

MANAGEMENT OF EXTRAVASATION INJURY IN NEONATES

Background

Extravasation is the non-intentional leakage of infused fluid into surrounding tissue. Extravasation injury to the skin is one of the main iatrogenic injuries in neonatology. Extravasation has been shown to occur in up to 70% of neonates, although tissue damage and skin necrosis is much less common. About 3.8 - 4% of infants leave neonatal intensive care units with cosmetically or functionally significant scars, thought to be caused by extravasation injuries. Certainly very preterm infants who are dependent on intravenous infusions for their survival are vulnerable to this type of injury.

Most occur from extravasation of peripheral venous cannulae (93%) with the veins in the dorsum of the foot and back of the hand being particularly vulnerable. The relative lack of subcutaneous tissue at these sites makes them both attractive (because of visibility of the veins) for peripheral cannulation and also more vulnerable when extravasation occurs. Difficult and fragile venous access and potentially caustic infusates combine to create this risk. While many of these injuries will heal without consequence, some cause permanent scarring. Skin necrosis from extravasation can result from a range of infusates. The most common on NICU are –

- Amino acid/glucose/electrolyte mix of TPN
- Concentrated glucose solution > 12.5%
- Infusions containing calcium and or bicarbonate
- Peripheral inotropic solutions

Issues in the management of extravasation injuries:

- They could lead to cosmetically and functionally significant scars
- The initial appearance of the injury may not be able to predict the nature of subsequent scarring
- Treatment options are often invasive
- Evidence base for any particular form of therapy is small

It is important to ensure that the risks of the therapies that we deliver do not exceed the risks of what we are attempting to treat.

Evidence for rescue therapy:

There are a range of possible rescue therapies that have been suggested for treatment of extravasation to prevent scarring and injury. These include –

- Saline flushes with or without hyaluronidase
- liposuction

- Use of hydrogel and plastic bags
- Heat or cold therapy
- Vasodilators such as glyceryl trinitrate creams and phentolamine (for dopamine extravasation).

The evidence to support the use of any of these therapies is low level, mainly anecdotal or observational case series. The therapy with the most observational evidence is saline irrigation of the subcutaneous tissue affected by the extravasation. Most reports are based in referral Plastic Surgery services so probably represent the worst cases.

- Gault described a six year experience of extravasation cases referred to a Plastic Surgery Service. Forty four cases referred within 24 hours of the injury were treated with predominantly saline flushes (\pm hyaluronidase pre-treatment) and compared to 52 cases with late referral. Eighty eight percent of the early treated group had no tissue damage vs. 15% of the late treated group. Notwithstanding that the late group were probably included referrals because they had tissue damage, the early treated group included quite toxic extravasated agents (chemotherapy, calcium etc)
- Harris describes using a modification of this technique using only normal saline flush out in 56 babies, none of whom developed tissue damage
- Casanova describes 14 neonates with extravasation in which saline flush and liposuction was used, with 11 cases having no skin necrosis and the other 3 having some damage that healed spontaneously
- In contrast, in the series of Kumar et al where the management was conservative, 7 of 9 babies required prolonged scar management

Hyaluronidase is an enzyme that breaks down hyaluronic acid, a major component of the normal interstitial barrier of the body's connective tissue and the cement of tissue spaces. Following subcutaneous injection at the injury site, it allows dispersion, diffusion and resorption of the extravasated fluids and substances, allows more effective flush out with saline, thereby decreasing tissue damage.

Which injuries to treat?

On TMBU we use saline flush out technique following hyaluronidase infiltration as the treatment of choice. This technique should be used in all extravasation injuries resulting from infusion of calcium, sodium bicarbonate and inotropes and TPN in particular if this is associated with significant swelling or signs of ischemia such as blanching, discolouration, blistering, skin breakdown and ulceration

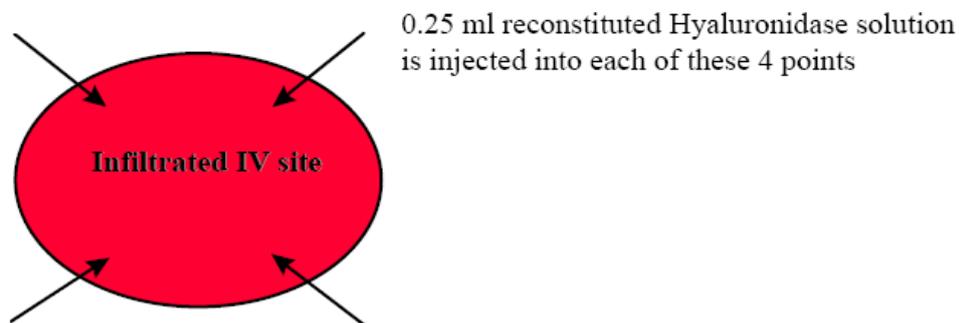
General Management Principles:

1. Stop intravenous infusion immediately
2. Try to aspirate any free extravasate through the cannula then remove cannula.
3. Notify the duty on call registrar immediately.
4. They should inspect and fully document the injury including time, nature of infusate, estimated volume extravasated(calculate indirectly by noting infusion rate and the time when the site was last checked)
5. The description of the injury should include -
 - Site and extent of swelling
 - Overlying blanching /erythema / induration
 - Distal perfusion
 - Accompanying skin necrosis / ulceration
6. Take a baseline picture with the digital camera and include in the medical notes
7. Proceed for definitive management as indicated. Ideally, irrigation should be started within an hour of identifying the injury If in doubt discuss with on call Neonatologist. If Hyaluronidase is not available proceed with saline irrigation only

Management of site:

- Before the definitive procedure ensure adequate pain relief. The procedure is extremely painful
Ventilated infants – 50 mcg/ kg of morphine IV
Non- ventilated infants – Careful administration of 20 mcg/kg of morphine IV over 10 minutes. Additional oral sucrose should be considered in babies if there are no contraindications.
- Swaddle the infant for comfort
- Ensure temperature control measures – Incubators, heated mattress and blankets as applicable
- Expose the area to be irrigated
- Prepare a sterile tray containing the following items
 1. 5ml syringe x 1
 2. 10ml syringe x2
 3. 25 gauge needle x 5
 4. Sterile gauge
 5. Sterile drape
 6. Alcohol swabs
- 1% lignocaine and Hyaluronidase (1500 units /vial)

- Infiltrate 1% lignocaine locally up to a maximum dose of 0.3mls/kg. It takes 1-2 minutes to work and lasts up to 2 hours
- Reconstitute Hyaluronidase with 1 ml of water for injection and then add 9 mls of saline to make up a solution containing 150 IU/ml. Attach 25 gauge needle to a 5 ml syringe and draw up 1ml of this reconstituted solution
- Inject 0.25 mls of this reconstituted solution subcutaneously into the area through 4 different points as shown in figure. A dose of up to 300-400 IU could be safely used for larger infiltrations



NB: Remember to check needle is not in a blood vessel before infiltration.

- Wait for 15 minutes after the infiltration
- Flush the injured area with 5 ml aliquots of normal saline through each injection port using a 10 ml pre-filled syringe and a 25 gauge needle. Watch the fluid come out freely through the other three openings. If the fluid does not come out freely through the openings, enlarge the openings with a 21G needle and use this to flush with saline.
- Use up to 50 mls of saline or until the flush out appears clear
- Any fluid accumulation in the local area should be dealt by milking the extra fluid out through the injection openings
- Take another picture post treatment and include in the notes. Document details of the procedure
- Dress the wound with Intrasite (see wound care nursing guidelines)
- Keep the limb elevated for at least 24 hours
- Cover with antibiotics if accompanying neutropenia
- Refer to plastic surgeons if there is skin breakdown or ulceration