Extravasation injuries

Extravasation is defined as the inadvertent leakage of infused fluid into the surrounding tissue. The resultant damage to tissue can be very serious ranging from skin loss and tendon damage to loss of digits or limb.

About 4% of infants leave neonatal intensive care units with cosmetically or functionally significant scars, thought to be caused by extravasation injuries.

A survey of regional neonatal units in the United Kingdom determined a prevalence of 38 per 1000 neonates who sustained an extravasation injury that caused skin necrosis with 70% of these injuries occurring in infants of 26 weeks or less gestation.

Most extravasations occur from extravasation of peripheral venous cannulae (93%) with the veins in the dorsum of the foot and the back of the hand being most vulnerable.

Extravasation Grading.

<table>
<thead>
<tr>
<th>Grade1</th>
<th>Grade2</th>
<th>Grade3</th>
<th>Grade4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain at infusion site</td>
<td>Pain at infusion site</td>
<td>Pain at infusion site</td>
<td>Pain at infusion site</td>
</tr>
<tr>
<td>No swelling</td>
<td>Swelling</td>
<td>Swelling</td>
<td>Swelling</td>
</tr>
<tr>
<td>No erythema</td>
<td>No skin blanching</td>
<td>Skin blanching</td>
<td>Skin blanching</td>
</tr>
<tr>
<td>Capillary refill normal</td>
<td></td>
<td>Reduced capillary refill &lt;45 sec</td>
<td></td>
</tr>
<tr>
<td>Skin cool to touch</td>
<td>+/- Decreased or absent distal pulse</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+/- Blistering or skin breakdown</td>
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</table>

Risk factors and drugs/infusion commonly associated with tissue damage include:

<table>
<thead>
<tr>
<th>Patient Factors</th>
<th>Drugs and Fluids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extreme Prematurity</td>
<td>Dextrose greater than 12.5% Concentration</td>
</tr>
<tr>
<td>Infusion of irritant or vasoactive drugs and fluids via peripheral venous canulae</td>
<td>Parental Nutrition (TPN)</td>
</tr>
<tr>
<td></td>
<td>Fluids containing calcium, Potassium, Bicarbonate, Hypertonic dextrose, Vasoactive drugs eg: Dopamine, Dobutamine, Adrenaline and Antibiotics</td>
</tr>
<tr>
<td></td>
<td>Blood</td>
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The management of extravasation is partially dependent on the characteristics of the extravasated agent and include limb elevation, exposure of affected site, occlusive dressing, use of hyaluronidase and use of topical nitroglycerin.
Once extravasation has occurred it may be difficult to predict whether a soft tissue complication will occur or whether the leak will dissipate without problems.

NOTE: Once a significant extravasation has occurred,
1. Notify the neonatal doctor immediately
2. Fill in a wound assessment form
3. Complete Datix form
4. Take a photograph of the site. Parental consent MUST be obtained before the pictures are printed and attached to the patient’s records, but treatment should be initiated without delay (Consent form can be found on trustnet). If consent is refused, then pictures must be deleted
5 Use **Hyaluronidase as soon as possible**

**Action**

<table>
<thead>
<tr>
<th>Grade1</th>
<th>Grade2</th>
<th>Grade3</th>
<th>Grade4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Remove all splints and tapes</td>
<td>1. Remove all splints and tapes</td>
<td>3. Document and communicate findings</td>
<td>4. Inform Consultant</td>
</tr>
<tr>
<td>2. Elevate limb</td>
<td>2. Elevate limb</td>
<td>5. Photograph site</td>
<td>6. Identify extravasated drug/infusion</td>
</tr>
</tbody>
</table>

**HYALURONIDASE for extravasation injuries**

**Materials**
0.5% Lignocaine/Xylocaine (no adrenaline)
1 vial Hyaluronidase (1500units). Dilute with 1.5ml of normal saline as per neonatal formulary
250ml Normal saline
20 or 50cc syringe
2x 10ml/ 50ml syringes
2 x 21G green needles 2 x 25G orange needles
23/25 gauge cannula
1 kidney dish.

**Method (Aseptic conditions)**
Remove the cannula
Give sucrose prior removal of cannula
1. Infiltrate local anaesthetic agent in and around the extravasation site
   (0.3ml/kg maximum) Wait 3-5 minutes after infiltrating the anaesthetic agent
2. Using a 25G needle, infiltrate hyaluronidase in 0.3 – 0.5 ml aliquots into the subcutaneous tissue
   (1 vial is diluted with 1.5ml of normal saline) in 3-4 separate sites around the extravasation aiming at
   the centre of the site. Wait 3 – 5 minutes after administering the hyaluronidase
3. Make multiple small exit wounds with a green needle around the periphery of the area and within
   the affected area
4. * Flush 20-50ml of normal saline through the subcutaneous space in 3-5ml aliquots. The saline is
   irrigated through 4-5 of the exit wound sites, exiting as a shower through the remainder. (*The
   amount of fluid used depends on the size of the baby and extent of the wound)*
5. Gentle massage of the limb can be done to express fluid through the injection site
6. Apply a sterile non-stick dressing and place the limb in a comfortable neutral position.
7. The site must be reviewed on a regular basis
8. Post procedural photographs are recommended
9. If necessary, the patient will be followed up by the plastic surgery service in conjunction with the neonatal service (community and outpatient follow up)

**Hyaluronidase and Saline flush-out technique**

**GLYCERINE TRINITRATE (GTN) for extravasation injuries and ischaemic injuries**

Nitroglycerin increases collateral circulation to the local area of peripheral venous ischemia and has been found to be useful to use after extravasation with certain agents. These have included dopamine, adrenaline and TPN. It has also been found to reduce peripheral vasospasm caused by indwelling umbilical arterial catheters and peripheral arterial lines. A patch or ointment can be used. The latter is preferred when used on irregular joints.

The main side effect is systemic vasodilatation and a rise in methaemoglobin level. The blood pressure needs to be monitored on regular basis. If used for prolonged periods, measure metHb levels.

**Current indications for use**

Ischaemia secondary to arterial cannulation

It can be applied up to 12 hrs after the injury.

**Treatment**

If there is persistent blanching or duskeness of the peripheries of the affected limb, remove the catheter/cannula

Keep under close observation

If the vasospasm does not improve in a few minutes, apply a GTN patch or ointment

**Dosage and duration**

**GTN PATCH**

GTN Patch can be used to manage extravasation injury associated with intense local vasoconstriction. Glyceryl trinitrate (GTN) is a powerful local vasodilatory and the patch containing 25 mg (releasing 5mg per 24 hrs) can be applied to the ischemic area for one hour. As it is a patch, it may not cover edges of the affected area.

**Transdermal patch**
Apply a 18.5mg patch (delivers 5mg/day) to the affected area for 24 hours or less
Review and reassess on a regular basis
If required reapply a patch and review at regular intervals

**Nitroglycerin ointment**
Apply thin layer of 2% nitroglycerin ointment to affected areas (which may include catheter site and surrounding area) as often as every 4-6 hours (approximately 4 mm/kg applied topically is equivalent to 0.2-0.5 mcg/kg/min continuous IV infusion nitroglycerin.) Blood pressure and heart rate should continue to be monitored. Apply ointment using gloves. Topical nitroglycerin ointment is absorbed readily and may cause severe headache and/or hypotension secondary to systemic absorption and vasodilation. If skin should come in contact with the ointment wash area with soap and water immediately.

Document all findings and actions, with timings, very carefully in the notes. Make drawings and take photos (parental consent needed, consent form found in trustnet) where possible.

**REFERENCES**
Joyce Generali, Dennis J Cada Nitroglycerin (Topical): Extravasation treatment, Hospital Pharmacy, Volume 36 No 10 pp 1091-1095 2001

**Additional reading**
Lamb H et al. Newborn services Clinical Guideline, May 2006

Prepared by Alice D'Souza, Deputy Sister NICU

**Guideline**
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**Review Nov 2020**