

PROCEDURES

Blood for Genetic Testing

Blood for Chromosomes should be taken during the day and sent with the help of the ward clerk by first class post to arrive the following morning. (It follows therefore that samples should not be taken on a Friday as there will not be anyone to see them.) Please pre-warn the lab at Guy's that samples have been sent (*8229 or tel:020 7188 7188)

Occasionally it may be necessary to send samples very urgently by courier. This should be authorised or requested by a consultant as it is very expensive and comes out of the UNIT budget. The number for the courier is on the wall adjacent to the ward clerk's desk. If sending urgent samples contact the genetics lab at Guy's & St Thomas' Hospital – short code *8229 or tel:020 7188 7188

For detailed information on how to prepare samples for genetic testing see the website www.guysandstthomas.nhs.uk/page2045.htm. A copy of the guidelines from the website is available in the drawers on TMBU and SCBU at PRH. There are also information leaflets for parents and families, the informed consent form, and the form which needs to go with these samples.

Surfactant Administration Protocol

(see Delivery room management and resuscitation guideline)

'All babies born at less than 30 weeks gestation, thought to be at significant risk of developing RDS, should be given surfactant at birth if they need intubation as this has been shown to be associated with improved survival and morbidity outcomes.' (Soll and Morley, 1998).

1. **All** intubated babies at or below 30/40 are eligible for early surfactant administration.
2. The baby should be initially stabilised on labour ward before transfer to UNIT.

If intubation is required an endotracheal tube (ETT) may be pre-cut to the appropriate length for the estimated weight (See table below).

Gestational age	Estimated mean birthweight	Length of ETT at gums
24-26/40	<1kg	6cm
27/40	1.1kg	6.5cm
28/40	1.2kg	7cm
29/40	1.3kg	7cm
30/40	1.5kg	7cm

SaO₂, RR , HR and temperature should be monitored as soon as possible after delivery.

Surfactant should not usually be given on labour ward.

1. Transfer to UNIT as quickly as possible.
2. On UNIT the position of the ETT should be confirmed by visible bilateral equal chest movement and on auscultation.
3. Establish HR, RR and oxygen saturation monitoring as quickly as possible and optimise oxygenation. SaO₂ should maintained at 92-97%
4. Position the head in the mid-line for administration of curosurf.

5. Curosurf should be given within the first hour following delivery. A chest x-ray is not necessary if the ETT position has been confirmed by an experienced paediatrician.
6. Curosurf should be given via the ETT in one bolus via a nasogastric tube through the port proximal to the ETT. Sterile gloves, blade, nasogastric tube on a sterile field should be used to prepare the curosurf bolus (remember, the tape measure is **not** sterile). The doses of curosurf to be given are equivalent to 100mg/kg (see table below).

Gestational age	Estimated mean birthweight	Dose of curosurf
24-26/40	<1kg	100mg
27/40	1.1kg	110mg
28/40	1.2kg	120mg
29/40	1.3kg	130mg
30/40	1.5kg	150mg

1. Once curosurf has been given the administrator should remain at the cot side to manipulate the ventilation requirements as the effect can be almost instantaneous.
2. As soon as possible after administration arterial access should be achieved and a chest x-ray requested.

References

Soll R.F. and Morley C. J. Oxford Update: (1998): 4 *Prophylactic surfactant versus treatment with surfactant*. (Cochrane Review).

Cardiac Tamponade

GUIDELINES FOR THE MANAGEMENT OF CARDIAC TAMPONADE

Definition: cardiac tamponade is compression of the heart produced by accumulation of fluid under pressure in the confined space of the pericardial sac.

Aetiology: in neonatal practice tamponade may occur following thoracic or cardiac surgery or secondary to infectious pericarditis. However, more commonly it is the result of perforation of the cardiac wall as a complication of central venous line (CVL) replacement.

Pathophysiology: pressure in the pericardial space increases exceeding the intracardiac pressure resulting in decreased filling and a reduced cardiac output. The rise in ventricular end diastolic pressure produces systemic and pulmonary venous congestion.

History and Examination:

Have a high index of suspicion in a rapidly deteriorating infant with a CVL.

- a) Initially a lowered systolic BP with a narrowed pulse pressure and tachycardia, followed by a falling mean arterial pressure and bradycardia.
- b) Muffled heart sounds, poor peripheral perfusion.
- c) Distended neck veins and rising central venous pressure.

Slow accumulation of TPN in the pericardial sac may be surprisingly well tolerated initially and the diagnosis may be made from a routine chest x ray showing an unexpected widening of the mediastinal shadow. However, in a symptomatic patient do not delay by gaining a chest x ray to confirm the diagnosis. It is easy to demonstrate a pericardial effusion on echocardiography and this rapid investigation may be extremely useful in an infant whose acute deterioration you are unable to understand.

Management: In a symptomatic infant standard resuscitative measures will be in progress: **A**irway, **B**reathing and **C**irculation. However, move rapidly on to subxiphoid pericardiocentesis once cardiac tamponade is confirmed or strongly suspected.

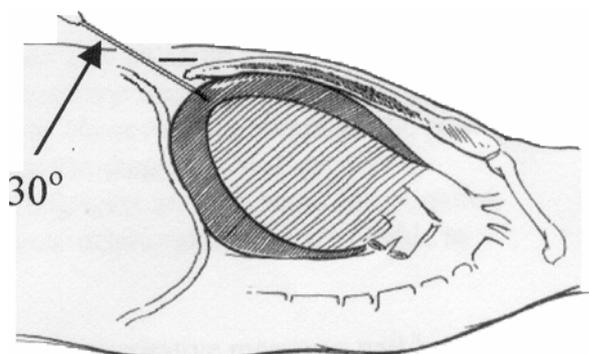
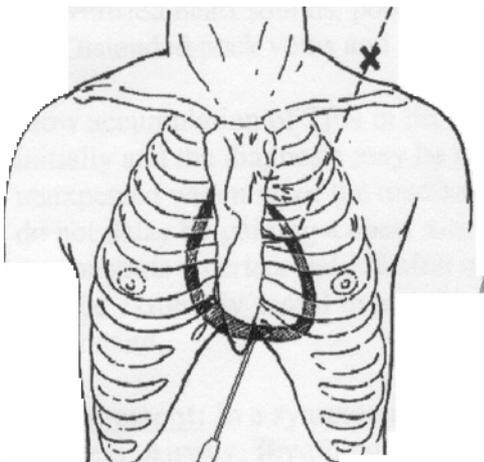
PERICARDIOCENTESIS

Minimum equipment:

- ECG monitoring
- Skin prep (chlorhexidine 0.5% in 70% alcohol) and surgical drapes
- Local anaesthetic (1% lignocaine, 0.2 ml/kg maximum dose), 1ml syringe and 25G (orange) needle for infiltration
- 10 ml syringe
- 20G (pink) cannula

Procedure:

- Swab xiphoid and subxiphoid areas with surgical prep
- If time permits sterile drapes and local anaesthesia
- Attach the 10 ml syringe to the cannula
- Puncture the skin just to the left of the xiphoid process
- Advance the cannula at a 30° angle to the skin in a line aiming just medial to the left shoulder tip (see figures). Aspirate all the time.
- If during the procedure the cannula needle is advanced too far (into the myocardium), blood will be aspirated and ECG changes observed e.g. ST elevation, wide QRS complexes. If the needle is withdrawn slowly the ECG will normalise and a further attempt at aspiration can be tried without ill effect.
- In the case of TPN tamponade once the pericardium is entered lipid is aspirated. The cannula can be advanced removing the needle and for further aspiration of fluid (often 10-20 ml) a three-way tap may be attached.
- Fluid should be sent for culture and biochemical analysis including lipids.



- Clinical recovery is dramatic and the cannula should be removed straight away.
- In a severely ill infant a CVL may be lifesaving and its removal is not strictly necessary following tamponade. However, the line needs to be withdrawn and the correct position of the tip confirmed on X-ray.
- The baby should be observed for further signs of tamponade.

NB. Pericardlocentesis may be life saving but correct central line placement should make this procedure almost redundant in neonatal practice (see policy for insertion of central catheters).

Cerebral Ultrasounds

Guidelines to perform a cerebral ultrasound

Date amended: 20th, February 2003 HR

Next review: 03/04

Indications for cerebral ultrasound

- ❖ All infants equal or < 32 weeks gestation
- ❖ All infants with intrauterine growth retardation admitted to UNIT or PRH SCBU
- ❖ All infants with history consistent with hypoxic ischemic insult

- ❖ Time scheduled
 - Day 1 (if baby is stable)
 - Day 3-5
 - Day 7, 14, 28, term or at discharge

Practical procedure:

1. Warm up a small amount of ultrasound gel in incubator, switch on machine and clean transducer with Cutan wipes. Make sure that the program paediatric/cerebral is selected. If not, press "scan head" to select.
2. Press "patient data" and type in patient's surname, first name, your initials and patient K number.
3. Adjust the focal zone to maximum depths by using the switch focus. The green dot on the transducer probe corresponds to the left/right marker on the screen. The green marker should be directed to the right ear of the patient for the coronal sections, so that the printed image will be an anatomically correct view. For sagittal/parasagittals sections the green marker should direct to the patient's nose. Please do not forget to mark all views with RT for right and LT for left.
4. Quality demands for ultrasound image:
 - ❖ The images should be symmetrical about the midline.
 - ❖ The depth control should be adjusted for each image to ensure that the whole of the brain is included with optimum magnification, so that the image fills the screen. The lower border must include the skull bones.
 - ❖ Appropriate depth, gain (power) and slope (time gain curve) settings should be used to produce a uniform echo pattern in the near and far fields.
 - ❖ The complete cerebral ultrasound examination should comprise of 12 sections (see figures below). In some circumstances, more images might be useful and in others (eg following progress of ventricular dilatation) fewer images might be sufficient.
 - ❖ The sections 1 to 11 can be obtained with 7.5 sector transducer. For section 12, which is used to determine the size of the extracerebral CSF space, the linear transducer is required. A small intrusion depth should be used.
 - ❖ Document your findings on the respective sheets in the patient's notes and update the cranial ultrasound diagnosis on NIMS. Apart from obtaining the printout of the sections in future recording on video could be used. These can then be reviewed in the weekly teaching sessions.

(Feb 2003 -HR, review Feb 2006)

Updated October 2008 (RF)

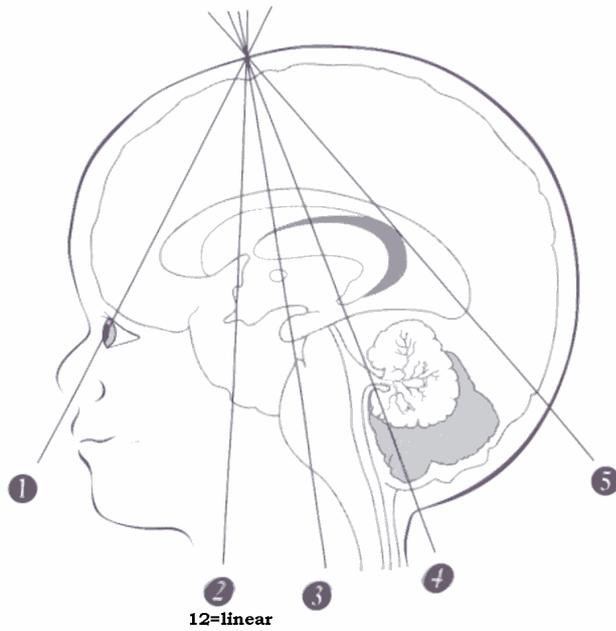


Fig. 3.1. *Planes of section for coronal scans.*

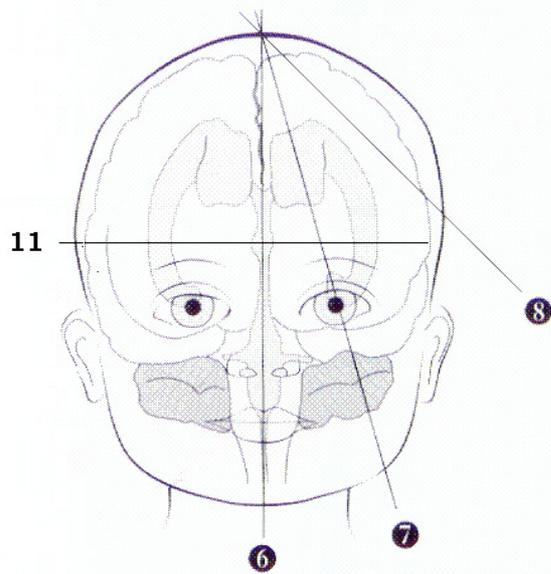


Fig. 3.2. *Planes of section for sagittal and parasagittal scans.*

References:
 JM Rennie, Neonatal cerebral ultrasound, Cambridge 1997

BAPM: Technical standard – neonatal cranial ultrasound, 9.1.2003

Exchange Transfusion

A procedure by which severe anaemia is corrected and toxic metabolites, bilirubin and drugs are removed from the circulation.

Indications:

1. Severe haemolytic anaemia: eg rhesus iso-immunisation (**double volume exchange transfusion of semi-packed RBCs**)
2. Severe non-haemolytic anaemia eg twin to twin transfusion causing chronic anaemia with heart failure (**single volume exchange of packed RBCs**)
3. Severe hyperbilirubinaemia (**double volume exchange of packed or semi-packed RBCs**)
4. Severe coagulopathies and DIC (**double volume exchange of whole blood**)
5. Removal of toxic metabolites eg. Ammonia in amino-acidopathies and drug poisoning (**single volume with semi-packed RBCs**)
6. Polycythaemia: **partial** exchange transfusion may be indicated using **0.9% saline**

$$\text{Partial exchange (ml)} = \frac{80 \times \text{weight (kg)} \times (\text{Observed Hct} - \text{Desired Hct})}{\text{Observed Hct}}$$

- **Single volume exchange (ml) = 80 x weight (kg)**
- **Double volume exchange (ml) = 2 x 80 x weight (kg)**

Donor Blood:

1. ABO compatible. CMV, HIV, Hepatitis B and rhesus negative.
2. <48 hours old, citrate phosphate dextrose (CPD) is preferred, it has higher PH, more 2.3 diphosphoglycerate and lower potassium.
3. Infants with Rh incompatibility: the blood must be O Rh negative crossed matched with the mother's blood.
4. Infants with ABO incompatibility: the blood must be O Rh compatible (with the mother and the infant) or Rh negative and cross-matched with the infant's and the mother's blood.
5. Other blood group incompatibilities: (eg anti-Rh-C, anti-Kell, anti-Duffy), blood must be cross-matched with the mother's blood.

Technique:

Iso-Volumetric (preferred method): Use umbilical artery and umbilical vein or peripheral artery and peripheral vein. Iso-volumetric exchange transfusion needs two operators; one for withdrawing and the other for infusing blood at the same time at the same rate (**see diagram 1**).

Non-Volumetric: A single umbilical vein is used. One operator is needed using two 3-way taps (**diagram 2**).

Equipment:

1. Radiant warmer and equipment for respiratory support and resuscitation.

2. Monitoring of HR, RR, Temperature, Sat O₂, BP and CVP.
3. Umbilical artery and venous catheterisation sets.
4. Exchange transfusion set, connections and blood warmer.
5. NGT to evacuate stomach before the procedure and keep it in-situ.
6. An assistant for iso-volumetric exchange transfusion and a third person to monitor the vital signs, check blood gases and record the exchanged volumes.

Exchange transfusion is an intensive care procedure performed under aseptic conditions.

Procedure:

- ❖ Inform parents about the procedure, which may take 60-90 minutes to perform.
- ❖ Complications (see later) may arise especially if the procedure is not strictly adhered to.
- ❖ The baby will have an IV dextrose infusion with calcium supplement. Enteral feeds will be stopped and not re-started until 24 hours after the procedure.
- ❖ If deemed necessary, the procedure may need to be repeated.

1. Insert a NGT and aspirate the stomach contents.
2. Aseptically cannulate umbilical artery (UAC) and umbilical vein (UVC).
3. Take blood for:

- ❖ Group & direct Coomb test
- ❖ FBC, Hct, film, coagulation screen
- ❖ U&E, LFTs, Ca, bilirubin, glucose
- ❖ ABG

1. Check the blood pack information: group, rhesus status, expiry date. The blood pack is connected to a giving set which will coil in a blood warmer to keep it's temperature at **37°C** before it is given to the baby.
 2. Connect 3-way tap and 10ml syringe to the UAC and waste bag. Blood withdrawn from the infant is pushed via a sterile waste pipe into a sterile waste bag.
 3. Connect 3-way tap and 10ml syringe to the UVC and transfusion giving set. Withdraw blood from the transfusion bag and give to the baby.
- Aliquots of 5mls in preterm and 10-15mls in full term babies are withdrawn and infused over no faster than 3-minute cycles.
 - For a partial exchange, follow the same principles only the volume of exchange will be less and with a 0.9% saline.

During the procedure:

- Monitor BM and ABG every 30 minutes.
- Monitor ECG trace, HR, RR, BP, CVP every 15 minutes.
- Observe for any evidence of hypocalcaemia eg twitching, prolonged Q-T interval.
- Look for any cyanosis, pallor, abdominal distension, and vomiting or bloody diarrhoea. If any of these develop, stop the procedure, do a blood gas, BM, Ca, K and treat accordingly. If CVP is >8mmHg and you are sure the catheter tip is in the right atrium, remove 5-10ml of blood slowly until the VP is 3-6mmHg. Start again when stable.

After you finish, take blood for:

- ❖ FBC, Hct and coagulation screen
- ❖ U&E, Ca, glucose, bilirubin
- ❖ Blood culture
- ❖ ABG

- If a further exchange transfusion is likely, leave the lines in otherwise remove.
- Commence phototherapy.

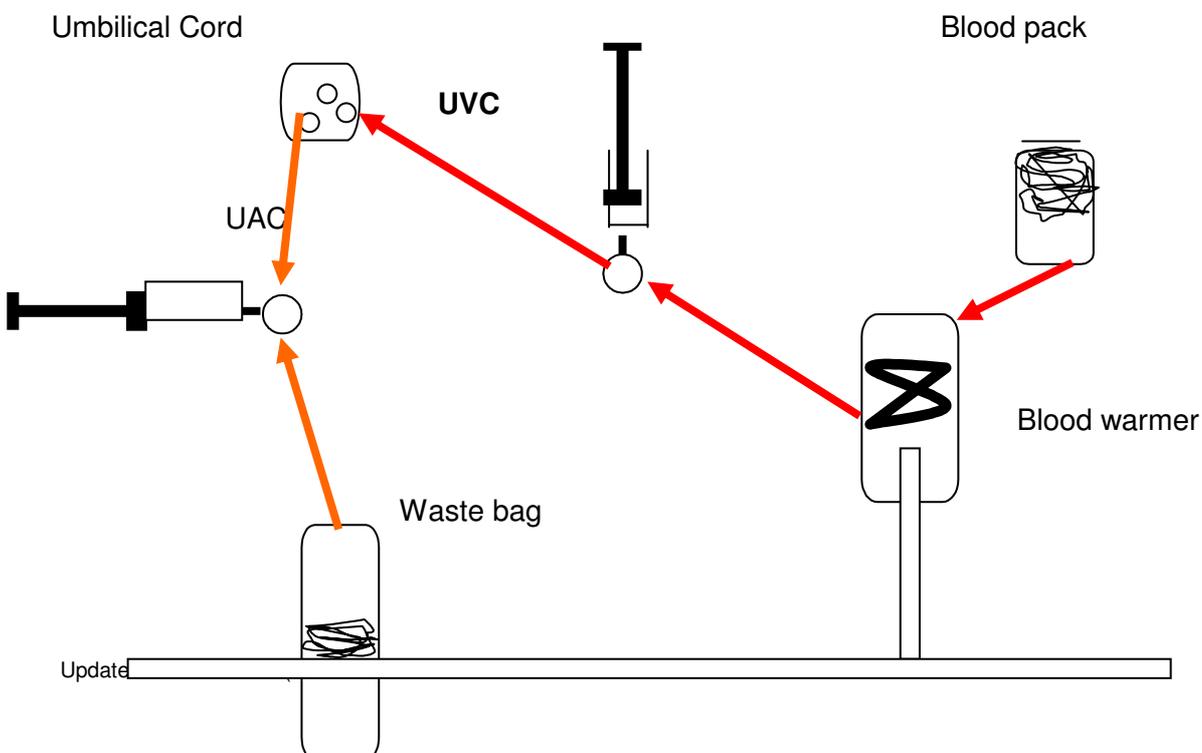
Complications of exchange transfusion:

1. Metabolic acidosis
2. Hypoglycaemia
3. Hypocalcaemia
4. Hyperkalaemia
5. Thrombocytopenia
6. Coagulopathy
7. Circulatory overload
8. Cardiac arrhythmias
9. Air embolism
10. Acute dilatation of stomach
11. Ischaemia of intestine, perforation and necrotising enterocolitis
12. Infection: Usually staphylococcal, hepatitis, CMV, HIV reported but rare nowadays.

References:

1. A manual of Neonatal Intensive Care. NRC Robertson. Edward Arnold – 3rd edition – 1993
 2. Neonatology Management, procedures, on-call, problems, diseases and drugs. TL Gomella, MD Cunningham, FG Eyal, KE Zenk. Apple & Lange – 3rd edition – 1994
 3. Handbook of Neonatal intensive Care. HL Halliday, G McClure, M Reid. Bailliere Tindall – 3rd edition 1989.
- (Feb 2002 - PA/KE, review Feb 2006)

Diagram 1: Isovolumetric exchange transfusion



Elective Intubations

Laryngoscopy and intubation provoke profound stress¹, resulting in bradycardia, hypoxia, and acute rise in intracranial pressure which may lead to intraventricular haemorrhage². Premedication with a regime similar to the one below can reduce these harmful responses²⁻³, and has been shown to be safe in clinical practice⁴.

DRUGS	DOSING
1. FENTANYL I.V	1mcg/kg
2. ATROPINE I.V	15mcg/kg
3. SUXAMETHONIUM I.V	2mg/kg

For non-emergency intubations, after establishing pre-oxygenation with effective bag-mask ventilation, the infant should receive these drugs in the order above.

Cautions:

- Do not use this regime for emergency intubations
- Do not use this regime unsupervised unless you have received specific training and support. Be aware of the following potential complications.
- Have IV Naloxone (10ug/kg) immediately available (see below)
- **Suxamethonium may cause reactive bradycardia, though this is usually prevented by atropine. Paralysis occurs after approximately thirty seconds and generally lasts three to five minutes, but may be longer in individual babies.**
- **Fentanyl can cause chest rigidity (about 2% of infants)⁴: this has usually occurred at larger doses than in this regime⁵; the risk is reduced by slow bolus administration, and it is usually abolished by suxamethonium⁴. If chest rigidity occurs (usually recognised by difficult in inflating the chest:**
 - 1) Give the suxamethonium dose immediately
 - 2) If rigidity persists, give IV Naloxone 10mcg/kg
- **Opiates can cause hypotension. Therefore, check blood pressure prior to giving dose: if borderline or low give fluid bolus and consider inotrope support.**
- **If intubation is unsuccessful, re-establish bag-mask ventilation and adequate oxygenation before further attempts, and seek experienced help.**
- Babies with acute lung disease may deteriorate after paralysis.

1. Marshall TA, Deeder R, Pai S, Berkovitz GP, Austin TL. Physiologic changes associated with endotracheal intubation in preterm infants. *Crit.Care Med.* 1984;**12**:501-3.
2. Friesen RH, Honda AT, Thieme RE. Changes in anterior fontanel pressure in preterm neonates during tracheal intubation. *Anesth.Analg.* 1987;**66**:874-8.
3. Barrington KJ, Finer NN, Etches PC. Succinylcholine and atropine for the premedication of the infant before nasotracheal intubation: a randomised, controlled trial. *Crit.Care Med.* 1989;**17**:1293-6.
4. Barrington KJ, Byrne JB. Premedication for neonatal intubation. *Am.J.Perinatol.* 1998;**15**:213-6.
5. Fahrenstich H, Steffan J, Kau N, Bartmann P. Fentanyl-induced chest rigidity and laryngospasm in preterm and term infants. *Crit.Care Med.* 2000;**28**:836-9.

(Oct 2002 - Standards Group/PS, review Oct 2004)

Rationale

The pleural membranes have an important role in effective lung expansion. The visceral pleura is a thin, smooth, serous membrane covering the surface of the lungs and is perfused by the pulmonary circulation. The parietal pleura lines the thoracic cavity and is perfused by the systemic circulation. The visceral and parietal pleurae are in close contact and the potential space between them is called the pleural space or pleural cavity and is filled with a very thin layer of fluid. This fluid acts as a lubricant and allows the pleural membranes to slide easily against each other during respiration (Allibone 2003).

Any injuries, diseases or surgical procedures that can cause the collection of air, blood, bile, pus, chyle, gastric contents or fluid in the pleural cavity may affect ventilation. The most common conditions requiring a chest drain in the neonate are tension pneumothorax and pleural effusion (Carey 1999). A chest drain may also be inserted to treat a haemothorax or chylothorax

Prior to insertion

1. A pneumothorax should be suspected in any ventilated infant who deteriorates with asymmetrical chest wall movement and air entry. Clinical signs include an increased oxygen requirement, a drop in PaO₂ and usually a rise in PaCO₂ (although this may not always occur in infants on high frequency oscillation). The infant may present with hypotension and tachycardia followed by bradycardia and hypo/hypertension. **A blocked ETT must be excluded first.**
2. Confirm the diagnosis of an effusion or pneumothorax by cold light, ultrasound and/or X-ray. The affected side will transilluminate when a cold light is applied to the chest wall. **N.B.** in preterm infants with interstitial emphysema, transillumination may be present in the absence of a pneumothorax. Conversely, in term infants with subcutaneous fat and a thicker chest wall, transillumination may not reveal a pneumothorax.
3. Inform parents/gain written consent prior to insertion unless in an emergency.
4. If possible check clotting status.
5. Prepare infant by positioning and administration of adequate analgesia.

Needle aspiration

1. This procedure may be used diagnostically or in an emergency situation for the treatment of a tension pneumothorax (Harling 2000). Wash hands and apply alcohol hand rub and non-sterile gloves. The procedure should be undertaken using an aseptic non-touch technique. Attach a 23 or 25 gauge 'butterfly' with extension to a large syringe via a 3-way tap. Prepare the skin with chlorhexidine.
2. Insert the needle anteriorly into the second intercostal space in the mid-clavicular line. Aim to slide over the top of the third rib to minimise the chance of damaging the intercostal artery.
3. Apply continuous suction to the syringe as the needle is inserted. A rapid flow of air will occur when the pneumothorax is entered. Minimise needle penetration to reduce the risk of puncturing the lung while free air is evacuated.
4. Once air flow ceases, remove the needle. If the air leak is continuous leave the needle in place with the extension tubing in a pot of sterile water. Allow to bubble whilst a chest drain is inserted. (Alternatively, a 22G or 24G cannula can be used in place of a butterfly. Remove the needle once you are through the chest wall).
5. Document the procedure with the time and date and condition of the infant during the procedure.

Chest drain insertion

This should be done under supervision if the practitioner has limited experience of the procedure. This procedure is used to drain a pleural effusion or pneumothorax without life-threatening symptoms.

1. Equipment

- a. sterile chest drain pack, gown and gloves;
- b. sterile drapes;
- c. a straight scalpel blade;
- d. sutures; steristrips; tegaderm dressing;
- e. intercostal drain (8ch for preterm and 10ch for term. When draining haemorrhagic or protein rich effusions a larger drain may be needed);
- f. Chlorhexidine skin cleansing agent;
- g. 1% plain lignocaine, a 2 ml syringe and orange needle (25G);
- h. a drainage system with connector (Heimlich valve if the infant is being transported).

1. Procedure

- a. The infant should be given a bolus of morphine (50 – 100 mcg/Kg IV). The lower dose is used if the infant is not ventilated. Ventilation may also be required before insertion of the chest drain for hypoxia.
- b. Position and support the infant with the affected side elevated by placing a towel under the back. The infant's arm should be at 90 degrees. This position should ensure that the chest drain is inserted anteriorly. Remove any butterfly that may be in situ.
- c. Clean the skin with chlorhexidine and remove excess with sterile water/saline ensuring the chlorhexidine does not pool under the infant. Prepare sterile field.
- d. Infiltrate the skin and subcutaneous tissues over the insertion point with 0.2ml/kg of 1% lignocaine. Allow enough time for local anaesthesia to take place
- e. With a straight scalpel blade make an incision in the mid to anterior axillary line through the 5th or 6th intercostal space (keeping well away from the breast bud). The incision should be just large enough to admit the drain. For an anterior pneumothorax the landmark is the 2nd intercostal space in the midclavicular line.
- f. Use artery forceps in blunt dissection to open a track down to the pleura through which the drain can be guided. Perforate the pleura with the forceps. The trocar should not be used to dissect the muscle or pierce the pleura. It should be withdrawn 0.5 cm into the drain and clamped in that position before insertion. Gently advance the chest drain 2-3 cm into the pleural space aiming up towards the lung apex ensuring that the side holes of the drain lie within the pleural space (Harling 2000).
- g. The infant should be observed throughout the procedure and their respiratory and cardiac status monitored. Any changes should be reported to the practitioner inserting the chest drain.
- h. When the drain is in the pleural space, the trocar can be slowly withdrawn until there is sufficient space to clamp the drain near the skin, after which it can be removed. Any pleural fluid should be sent for cultures, white cell count and protein.
- i. Fill the drainage bottle to the identified line with sterile water. Connect the chest drain to the drainage system. If the pneumothorax does not resolve, suction can be applied at a negative pressure of 5 – 10cm of H₂O or 1 – 2 kpa.
- j. An anchoring suture or usually steristrips should be placed across the incision to help seal the wound around the drain. The suture is then attached to the drain using elastoplast tape. A tegaderm dressing is then applied to keep the site clean and allow it to be observed. In pleural effusions fix in an anterior caudal direction, in a pneumothorax a posterior caudal direction.
- k. Check the position of the drain with a chest X-ray. Document the procedure with the time, date and condition of the infant during the procedure.

1. Nursing management

- a. Commence/continue with morphine infusion. Secure chest drain tubing (to minimise the risk of kinking or coiling) and drainage bottle to ensure that these are not accidentally pulled or knocked. The drainage bottle must be below the infant's chest level at all times to prevent fluid re-entering the pleural space.
- b. Record drainage in the bottle by applying tape vertically on the bottle and then marking the drainage level at regular intervals. In addition to the volume, the colour and consistency should also be recorded. The medical staff should be informed of a sudden increase in drainage.
- c. Hourly observations of the chest drain site, swinging (indicating correct position of the drain in the pleural space) and bubbling (indicating the continued presence of air in the pleural space) should be recorded.
- d. Two clamps should be available at the cotside at all times. The drain should only be clamped when changing the bottle or after accidental disconnection (there should be no need to clamp the tubing when moving the infant) (Allibone 2003). Two clamps should be used close to the chest wall. The tubing should then be unclamped as soon as possible to minimise the risk of air or fluid re-accumulating. The bottle should be changed when it becomes over half full as this will increase the resistance to the drainage.

Removal of chest drain

1. In pleural effusions, the chest drain can be removed if drainage is less than 5 to 10 mls/kg/day and if the underlying disease is under control.
2. In a pneumothorax, prior to removal the drain should cease bubbling for 24 hours, then stop the negative pressure for 8 to 12 hours. (Following surgery, the surgeon may request that the chest drain is clamped for 24 hours prior to removal).
3. If air does not reaccumulate the drain can be removed. Ensure the infant has received adequate analgesia and is supported during the procedure. Equipment needed (using a blue tray): sterile gloves; stitch cutter; sterile gauze; sterile scissors; universal container. If the drain has been clamped, unclamp now prior to removal. Wash hands, apply alcohol hand rub and sterile gloves. Using a non-touch aseptic technique, the tegaderm dressing should be carefully removed according to manufacturer's instructions and the stitch cut. The chest drain can then be carefully pulled, ensuring the two skin edges of the entry site are together as the chest drain is removed. The tip should be sent for culture and sensitivity.
4. Keep the insertion site clean and dry by applying a piece of aquacel (occludes the puncture hole and soaks up any exudates) and a tegaderm dressing. The tegaderm dressing should be removed after 4 to 5 days.
5. Document the procedure (a chest X-ray may be requested).
6. Continue to observe the infant's respiratory status for signs of deterioration.

References

- Allibone,A. 2003. Nursing management of chest drains *Nursing Standard* 17(22): 45 – 54
- Carey,C. 1999. Neonatal air leaks:pneumothorax, pneumomediastinum, pulmonary interstitial emphysema, pneumopericardium *Neonatal Network* 18(8): 81 - 84
- Harling,E. 2000. Diagnostic and therapeutic procedures IN Boxwell,G. (ed). *Neonatal Intensive Care Nursing* London: Routledge

Care Plan For Laser Eye Surgery

Patients with grade 3 disease may require treatment and those with "Plus Disease" or rapidly progressing disease will require treatment. Cryotherapy and laser therapy are the two types of treatment available. Laser therapy is considered more effective, less time consuming and less painful than cryotherapy. The endpoint of Retinopathy of Prematurity is scar tissue formation causing retinal traction resulting in visual disturbance and detachment. Scar tissue formation is triggered by proliferating retinal vessels. The aim of laser therapy is to arrest abnormal vessel proliferation by lasering the adjacent retina. Treatment requires a high degree of skill and it should be the aim of the UNIT staff to optimise conditions for the procedure in order to allow its safe and effective completion.

Preparation for Laser Therapy:

1. Once the ophthalmologist has decided to proceed to surgery the parents need to be fully informed and written consent gained by the surgeon.
2. A date and time convenient for the ophthalmologist and UNIT team should be set. Parents, the Nurse and Consultant In-Charge of Nursery 1, the Transport Team and Technician should all be informed of the date and time.
3. Check FBC, U&Es and clotting profile
4. Organise the Equipment

Open Incubator (height adjustable)

2 Size G Air cylinders

2 Size G Oxygen cylinders

Ventilator

Overhead Heater

Supports to help position baby's head

Light source

Safety goggles (provided by Ophthalmology team)

Safety signs

The Equipment Room on UNIT is used for the procedure. Goggles must be available for all staff required to stay in the room. No entry signs should be placed on the door notifying others of the laser procedure.

Preparation on the Day of Surgery

Transport Team and technician will check all equipment is functioning well.

Check the equipment room is as clear as possible with space for the open incubator, ventilator, laser equipment and staff.

Ensure that equipment room is warm.

Stop oral feeds 4 hours prior to intubation and ventilation

No later than 4 hours prior to the procedure:

Bring baby into Nursery 1 and check identity

Confirm that consent has been signed.

Ensure baby is fit for procedure and check blood results.

Gain two reliable IV accesses

Electively intubate as per protocol and ventilate.

Continue with morphine infusion and paralysis (Pancuronium boluses or Vecuronium infusion as per Pharmacy Guidelines)

Stabilise baby on ventilator

Check blood gases and glucose

Secure ETT well and check position with a CXR

Check blood pressure

Monitor heart rate and saturations

Start maintenance IV fluids

During the Procedure:

Check patient identity prior to starting treatment
Plug equipment into room power supply, keep baby warm
Continue monitoring and check IV infusions are running
Position the baby's head as requested by the ophthalmologist.
Ensure all staff are wearing goggles and no entry signs are placed on the door
During any change in the ventilator gas supply, the ophthalmologist must be asked to stop the procedure, the baby should then have bag ET ventilation until gas supply restored to the ventilator.
Ensure adequate pain control and paralysis throughout

Stop the procedure if you have doubts about the baby's wellbeing

Staff needed in the room during procedure
Transport Team: Nurse, Registrar +/- Consultant
Ophthalmology Team: Consultant and Registrar.
Unit Technician

Post operative procedure:

Stop paralysing agents
Wean morphine infusion as tolerated.
Commence steroid eye drops as indicated by Ophthalmology Team.
Wean ventilation and extubate as soon as clinically indicated.
Restart feeds when stable off ventilator.
Ensure ophthalmology follow-up arranged.
(VERSION COMPLETED 29/01/05)

Guideline For Newborn Blood Spot Screening

RATIONALE

Babies in this area are now screened for phenylketonuria, congenital hypothyroidism (CHT), MCADD (see fact sheet accompanying this guideline) (only at RSCH site as test sent to a different lab) and sickle cell. The UK Newborn Screening Programme Centre is currently managing the implementation of newborn screening for cystic fibrosis. Mass newborn screening identifies babies at risk, who may need further definitive testing and can detect disease, before irreparable damage occurs, by initiating early medical management. Both false-negative and false-positives can be obtained on initial screening (Wallman 1998),

PRACTICE

- On the baby's admission to the unit the parents/carers need to receive a copy of the pre-screening information leaflet, and be given an opportunity to ask any questions. This may not be possible in an emergency transfusion situation. The parents/carers may have already received this leaflet if they have reached the third trimester, as this is the time the midwives are distributing the leaflet antenatally.
- All parents/carers will need to give verbal consent for this test, which needs to be documented on the baby's blood spot screening record sheet. They also need to be informed about any repeat tests that are required.
- All babies on **day 5** have a heel prick blood sample for newborn blood spot screening.
- **The day of birth for all babies irrespective of time of birth will now be counted as day 0.**
- If the baby requires a blood transfusion prior to day 5, then the test should be taken **before** this, as the results will not be reliable for sickle cell testing following transfusion. Another test is not required before any subsequent transfusions. **These babies will require a further test on day 5. On reaching day 5, if 72 hours has not passed post transfusion, then wait until this number of hours has been reached.** This is to get an accurate result for CHT.
- If the baby has been transfused and a test has **not** been taken before the transfusion, **the test must still be taken on day 5. On reaching day 5, if 72 hours has not passed post transfusion, then wait until this number of hours has been reached.** This is to get an accurate result for CHT. The baby will also need another repeat test taken for sickle cell disorders, a letter will be sent from the lab indicating the time of the next test which will be around **3 months** after the **last** transfusion the baby has received. The baby's consultant will be responsible for organising repeat blood samples if the baby has been discharged from hospital, before the repeat is due.

- **The lab will inform the unit of any baby that needs a repeat test, if their present condition means that an accurate result is not possible.**
Therefore, it is important to include all details regarding the baby's feeding (intravenous and oral) and transfusion details on the test card.
- If the lab asks for a repeat test when the baby has had 4 days of milk/protein feeds, then wait until this time. Document this requirement on the neonatal blood spot screening form. This does mean 4 days of 100mls/kg of TPN if the baby is not being fed enterally.
- Alcohol, Vaseline or any antiseptic solutions for skin preparation should **not** be used, as these can interfere with the results.
- Each of the 4 circles on the test card should be completely filled with blood, with no over spotting ie. Layering another spot of blood over the top of the first spot on the card. When completed the card should be placed in the greaseproof envelope provided, this prevents water damage in transit.
- Blood **can** be taken from an arterial line or a venepuncture.
- A capillary tube **can** be used to aid accuracy of the blood spots on the card.
- The test card should be completed legibly using a black ballpoint pen. Please ensure all details are filled in as requested.
- If either the baby or a breast feeding mother has received any drug (e.g. antibiotics) within 24 hours of the blood test, please state which on the card. Also state if the mother received thyroxine or anti-thyroid drugs in pregnancy.
- If any of the conditions to be tested are known to have occurred in a sibling (or other close relative), or if any of these disorders have been diagnosed by pre-natal testing, please record this under "comments".
- **Premature babies will require a repeat heelprick sample when they reach the equivalent of 36 weeks gestation (start this with any babies born from 1st January 2005)** This is because immaturity of the hypothalamic-pituitary axis in very low birth weight and preterm babies may initially mask primary congenital hypothyroidism (Department of Health 2004). This applies to any babies born below 35 completed weeks. If the baby is discharged or transferred before this date, details will need to be included on the discharge/ transfer letter, so this repeat test is not missed.
- If the parents/carers decline, either for specific conditions or the full programme, the health professional should still send in a test card with all details documented, and indicate that all or part of the test has been declined. If it is only part of the test, then indicate which part on the test card.
- A letter should be sent to the GP and health visitor informing them that the test has been declined.
- **Blood spot screening cards should be sent to the screening laboratory within 12 hours of being taken.**

- The screening lab will provide pre-paid screening envelopes for us to send the cards by Royal Mail. The tests are not to go in the hospital internal mail system. Jan, Pat, Jenny (HCA) and Jackie Mason will take envelopes daily to the post box. If these people are not on duty when you take a test, please be responsible for ensuring prompt delivery to the post box.
- The test card should have the baby's NHS number and **NOT** hospital number on it.
- **RECORD THAT THE TEST HAS BEEN COMPLETED IN THE ADMISSION BOOK, IN THE INFANT'S RED BOOK (if applicable) , IN THE CENTRAL NEONATAL SCREENING RECORD BOOK FOR THE UNIT AND ON THE NEONATAL BLOOD SPOT SCREENING RECORD SHEET (EACH BABY SHOULD HAVE ONE OF THESE) - Jackie Mason is the co-ordinator for the unit and Sister Sarah Jones (UNIT) or Karen Creed, Antenatal Screening Co-ordinator (Level 11 EXT. 7477 or mobile 07876357423) will help with any questions about the screening.**

REFERENCE

Wallman C. 1998 Newborn Genetic Screening. Neonatal Network 17 (3) pp 55-60

Great Ormond Street Hospital for Children NHS Trust, The Institute of Child Health and The Institute of Education. 2004. Policies and Standards for Newborn Blood Spot Screening. Department of Health.

This guideline is following the new national guidelines for blood spot screening so further changes may need to be made once the system is operational.

SEE ALSO NEONATAL BLOOD SPOT SCREENING FOLDER (IN NURSERY 1)

STANDARDS GROUP: JANUARY 2005

REVIEW: JANUARY 2005

Testing babies who have a high risk of PKU

1. Blood should be sent on Day 0, either by cord or heel, and couriered as fast as possible to Dr Mike Champion at the Evelina Metabolic Team.
2. Dr Champion's team should be called in advance of that arriving to warn them it is coming.
3. It is safe to feed the baby normal feeds whilst this card is being processed.
4. If you are very concerned a Day 3 card may be sent (again, couriered and processed urgently).
5. Otherwise if the level of concern is low, normal feeds should be continued until Day 5 when the second test should be sent and couriered to the Evelina.

Guidelines for the management of extravasation injury in neonates (Draft version Aug 2006)

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.

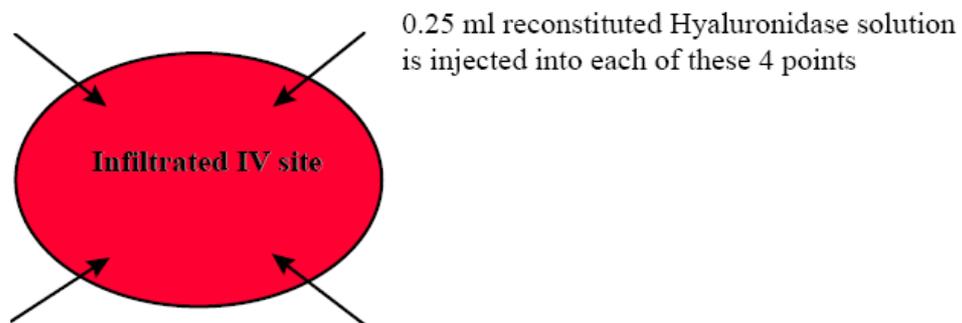
3. Notify the duty on call registrar immediately.
4. They should inspect and fully document the injury including time, nature of infusate, estimated volume extravasated(calculate indirectly by noting infusion rate and the time when the site was last checked)
5. The description of the injury should include -
 - 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

References:

1. Wada A, Fujii T, Takanmura K, et al. Physeal arrest of the ankle secondary to extravasation in a neonate. *Journal of Pediatric Orthopedics* 2003; **12**: 129-132
2. Wilkins CE, Emmerson AJB. Extravasation injuries on regional neonatal units. *Arch. Dis. Child. Fetal Neonatal Ed* 2004; **89**: F274 - F275
3. Kumar RJ, Pegg SP, Kimble RM. Management of extravasation injuries. *ANZ J Surg* 2001; **71**: 285-9
4. Gault DT. Extravasation injuries. *Br J Plastic Surgery* 1993; **46**: 91-96
5. Harris PA, Moss ALH. Management of extravasation injuries. *ANZ J Surg* 2002; **72**: 684
6. Casanova D, Bardot J, Magalon G. Emergency treatment of accidental infusion leakage in the newborn: report of 14 cases. *British Journal of Plastic Surgery*. 2001; **54**: 396-91
7. Avoiding extravasation injury in neonates – Guideline 2005 – Royal Prince Alfred Hospital, Melbourne
8. Guidelines for the management of extravasation injuries – Neonatal Unit – BC Children's Hospital, Vancouver, Canada