

# PRESSURE! PUSHING DOWN ON ME, PRESSING DOWN ON YOU THE UNDERLYING DANGER OF WATER PRESSURE INJURIES

Morgan Ritz, M.D., Ana Davitt, M.D.  
Crozer Chester Medical Center

## ABSTRACT

Water pressure injuries are rarely seen in the Emergency Department but have major consequences if underlying injury or extent of the injury is missed or overlooked. Although underlying trauma is normally examined and ruled out by CT scans, initial x-rays can help effectively triage and diagnose deeper soft tissue damage. In this case, initial x-rays in the Emergency Department were able to demonstrate significant soft tissue trauma, thus enabling the patient's treating physicians to quickly initiate appropriate antibiotics and analgesics and begin trauma consultation leading to trauma admission.

## INTRODUCTION

We present a patient with extensive underlying tissue damage diagnosed on initial x-rays after sustaining a power washer injury. We report here how a high-pressure injury with superficial physical exam findings can have significant damage which extends beyond the wound or injury itself secondary to shearing and energy dispersion after the initial insult. Diagnosis of underlying trauma in the Emergency Department is usually completed by CT scans, however we demonstrate that initial use of x-rays can be an efficient way to triage and start appropriate treatment for high pressure/ power washer injuries and to effectively diagnose underlying trauma. This is extremely important in the Emergency Department since one of the important **complications** of pressure injuries includes acute extremity **compartment syndrome**.



## CASE PRESENTATION

32-year-old male presented to the Emergency Department with a chief complaint of **right forearm pain**. The patient, who is **left-handed, was using a pressure washer at work**, about 20 minutes prior to Emergency Department arrival, when it slipped and hit the volar aspect of his right forearm. On arrival, the patient **complained of severe pain** in the volar aspect of his arm extending through his wrist and elbow, which was **made worse with the slightest extension movement**. He held his wrist in a flexed position secondary to pain. Patient noted that he was otherwise healthy and denied any other medical problems. On further questioning he did not know if his tetanus was up to date.

On inspection, the patient endorsed pain from his right elbow down to his hand. He had a **1-2 cm circular superficial wound** to the distal third of this volar forearm without surrounding erythema or edema. He had full range of motion of his fingers, wrist, and elbow. His sensation and motor strength were intact. Due to suspicion for extensive subcutaneous injury at bedside, **x-rays** of the patient's **right arm** were ordered immediately after initial evaluation. Examination of the images showed **extensive subcutaneous air** dissecting through multiple tissue planes extending from his wrist to proximal forearm beyond the patient's superficial wound location. This is a common finding after pressure washer injuries. The patient was then started on intravenous antibiotics along with additional analgesia and trauma surgery was consulted. They examined the patient at bedside and he was **admitted to the trauma service** for further monitoring with frequent neurologic checks and pain control.



**Image 1:** Right forearm lateral x-ray showing extensive subcutaneous air beyond superficial wound location



**Image 2:** Right forearm anterior-posterior x-ray showing subcutaneous air into the wrist and hand

## DISCUSSION

Pressure washer injuries **tend to occur on the patient's non dominant hand or arm**.<sup>1</sup> The degree of underlying damage has a high risk of being underestimated on presentation secondary to small or superficial surface wounds. **Up to 30%** of pressure injuries **eventually need amputation** and some surgeons even recommend that all high pressure injection injuries receive a fasciotomy within six hours from injury onset in order to decrease amputation risk.<sup>2</sup> Pressure washer injuries, like other high pressure injection injuries (including paint, gas, air, and grease), **can inject gas or liquid** into the surrounding and underlying soft tissues **increasing risk for infection and pain**.<sup>3</sup> The foreign material dissects quickly through tissue planes, increasing pressure within the muscle compartments and restricting blood flow due to extraluminal pressure on blood vessels. In addition, the disseminated foreign material can seed bacteria throughout the affected areas, creating a risk for deep space infections and worsening inflammation.

## CONCLUSION

Although pressure washer injuries may only leave small superficial wounds, they can create widespread multilayer soft tissue injuries and later infection. If used effectively, an initial x-ray can reveal if deeper trauma was sustained. An initial x-ray decreased our time to diagnosis with little harm or radiation to the patient, eliminated CT waiting time, and enabled rapid consultation, admission, and appropriate treatment for the patient. This allowed for expedited evaluation and assumption of care by trauma surgery for continued monitoring and management.<sup>4</sup>

### SIGNS CONCERNING FOR WORSENING INFECTION OR COMPARTMENT SYNDROME

Worsening pain	Increased swelling
Redness	Warmth
Decreased pulse	Numbness
Weakness	Fevers

## REFERENCES

1. Sirio CA, Smith JS Jr, Graham WP 3rd. High-pressure injection injuries of the hand. A review. *Am Surg* 1989;55:714.
2. Hogan CJ, Ruland RT. High-pressure injection injuries to the upper extremity: a review of the literature. *J Orthop Trauma* 2006;20:503.
3. Giladi AM, Chung KC. Fasciotomy for compartment syndrome of the hand and forearm. *Operative Techniques: Hand and Wrist Surg* 2017;13.
4. Dailiana, HZ, Kotsaki D, Varitimidis S, et al. Injection injuries: seemingly minor injuries with major consequences. *Hippokratia*. 2008;12(1):33-36
5. Scott AR. Occupational high-pressure injection injuries: pathogenesis and prevention. *J Soc Occup Med*. 33(2):56159,1983

## CONTACT

Morgan Ritz, M.D.  
Crozer Chester Medical Center  
Department of Emergency Medicine  
972-757-2495