic Surgery department and treated with intravenous antibiotics (ciprofloxacin and clindamycin)

### Remember:

- The innocuous appearance of the wound of a high-pressure injection injury may mask the potential severity of the injury. Without diagnosis and treatment, inevitable necrosis usually destroys tissue viability, leading to amputation

*This department covers selected points to avoid pitfalls and improve patient care by family physicians in the ED.*

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## 3. What important questions should be asked?

During the history, a few main details should be elucidated as they are prognostic factors in patient outcome. The type of fluid injected is important, since paint, paint solvent and paint thinner present the highest risk of early tissue necrosis and gangrene. Grease and oil-based compounds may lead to:


- oligogranuloma and chronic fistula formation,
- scarring and
- loss of digit function.

The amount of fluid injected is also significant, because the amount of fluid injected correlates to the amount of increase in vascular compression.

The pressure of injection is also important, as higher pressures result in greater extension of fluid penetration in the digit and beyond. Perhaps, the most essential prognostic factor is the time between injection and treatment. The highest risk for amputation of the injected digit occurs if debridement is not done within 10 hours of injury.

## 4. How should these injuries be managed in the ED?

ED radiographs should be obtained and broad-spectrum antibiotics (e.g., a first-generation cephalosporin) should be prescribed. Tetanus status should also be determined and parenteral analgesics should be given. The extremity should be splinted and kept elevated.

Emergency care should include plastic surgery consultation for debridement of the injected digit. Prompt surgical debridement optimizes tissue salvage. There are reports that steroids may be of some advantage in cases where an intense inflammatory response develops, or if treatment is delayed. 

### References

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