

CASE REPORT

Extravasation injury by norepinephrine: a case report and description of treatment options

G. van der Wal, J.C. Janssen, P.E. Spronk

Department of Intensive Care Medicine, Gelre Hospitals Apeldoorn, the Netherlands

Correspondence

G. van der Wal – e-mail: g.van.der.wal@gelre.nl

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Abstract

In this case report we describe a patient with extravasation injury with norepinephrine given through a peripheral catheter in an emergency setting, awaiting placement of a central venous catheter. Delayed recognition and management of extravasation injury may result in serious consequences. It is important to be familiar with the treatment options to prevent further damage. We describe local treatment using the 'flush-out technique' with good results.

Introduction

Extravasation of medication given by the intravenous route occurs when the medication given accidentally flows out of the blood vessel into the surrounding tissue. Recognition of extravasation injury can be difficult but is important because skin necrosis can be prevented with immediate treatment in some cases.

We describe a patient with extravasation injury following norepinephrine infusion through a peripheral catheter and outline treatment options of extravasation injury.

Case report

A 65-year-old woman was admitted to the ICU with respiratory failure because of exacerbation of her chronic obstructive pulmonary disease. Despite non-invasive ventilation, intubation and mechanical ventilation was needed. After intubation, a subclavian central venous catheter was inserted, but placement was aborted because it was complicated by a tension pneumothorax with haemodynamic deterioration. Volume resuscitation was started and a thoracic drain was inserted immediately. Because of severe hypotension while placing the thoracic drain, norepinephrine was started for haemodynamic support through a peripheral intravenous catheter. The haemodynamic situation in the patient stabilised immediately after placement of the thoracic drain. The nurse noticed that the skin was pale and cold around the puncture of the peripheral catheter located in her left underarm, suggesting

subcutaneous extravasation of norepinephrine (infusion of 0.1 mg (0.5 ml) in max. 15 minutes) (*figure 1a*). The norepinephrine infusion was promptly stopped and transferred to the central catheter, which had been inserted in the meantime. No fluids could be aspirated from the peripheral catheter and the line was removed.

The extravasation injury was treated by the subcutaneous 'flush-out technique' described by Gault.⁷ Little incisions were made around the affected area, the subcutaneous tissues were made permeable by blunt cannulation and physiological saline was irrigated through the subcutaneous tissue flowing out of the other incisions. Follow-up after irrigation (*figure 1b*) showed improvement of the local skin perfusion. Five days later (*figure 2a*) and after four months (*figure 2b*) good healing was seen and skin necrosis had been prevented. After two days she was extubated. She recovered well and was discharged from the hospital 16 days after ICU admission.

Discussion

Extravasation injury results from a combination of factors including 1) solution osmolality (e.g. potassium chloride, sodium bicarbonate, calcium, glucose (>10%), hypertonic saline and total parenteral nutrition), 2) local tissue toxicity (cytotoxic agents), 3) vasoconstrictor properties (epinephrine, norepinephrine), 4) infusion pressure (radiographic contrast media) and 5) regional anatomical peculiarity (thin skin or places with little soft-tissue coverage).¹⁻⁶ Extravasation injury should be recognised as soon as possible to prevent further damage.

Norepinephrine is a vasopressor (alpha adrenergic agonist) commonly used in haemodynamically unstable patients in the intensive care unit (ICU). Other aforementioned medications are also widely used in the ICU and they are in general administered through a central venous catheter for rapid dilution and to prevent the risk of extravasation injury.^{1,2,5-8}

Extravasation with norepinephrine may cause severe local tissue ischaemia mediated by vasoconstriction, which can

result in severe skin necrosis. Ischaemic necrosis can also occur when the peripheral catheter is in place without extravasation, because of local stasis and concentration of the drug in case of low blood flow.⁸ The extent of damage is dependent on the dilution, volume, time of infusion and the localisation of the peripheral catheter.^{3,7} The severity of injury immediately after extravasation is not always predictable and frequently underestimated.^{4,5} An early warning sign might be pain at the site of infusion, local swelling or a change of skin colour. However, most ICU patients are unable to localise, as in our case, because of their decreased level of consciousness.⁵ Delayed recognition and management or mismanagement may therefore have serious consequences from scarring, damage to the underlying tendons and nerves, contracture, marked soft skin tissue loss requiring skin grafting to amputation and permanent disability.^{1,5,7}

No randomised controlled trials exist about the management of extravasation injuries. Consequently, treatment strategy is mostly based on empiric research.^{1,3,7} In case of extravasation injury the medication should be discontinued quickly and the injury should be treated without any delay. Before removing the catheter, aspiration through the catheter may remove some blood and extravasate. The extremity should be elevated and immobilised. Mild extravasations can be observed and do not need further treatment. When more severe, intervention seems to improve outcome and can prevent further damage.^{1,3,7} Gault used saline flush-out and/or local liposuction within 24 hours after extravasation before skin necrosis occurs with favourable results. Of 44 cases, 88.5% healed with no soft tissue loss.⁷ When the patient is awake 1% lidocaine is injected subcutaneously. Infiltration with hyaluronidase (1500 Units) can increase

permeability of the connective tissue by enzymatic breakdown of hyaluronic acid. Small stab incisions are made around the extravasation area and a large amount (500 ml) of physiological saline solution is flushed with a blunt tipped catheter through the subcutaneous tissue flowing out of the other incisions. This should be repeated through the other incisions. Care should be taken that the fluids do not accumulate and a sterile procedure should be used. The incisions are allowed to close spontaneously.⁷ If saline flush-out and hyaluronidase are insufficient, liposuction under local or general anaesthesia can be used to aspirate the extravasated material and subcutaneous fat.^{3,4,6-8} Administration of a vasodilator such as phentolamine 5-10 mg (an alpha adrenergic antagonist) is also recommended in case of extravasation injury with vasopressors which give local vasodilatation and hyperaemia.^{2,8} In more severe cases with blistering and necrosis, the treatment should be surgical: debridement, eventually followed by skin grafting or flap reconstruction.

It is not exactly known which patients will have serious damage after extravasation and who needs aggressive treatment,⁷ but when necrosis develops it is too late to save the skin. In our case it was sufficient to use the saline flush-out technique with good result. We made the subcutis permeable with a blunt instrument because hyaluronidase was not available at the time of the injury.

In conclusion, extravasation injury with norepinephrine may result in serious skin necrosis when not recognised rapidly and treated correctly. The best way of treating an extravasation injury is to prevent it. This case underlines the importance of giving high-risk medications through a central venous catheter. When, like in our case, these medications need to

be given as an emergency through a peripheral catheter, the puncture site should be monitored closely. Although evidence for treatment is limited, it is good to be familiar with the treatment possibilities that are described to be able to prevent further damage.

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Figure 1. (a) Extravasation injury and (b) directly after wash out



Figure 2. (a) Extravasation injury after 5 days and (b) 4 months later

