

High-pressure water jet injury to the pharynx, requiring intubation

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Abstract

We report a case of upper airway obstruction following high-pressure water jet injury to the pharynx incurred from a car wash jet. Injuries from high-pressure water jets are relatively rare and, to the best of our knowledge, airway obstruction as a result has not been reported. Since this unusual injury may be associated with life-threatening complications, it must be promptly recognized and treated.

Key words: Soft Tissue Injuries; Wounds, Non Penetrating; Pharynx; Airway Obstruction; Water Jet

Introduction

High-pressure water jets are used in several industries for cleaning and cutting and can deliver fluids at very high pressures, up to 4000 bar, with car wash jets at the lower end of the spectrum, between 100 and 140 bar. Injuries from high-pressure water jet devices are surgical emergencies: the high velocity generated produces injuries that resemble the trauma caused by high-velocity missiles. These injuries show a unique pattern of extensive internal damage, often masked by trivial external evidence of injury.

We report the case of a patient who sustained a high-pressure water jet injury to the pharynx, resulting in airway obstruction.

Case report

An eight-year-old boy was brought to the emergency room with neck pain, dysphagia and dysphonia. He had suffered a high-pressure injury to his oropharynx when a jet of water was sprayed into his mouth from a car wash jet while playing with friends. He complained of difficulty swallowing and speaking and of pain in the anterior part of his neck.

There was no stridor and the patient's oxygen saturation was 100 per cent at the time of presentation, with a respiratory rate of 16/minute. On examination, there was diffuse swelling and tenderness over the anterior neck. The patient was unable to speak in complete sentences. A lateral neck X-ray showed soft tissue emphysema in the prevertebral soft tissues and retropharyngeal swelling impinging on the airway (Figure 1).

On admission to our ENT unit, the patient had become drowsy and was unable to speak. He was lying prone, with his head turned to the left, unable to straighten it. His oxygen saturation was now 98 per cent and the respiratory rate had increased to 23/minute. Fibre-optic examination showed marked swelling of the posterior pharyngeal wall, which was white and ulcerated, nearly touching the

arytenoids. The larynx, however, appeared normal. The patient was intubated under general anaesthetic – the procedure was difficult, as head straightening resulted in complete airway obstruction, and there was poor visualization of the larynx. He was transferred to the paediatric intensive care unit, where he was ventilated for three days.

Broad-spectrum intravenous antibiotics (metronidazole and cefuroxime), which had been commenced on admission, were continued until discharge. The patient also received regular dexamethasone (3.6 mg at 150 µg/kg six-hourly) for the first 24 hours. He was extubated three days later after an examination under anaesthesia showed significantly reduced swelling and healing pharyngeal mucosal injury. He required adrenaline nebulizers and a further single dose of 3.6 mg dexamethasone intravenously post-extubation. A contrast swallow was performed to rule out oesophageal injury; this was normal. The patient was then transferred to a paediatric ward, where he made an uneventful recovery and was discharged home five days later.

Discussion

Although pharyngeal injury resulting from a high-pressure water jet has not been reported, injuries to other parts of the body by this mechanism are well described. These include: injuries to the rectum¹ and vagina² caused by water jets from personal watercraft; limb-threatening injuries;³ pneumocephalus from water jet injury to the nose;⁴ and traumatic enucleation of the eye.⁵ DeBreaux⁶ reported a case of peritoneal penetration and injury to the mesentery from an industrial water jet.

These injuries tend to show a common pattern, characterized by minimal external evidence of injury often masking extensive internal damage.⁷ The high pressure of the water jet might cause infiltration of water and air into the tissue planes, resulting in significant submucosal injury, as seen in this case and also described in water jet injuries to the rectum and vagina.^{1,2} The resultant soft

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FIG. 1

Lateral soft tissue X-ray of the neck, showing marked retropharyngeal swelling and surgical emphysema.

tissue emphysema, seen in this case, appears as mixed radio-density on a radiograph (see Figure 1) – a pattern of injury similar to the subcutaneous emphysema reported in water jet injuries to the limbs.³

In addition to the primary injury caused by the kinetic energy of the water jet, ischaemia may result due to direct injury or thrombosis of blood vessels.⁸ The injection of bacteria and other micro-organisms, which might be normal skin or mucosal flora or contaminants in the water jet, may lead to further inflammation, tissue necrosis and, in the long term, fibrosis.^{8,9} Thus, prophylactic antibiotics, as given in this case, are an integral part of the management of high-pressure water jet injuries. The possibility of unusual organisms, such as *Aeromonas hydrophila*, which are not commonly encountered in clinical practice, should be considered in injuries from fresh water jets.¹⁰

In the present case, the retropharyngeal soft tissue swelling caused airway obstruction, which required endotracheal intubation to secure the airway. Post-extubation, the mucosal injury seen was minimal compared to the obvious submucosal inflammation shown in Figure 1. This case emphasizes the need for a high index of suspicion when assessing patients presenting with injuries from high-pressure water jets.

A patient presenting with a history of a direct hit in the mouth by a jet wash should be deemed to have impending

airway obstruction, as this can evolve over several hours or even days if infection supervenes. Therefore, even if asymptomatic, these patients should be admitted for monitoring. Rapid evaluation and appropriate intervention, including protection of the airway, are required.

- **Injuries from high-pressure water jets are relatively uncommon. They are characterized by minimal external evidence of injury often masking extensive internal damage**
- **A high index of suspicion is required when assessing patients with injuries from water jets. The presence of dysphagia, dysphonia or dyspnoea should alert the emergency physician to the possibility of impending airway obstruction**
- **Rapid evaluation and airway protection are critical**

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