Introduction
Oesophageal Atresia (OA) is a condition in which the proximal and distal portions of the esophagus do not communicate. In 88% of cases, the upper segment of the oesophagus is a dilated, blind-ending pouch with a thickened muscular wall). The distal oesophageal portion is a pouch with a small diameter and a thin muscular wall.

Tracheo-Oesophageal Fistula (TOF) is an abnormal communication between the trachea and oesophagus. When associated with OA, the fistula most commonly occurs between the distal esophageal segment and the trachea, just above the carina.

Fig 1a Normal anatomy of the respiratory system and upper gastro-intestinal tract

Fig 1b Oesophageal atresia and distal ended tracheo-oesophageal fistula

http://www.tofs.org.uk/leaflets/AboutTOFbooklet.pdf
Incidence and Risk Factors

Most cases of OA occur sporadically and can occur with or without Tracheo-Oesophageal Fistula. It is a congenital disorder occurring in 1 in 3500-4500 live births, with a higher incidence rate in twins. Although aetiology is not clearly known it is caused by the failure of the oesophagus to differentiate and separate from the trachea in early organ development. The most common type of OA/TOF is Oesophageal Atresia with distal Tracheo Oesophageal Fistula.

50 percent of OA/TOF cases can be associated with VACTERL syndrome. It involves a combination of anomalies affecting Vertebrae Anus Cardiac Tracheo Esophageal Renal Limbs with cardiac malformations being the most common. Trisomies 18 and 21 (Edwards and Downs Syndrome) can also be associated with OA/TOF.

Antenatal diagnosis

Antenatal associations with congenital OA/TOF include polyhydramnios due to the inability of the fetus to swallow and absorb amniotic fluid and an absent or small stomach. This may be identified as a bubble on an antenatal ultrasound scan. Despite routine anomaly ultrasound scans only 40-50% of cases are diagnosed before birth.

Some have reported an improved detection rate with MRI – see Figure 3. When there is an antenatal finding of OA/TOF, ongoing care of the mother and baby should be transferred to a tertiary perinatal centre with neonatal surgical facilities.
**Postnatal Diagnosis**

The majority of newborns with OA/TOF are diagnosed after birth and usually admitted to the NICU within the first few hours of life. *Some/all of the following signs will be observed:*

- Excessive saliva production—‘bubbly mouth’
- Drooling, choking, coughing
- Transient apnoea
- Respiratory distress
- Distended abdomen
- Regurgitation post feed
- Aspiration of regurgitated food and gastric content into the lungs—pneumonia
- Inability to pass an intragastric tube

Due to a discontinuous oesophagus, infants with OA cannot clear their secretions. This defect leads to persistent drooling and aspiration or regurgitation of food after attempted feedings. Tracheo-oesophageal fistula (TOF) causes additional complications as a result of the communication between the trachea and the oesophagus. When infants with TOF strain, cough, or cry, air enters the stomach through the fistula. As a result, the stomach and small intestine can become dilated, which elevates the diaphragm and makes respiration more difficult. Food and gastric secretions can reflux through the fistula into the tracheal bronchial tree and up/down the oesophagus causing pneumonia and atelectasis. Therefore, pneumonia and respiratory distress are common complications of TOF.

**Clinical Diagnosis**

There should be a low threshold for investigation if a TOF / OA is suspected and the newborn should be admitted to Newborn Care and placed in an incubator or open care cot for observation, stabilisation and investigation. When attempts are made to pass an intra gastric tube there may be resistance and the clinician may find that the IG tube coils back up and out the mouth i.e. the inability to pass the IG tube successfully down into the stomach. The medical team must be informed and further investigations ordered such as a chest and abdomen X-ray to confirm OA/TOF - see Figure 4 for a typical X-ray.

*On confirmation OA/TOF, the following should be performed:*

All infants diagnosed with a TOF / OA will be transferred to a neonatal surgical centre as soon as practical. *Pre transfer stabilisation will include:*

- **Management of the airway**—these infants are **not** ventilated routinely but a patent airway must be maintained to avoid aspiration of excess secretions or gastric contents. These infants should be nursed in an elevated position (head up) at 35-40 degrees
- **Keep baby nil by mouth**—IV cannula insertion and parenteral fluids to maintain hydration
- **Passing of a FG10 size Replogle® tube**—This should be done by an experienced clinician (CNS / registrar) - *see procedure below.*
- **Suction**—Continuous low suction on the Replogle® tube at minus 5kpa to facilitate clearance of secretions – *see procedure below.*

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Main author: Ms Alison Blackmore RN.
• **Comfort measures**- As per RPA Newborn Care developmental care protocols. Use of a pacifier is usually contra-indicated due to the risk of increasing oral secretions and possible aspiration.

• **Parents**- Give adequate support and explanation about their infant and plan of care. Show parents how to comfort their child, eg containment.

• **Preparation for transfer**- As per RPA Newborn Care transfer protocols to a neonatal surgical facility.

**Insertion and care management of the Replogle® tube**

For an infant with oesophageal atresia, insertion of a Replogle® tube allows continuous aspiration of the blind oesophageal pouch. The second (blue) lumen allows the tube to be flushed intermittently with normal saline and so minimise the accumulation of thick secretions and subsequent tube obstruction. This will reduce the risk of aspiration pneumonia.

**Equipment needed**

<table>
<thead>
<tr>
<th>Clean Equipment</th>
<th>Sterile Equipment</th>
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<tbody>
<tr>
<td>Comfeel®</td>
<td>FG10 Replogle® tube</td>
</tr>
<tr>
<td>Leukoplast® brown tape)</td>
<td>0.9% Normal saline</td>
</tr>
<tr>
<td>Suction tubing</td>
<td>3ml syringe</td>
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**Insertion of Replogle tube – see Figure 5**

- Collect equipment needed
- Ensure that equipment needed is in working order prior to use
- Use universal precautions
- Provide comfort measures to the infant
- Gently suction infants’ oro/nasopharyngeal airways
- *Gently* introduce the Replogle® tube into the oropharynx and advance into the oesophageal pouch until resistance is felt. Care must be taken not to perforate the posterior pharyngeal wall or the wall of the oesophageal pouch. The tube should now be in the upper oesophageal pouch.
- Pull tube *slightly* back (so when suction is applied it does not adhere to the oesophageal wall)
- *Apply* Comfeel® to face & use brown tape (Leucoplast®) to secure tube
- *Measure* the tube from the tip of the second (blue) lumen to the lip and document on the procedure label
- Ensure tube is secure as re-insertion causes discomfort and possible trauma
- Attach to the suction tubing & set and check pressure at minus 5kpa
- Observe for drainage of secretions from the Replogle® tube – if secretions are copious attach a specimen suction trap between the Replogle® tube and suction tubing to estimate losses
- *After initial insertion* instil 0.5ml of 0.9% Normal saline into the blue lumen of the Replogle® tube. The saline should immediately be seen to be suctioned out the clear lumen – this is confirmation that the system is working
- Consider an x-ray if there are concerns about position of the tube
- Keep the blue end open to air while on suction - do not obstruct this lumen or the sump drainage system will not work
- Record on procedure label and stick in the case history notes (MR45) -document position / length of tube and that is it working
- Record continued patency of the Replogle® tube by observing secretions in the clear lumen, and maintaining suction at minus 5kpa
• Inform senior nursing and medical staff if problems are still occurring or there is a deterioration in the infant’s condition.
• Use of dummies (pacifiers) to comfort these babies is controversial as sucking increases oral secretions – short term use to comfort the infant during procedures such as insertion of an IV cannula may be considered.

**Blocked Replogle® tube**
• Any increase in or excess oral secretions may indicate the tube is blocked. Check measurement to ensure the tube is still in the correct position, ensure connections are tight and suction is working.
• **Then** – instil 0.5ml 0.9% Normal saline into blue lumen and record result in the notes. *This procedure may need to be repeated more frequently if secretions are excessive and / or tenacious.* Discuss with team leader / registrar.
• If unable to aspirate the Replogle® tube, remove and gently suction the oropharynx using an 8-10Fg suction catheter – measure distance from the corner of the mouth to ear tip as per suction protocol.
• Report same to registrar / neonatal fellow and insert a new Replogle® tube as per procedure above.

**Key Points**

<table>
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<th>INTERVENTION</th>
<th>RATIONALE</th>
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| Admit as per NICU admission policy. Ensure cardio-respiratory and pulse oximetry is insitu and admitted into ICU. | Need for intensive care and monitoring
Follow admission policy
Emergency equipment – suction and Neopuff® to be available at all times |
| Use of mechanical ventilation is not routine, if required – minimal pressures should be used | For infants with a TOF observe for excessive abdominal distension |
| Keep infant nil by mouth | Prevent aspiration pneumonia
Pre-operative patient management |
| Insert Replogle® tube and commence low pressure suction (-5kpa) | To reduce aspiration/respiratory distress
To draining secretions from upper oesophageal pouch
To aid airway patency |
| Nurse infant in an elevated position (head up) at 35-40 degrees | Reduce the risk of reflux/aspiration
Facilitate drainage of upper oesophageal pouch
Optimise position of Replogle® tube |
| Parenteral fluids | Prevent aspiration pneumonia – nil by mouth
Maintain hydration
Measure output |
| Developmental care | Reduce infant distress |
| Parents | Support, explain rationale for interventions & answer questions
Discuss plan regarding transfer
Involve them in care of their infant as appropriate |
| Prepare for transfer | Need for surgical repair of OA/TOF at a specialist centre
See newborn transfer protocols |
Figure 3: Antenatal MRI

In utero magnetic resonance imaging (MRI) of the fetus indicating upper oesophageal pouch (EP) and diagnosis of oesophageal atresia (OA).

EP = Oesophageal Pouch (OA)
T = Trachea
B = MRI

Yagel et al, 2005

Figure 4: Chest and abdomen X-ray

Intragastric tube coiled up in upper oesophageal pouch

Air bubble present in stomach

Al-Rawi & Booker, 2007
**Figure 5: Replogle® tube**

A Replogle® tube is a double lumen, radio-opaque tube, used to give continuous suction and irrigation to a blind ending pouch.

*Great Ormond Street Children’s Hospital, 2004*
Reference List


Children’s Hospital Of Winsconsin, 2009. Tracheal esophageal fistula (TOF) and Esophageal Atresia (EA) http://www.chw.org/display/PPF/DocID/35572/Nav/1/router.asp
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