MCN for Neonatology
West of Scotland
Neonatal Guideline

Oesophageal Atresia and Tracheo-Oesophageal Fistula

This guideline is applicable to all medical, nursing and midwifery staff caring for neonates in the West of Scotland. All neonates with a diagnosis of oesophageal atresia (OA) and/or tracheo-oesophageal Fistula (TOF) will be referred to the neonatal surgical unit at the Queen Elizabeth Hospital (QEH).

Introduction

Oesophageal atresia is a congenital abnormality where the oesophagus ends in a blind upper pouch. It can occur in isolation or there may be one or more fistulae between the abnormal oesophagus and the trachea (tracheo-oesophageal fistula). Babies born with OA/TOF need to have intensive neonatal care prior to corrective surgery, normally within days of birth.

Presentation

Although maternal polyhydramnios and a small/absent stomach bubble may indicate oesophageal atresia, the condition is rarely definitively diagnosed before delivery. Postnatal presentation includes respiratory symptoms, frothing/ dribbling of saliva, coughing/choking during feeds, and inability to pass a nasogastric tube (NGT) into the stomach.

Initial management and investigations to confirm diagnosis

Provide respiratory support as required - Initiate ABC of resuscitation. Clear oral secretions and nurse infant tilted head up at all times. Avoid mask ventilation if at all possible – potential gastric or oesophageal pouch distension may lead to respiratory compromise and/ or aspiration through a fistula, or gastric rupture. If mask ventilation is required, apply minimal pressures for a short period, once the infant has stabilised administer supplementary oxygen to maintain acceptable oxygen saturations until more control over the tracheo-bronchial airway can be achieved. If intubation becomes necessary, inform the surgical team and observe for excessive abdominal distension which may require urgent surgical intervention.

Insert a Replogle tube/ large bore NGT prior to X-ray. An initial X-ray should include the whole of the trunk, to determine the length of the oesophageal pouch, to determine if there is gas in the stomach (fistula), and to look for vertebral abnormalities. Other intestinal atresias (N.B. duodenal atresia and imperforate anus) may lead to distension which will be highlighted on x-ray, and may mandate more urgent surgical intervention.

If the X-ray confirms the diagnosis of oesophageal atresia, follow the guidelines for ongoing care. The infant also needs be examined for other associated abnormalities (including congenital cardiac disease and anorectal malformation). It is important that a departmental ECHO is performed preoperatively to exclude major congenital cardiac anomalies and determine the position of the aortic arch (determines incision site).
Renal and Spinal Ultrasound Scans are preformed to exclude associated anomalies. The timing of these is less critical unless there are specific concerns e.g. antenatal anomalies or abnormal renal function.

Nursing care of the infant with a replogle tube

Definition:
A Replogle tube - a double-lumen radio-opaque tube - is used for continuous suction and irrigation of secretions collecting in the blind-ending oesophageal pouch of an infant with oesophageal atresia. Specific care requirements of the infant include respiratory vigilance, continual clearance of secretions to minimise the risk of aspiration, and safeguarding of the airway to maintain optimal respiratory function.

Pre-requisites for practitioners:
Registered nurse / midwife with paediatric and/or neonatal experience who is proficient in neonatal airway assessments and suctioning, who can manage the infant at high risk of aspiration (ascertained through staff competency assessments - N.B. unless signed off as competent, the nurse should be supervised).

Indications:
A Replogle tube is passed as soon as the diagnosis of trachea-oesophageal atresia is suspected / recognised. It is maintained within the pre-operative period to clear secretions continuously that would otherwise put the baby at risk of aspiration. Surgical intervention is normally undertaken when the infant is stable (usually within 48hours).

The finding of a long-gap atresia may call for a 'delayed primary anastomosis' and Replogle nursing for 6-8 weeks or longer, to allow the oesophagus time to lengthen. A formal gastrostomy will be fashioned in the first few days of life to enable enteral feeding. Variations to management plans are individually tailored to meet the specific needs of the infant, focussing on family involvement and maintaining the suck reflex for eventual oral feeding following repair.

PROCEDURE

1. Preparation
2. Insertion of Replogle tube.
    - The Replogle tube is passed orally in the majority of newborn infants
    - The preferred route for older and larger infants with long-gap OA is nasally
3. On-going care
4. Equipment
    - Replogle tube (Argyle size 10FR)
    - Suction tubing and catheters
    - Suction apparatus able to deliver low suction (5-8 Kpa/37-60 mmHg)
    - 1ml syringes
    - 0.9% sodium chloride (5ml ampoule for injection is suitable)
    - Appropriate fixators for replolge tube
    - Marker or tape for replolge tube
    - Monitoring and resuscitation equipment including 2nd suction apparatus

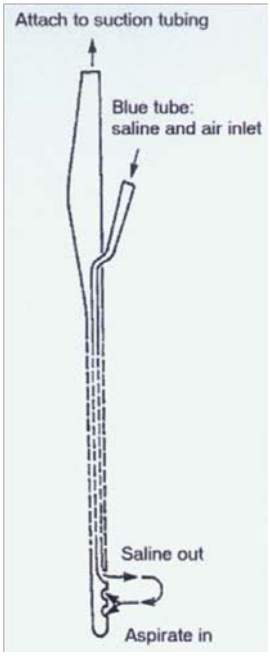

Figure 1: Replogle tube (from GOSH guideline)

Preparation

ACTION	RATIONALE
1. When oesophageal atresia is suspected, assess the infant fully, applying all necessary intensive care monitoring. Assemble equipment listed including suctioning/ resuscitation equipment.	1. The infant with an oesophageal atresia is at high risk of aspiration. To ensure that all equipment is available for immediate use if the infant deteriorates suddenly.
2. Clear oral secretions and nurse infant tilted head up. Keep the head of the incubator elevated.	2. To minimise aspiration of secretions and/ or gastric reflux through a possible associated tracheo-oesophageal fistula.
3. A Replogle tube should be passed by an experienced neonatal nurse able to assess when resistance is met (at the blind end of the upper oesophageal pouch).	3. 'Forcing' of the Replogle may lead to perforation of the oesophagus.
4. Explain rationale of procedure to the family, including: a) A Replogle tube, what it is and why it is needed. b) What the procedure entails, and how long it will take. c) How long the tube is likely to stay in.	4. To ensure that the family have an understanding of the baby's condition and needs, and to promote parental involvement in his/her care.

Insertion of a replogle tube

ACTION	RATIONALE
1. Wash hands and put on appropriate PPE.	1. To minimise risk of cross infection.
2. Ensure 2 suction apparatus' are available at cot-side.	2. For oropharyngeal suctioning when required, and dedicated apparatus for Replogle suctioning.
3. Oral suction if secretions are present.	3. To clear secretions
4. Lubricate tip with sterile water and pass the Replogle tube.	4. To ease passage of Replogle tube
5. When resistance is felt with the blind ending oesophagus, pull back tube very slightly i.e. 0.5cm. Mark length with marker or tape.	5. To ensure optimal placement for clearing secretions and preventing trauma/ adherence to oesophageal wall.
6. Connect Replogle tube to dedicated low pressure suction unit.	6. To allow continuous Replogle suction.
7. Set suction pressure ideally to (37-60 mmHg/ / 5 to 8 kPa).although higher pressure up to 10 may be required for short periods	7. To give effective suction without causing trauma to oesophageal tissue.
8. Check that secretions are draining CONTINUOUSLY along the Replogle tube and into the suction tubing.	8. Continuous drainage of secretions establishes optimal positioning of the Replogle tube for clearing secretions.
9. When optimal position of the Replogle tube has been achieved secure tube using appropriate fixator.	9. To secure the tube in place and to prevent accidentally dislodging or displacing tube).
10. Instil 0.5mls of 0.9% sodium chloride for injection, into 'side arm' of Replogle tube. Remove syringe. Observe for draining of secretions into the suction tubing.	10. To facilitate continuous drainage of secretions. Each instillation must be followed by observations confirming efficacy of secretion removal.
11. Anchor the suction tubing to the cot sheet if required.	11. To avoid 'tug' and inadvertent dislodgement of the Replogle tube.
12. Wash hands and remove PPE at end of procedure	12. To minimise the risk of cross-infection.
13. Record date of insertion, size and length of tube. Document information in care chart.	13. To alert others re: replacement/ length in the event of a transfer or emergency (tube displacement).

14. <u>Following first insertion, check position with an urgent X-ray.</u> For repeat insertions – check documented insertion length and insert to set position. Further x-rays are only indicated for problematic positions.	14. To ascertain position of Replogle tube/blind oesophageal pouch on X-ray.
15. Nurse the infant in the intensive care/ high dependency setting with cardio- respiratory and O_2 saturation monitoring.	15. To ensure prompt detection and intervention in the event of a sudden deterioration in condition.

<u>On-going care</u>

ACTION	RATIONALE
1. Instil 0.5ml boluses of 0.9% sodium chloride into the 'side arm' of the Replogle tube. Watch for secretions draining. Ensure that each bolus is interspersed with air pockets and secretions are draining easily and continuously. Repeat flushes every 15 minutes. **On admission to RHSC** frequency of replogle irrigation will be dictated by the viscosity and volume of secretions and baby's response to irrigation.	1. To clear viscous secretions from the oesophageal pouch, ensure patency of the tube, prevent tube blocking and avoid potential tracheal aspiration between irrigations.
2. **DO NOT** leave the flush syringe attached to the 'side arm' after flushing.	2. This practice interrupts secretions removal, increasing risk of aspiration.
3. Monitor suction pressures and document readings hourly. If pressure is increasing, flush Replogle tube and if still high seek assistance from an experienced nurse, who may manipulate or replace the tube.	3. An increasing pressure on the suction pump may indicate that the Replogle tube is becoming blocked, or is adhering to the oesophageal wall.
4. Suction the oropharynx if thick/ excessive secretions are present. DO NOT irrigate the Replogle tube when there are immediate concerns about airway stability, secretions, position of the tube, or with deterioration - Use conventional oropharyngeal suctioning instead.	4. To prevent aspiration of secretions as seen with oesophageal dysmotility/ high atresias.

5. Observe and document colour and consistency of secretions.	5. Pouch secretions quickly become colonised with organisms
6. Do not include instilled volumes within fluid balance.	6. Saline instilled is continuously aspirated and therefore not an 'intake'.
7. Change suction tubing daily and bottle liner as per unit protocol.	7. To minimise the risk of infection.
8. If the parents give consent the stable baby may have a dummy to suck.	8. To encourage non-nutritive sucking.
9. Ensure continuing support for family with regular up-dates on the baby's condition and progress. Provide information on local and national support-groups.	9. To promote parental involvement and understanding of their child's specific requirements.

Ongoing care of long gap atresia

ACTION	RATIONALE
1. Change Replogle tube every four days (more frequently if secretions are thick or excessive). Document in notes and observation chart.	1. To ensure continuous and effective removal of secretions.
2. Observe and document colour and consistency of secretions. Collect specimens of secretions for microbiology weekly, or as requested.	2. Pouch secretions quickly become colonised with organisms.
3. Check serum electrolytes weekly.	3. Sodium levels may fall due to the loss of saliva (electrolytes) during suctioning.
4. Administer sodium supplements as prescribed.	4. To maintain electrolyte balance.
5. Provide stimulation and play therapy. During cuddles with parents, maintain a high tilt/ upright position and continuous suction. The stable baby requires oral stimulation.	5. To promote normal development and bonding. To prevent aspiration/reflux of secretions. For promotion/ retention of the suck reflex.
6. The stable baby can be nursed with a pulse oximeter alone but has to be closely observed at all times.	6. To ensure prompt detection and intervention in the event of a sudden deterioration in condition.
7. Ensure continuing support for family, with regular up-dates on the baby's condition and progress.	7. To promote parental involvement and minimise misunderstandings.
8. **IF THE REPLOGLE TUBE IS NOT DRAINING:** Check suction is connected and working. Instil an	8. To rule out equipment failure. To ensure the Replogle tube is functioning.

additional 0.5ml flush of 0.9 sodium chloride cautiously. This should be observed moving immediately along the lumen of the tube and into the suction tubing.	
9. **IF THE FLUSH DOES NOT MOVE BACK IMMEDIATELY ALONG THE LUMEN:** Check that the tube is optimally positioned within the oesophageal pouch • Advance Replogle tube gently until resistance is felt, and withdraw 0.5-1cm**.** • Inject air into the 'side arm' using a 2 or 5ml syringe. • Move tube gently • If none of the above is successful, seek assistance from an experienced nurse or doctor. A brief increase of suction pressure to 10kPa/ 70mmHg may be required if secretions are very thick. However, this should not be allowed beyond a few minutes. Provide oropharyngeal suctioning if required. Also check for secretions collecting in the suction tubing itself, which is not emptying into the receptacle.	9. To ensure the Replogle tube is not been displaced. To assist in unblocking the Replogle tube. The Replogle tube may need to be removed and replaced. The increased pressure may result in the tube attaching to the wall of the oesophagus, preventing effective suctioning and also increasing the risk of damage to the wall of the oesophagus. Low suction pressures may be ineffective in removing large collections of secretions from tubing.

Other information:
Some units temporarily increase suction pressures to an upper limit of 7-10kPa/ 50-70mmHg when thick viscous secretions are present (Southern West Midlands Newborn Network & GOSH). Note: this is only a temporary measure to remove thick secretions. Beware that high pressures can cause the Replogle tube to adhere to the wall of the oesophagus, becoming altogether ineffective in removing secretions.

The baby with a long gap atresia requires extended care and active family involvement. Preoperative feeding/ swallowing/ oesophageal motility assessments are made and objectives set to reduce post-operative complications related to poor oral stimulation. Following educational assessments, preparation and support, the family will be guided through replogle tube care, and gastrostomy feeding. Gastrostomy guidelines are separately covered.

Specific pre-operative care:
It is important that an ECHO is performed preoperatively to exclude major congenital cardiac anomalies and determine the position of the aortic arch. A right sided aortic arch may indicate a change to the normal right sided thoracotomy approach. The infant also requires examination for other associated congenital abnormalities (including heart murmur, anorectal malformation). Elective intubation on the ward is positively contra-indicated. The infant is

intubated only in theatre, immediately prior to surgery, to avoid possible gastric distension which if untreated may lead to cardio-respiratory compromise or gastric perforation.

Ensure continuous suction is maintained during transport, using portable low pressure suction. Know the lowest suction pressure setting on whatever suction unit is being used and aim to achieve pressure of 5 to 8KPa. Intermittent suction is acceptable in situations where continuous suction is not available, suggest every 5 to 10 minutes. During neonatal transfers where the infant is secured within the incubator it may not be possible to elevate the infant's head. In this situation if a replogle tube is in situ, position the infant prone or side-lying. On the rare occasion when no replogle tube is available, the baby should be placed prone. **(ScotSTAR Guideline).**

Specific post-operative care:

Post operatively, the baby may have a Trans-Anastomotic nasogastric Tube (TAT) in place. This acts as a stent for the oesophageal anastomosis (and can be used for delivering gastric feeds when appropriate). Ensure that this tube is securely fastened and identified with tape labelled as follows: - DO NOT REMOVE". The nurse/carer needs to be aware that if the tube is accidentally removed in the first week post-operatively, it must not be reinserted at the beside (as blind passage of the tube can disrupt the anastomosis). The surgeon should be notified immediately in cases of accidental TAT displacement.

The baby will continue to be nursed head up to reduce the risk of gastric contents refluxing up to the anastomosis. Paralysis may be continued, especially with a tight repair, and ventilation continued for 4 to 7 days - with pain relief and sedation. The surgeon may also request that the infant be nursed supine with head flexed, to reduce tension on the suture line. NCPAP should be avoided, hence it is best not to hastily extubate the infant.

Careful measurement of the ET tube and suction catheters is required (noted on nursing care chart) to avoid damage of the repaired fistula site (most likely below the ET tube). DO NOT SUCTION BEYOND THE END OF THE ET TUBE (use catheters with measured increments). Oropharyngeal suctioning must avoid the anastomotic suture line - the surgeon will clarify the length of the anastomosis from the mouth.

If the baby has an extra pleural chest drain, do not put on continuous suction (unless specifically instructed to do so) as even low pressures may cause undue stress/damage to the newly repaired oesophagus. Monitor and record drainage. Saliva, air or bubbles in the drain may indicate leak from the anastomosis or fistula site. The surgical team should be notified urgently if this occurs.

Place nasogastric tube on free drainage. Monitor gastric aspirates 2-4 hourly. The initiation of gastric feeds will be determined by the surgical team, with or without a prior contrast swallow that assesses the integrity of the anastomosed suture line.

Post oesophageal repair, babies often display signs of oesophageal dysmotility. Gastrooesophageal reflux is highly likely. Elevating the cot and utilising positioning techniques may help control reflux symptoms. SALT assessment/ input may be required if disordered oesophageal peristalsis or poor oral skills make oral feeding challenging.

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TOFS support group - TOFS - Tracheo Oesophageal Fistula Support

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