

ANAESTHESIA FOR BLEEDING TONSIL

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Before reading the tutorial, consider this case scenario and answer the following questions (answers & discussion follow):

You have been called to see a 5-year-old child who had a tonsillectomy six hours previously. The child is bleeding and needs to go back to theatre for haemostasis. When you arrive on the ward the child is agitated and says he feels sick. The postoperative blood-loss is reported to be minimal by the nursing staff.

On examination he is pale. His pulse is 125/min, respiratory rate is 25/min, blood pressure 80/40mmHg and capillary refill time 4 seconds.

Questions

- 1) What are the specific problems in this case?
- 2) How do you assess hypovolemia in children?
- 3) What is the immediate management in the ward?

Introduction

Adenoidectomy and tonsillectomy are the most common operations performed in the UK, although less common in many developing countries. The incidence of bleeding following tonsillectomy is 0.5 - 2% depending upon the surgical technique.

Post tonsillectomy bleeding can be:

- **Primary** - this may occur within 24 hrs of surgery.
- **Secondary** – this may occur up to 28 days post surgery and is associated with sloughing of the eschar (dead tissue) overlying the tonsillar bed, loosened vessel ties or infection from underlying chronic tonsillitis.

Blood supply to the tonsils

The blood supply to the tonsil is through the external carotid artery and its branches, as follows:

- **Superior pole**
Ascending pharyngeal artery (tonsillar branches)
Lesser palatine artery
- **Inferior pole**
Facial artery branches
Dorsal lingual artery
Ascending palatine artery

Venous return is to the plexus around the tonsillar capsule, the lingual vein and the pharyngeal plexus. Post tonsillectomy bleeding is usually venous in origin.

Risk factors for bleeding after tonsillectomy

The risk of haemorrhage increases with age, and is higher in males. The surgical technique also influences the incidence of bleeding (1,2). The child may have an undetected coagulopathy, but this is an uncommon cause of primary tonsillar haemorrhage.

Surgical technique

The overall risk of haemorrhage after tonsillectomy is related to surgical technique. A **'hot'** surgical technique for both dissection and haemostasis (diathermy or radiofrequency coblation) has three times the risk of postoperative haemorrhage compared to traditional tonsillectomy using surgical instruments without the use of diathermy (**cold steel** tonsillectomy). The risk of postoperative haemorrhage for operations using cold steel for dissection but bipolar diathermy for haemostasis is around 1.5 times higher compared to cold steel operations using only ties or packs for haemostasis. There is more intraoperative bleeding during cold steel tonsillectomy, although less postoperative pain.

In a setting where secondary haemorrhage and postoperative pain are very difficult to manage (for instance where access to the hospital after surgery is difficult, or in the developing world), it may be sensible for the surgeon to use a cold steel technique in preference to a diathermy technique, albeit at the expense of more intraoperative bleeding (2).

Anaesthetic considerations

Important risk factors to consider in a child who is bleeding after tonsillectomy are as follows:

- Potential hypovolaemic shock
- Pulmonary aspiration (of regurgitated swallowed blood or postoperative oral intake)
- Potential difficult intubation - bleeding obscuring the view, oedema from previous airway instrumentation and surgery.
- A second general anaesthetic

Preoperative assessment and resuscitation

The presenting signs relate to the quantity of blood loss.

Blood loss is secondary to venous or capillary ooze from the tonsillar bed. It may be difficult to measure as bleeding may occur over several hours and large amounts of blood may be swallowed. Brisk bleeding may lead to the child spitting blood. The child may be hypovolaemic with a low haemoglobin.

Tachycardia, tachypnoea, delayed capillary refill and decreased urine output are early indicators of hypovolaemic shock, whereas hypotension and altered sensorium are late signs of hypovolaemia, with decompensated shock.

The cardiovascular status is assessed by considering cardiovascular parameters, also perfusion of other organs:

- **Heart rate** – this child may be tachycardic due to anxiety, but this may also be due to catecholamine release to maintain cardiac output in the presence of hypovolaemia. Bradycardia is caused by acidosis and hypoxia and is a preterminal sign.
- **Capillary refill time** - hypovolemia leads to a poor skin perfusion and prolonged capillary refill time (> 2 seconds). Mottling, pallor and peripheral cyanosis are also indicators of poor skin perfusion.
- **Blood pressure** is difficult to measure, especially in younger children. Hypotension is a late sign of hypovolaemic shock.
- **Tachypnoea** may be due to anxiety, but also occurs in response to acidosis secondary to poor tissue perfusion and with severe anaemia.
- **Core / Skin temperature difference** of more than 2°C is an important sign of shock.
- **Decreased or absent urine output.** Poor urine output (<1ml/kg/h in children, and < 2ml/kg/h in infants) indicates inadequate renal perfusion.
- **Blood gas analysis** may reveal metabolic acidosis secondary to poor tissue perfusion.

Preoperative resuscitation is essential and is guided by clinical signs and trends in monitoring. Haemoglobin and coagulation variables should be checked. Blood and blood products should be available and transfused as necessary.

As a general rule, a patient who is bleeding should be taken to theatre as soon as possible. However, the child must be resuscitated before induction of anaesthesia to avoid cardiovascular collapse. Resuscitation should be with isotonic crystalloid (0.9% Saline or Hartmann's solution), colloid or blood. Resuscitation is by intravenous boluses of fluid, 20 ml/kg stat, repeated if necessary after reassessment of the cardiovascular system. Large volumes of fluid may be required (40-60 ml/kg). Hypotonic fluids such as 5% dextrose, 0.18% saline and 2.5 % dextrose or 0.45% saline and 5% dextrose must not be used in the acute resuscitation of hypovolaemic children.

Note the time since surgery, the time since last ingestion of food (children are usually encouraged to eat postoperatively), the presence of clots in the mouth (if possible), and any signs of airway difficulty, such as stridor or intercostal/tracheal recession. Examine the previous anaesthetic chart if available, to identify the size of the tracheal tube used, the analgesia administered, also any problems such as intubation difficulty. Analgesia administered during the initial operation must be taken into account if the child returns to theatre soon after – particularly if considering a second dose of morphine.

Perioperative management

General considerations

These are difficult cases to manage and senior help should be sought early. The operating theatre should be prepared prior to induction:

- Two suction devices with wide bore tubing, turned on and available for immediate use.
- Laryngoscopes with the correct size of blade – check they are working and ready for use.
- Tracheal tube, size as used previously, plus half a size smaller in case of laryngeal oedema. Two tubes of each size will be required as the first tube inserted may become blocked with clots.
- Wide bore nasogastric or orogastric tube to empty the stomach of blood at the end of the procedure.
- The surgeon and surgical assistant should be scrubbed and ready with all instruments.

Anaesthetic technique

There is some debate about the safest technique of anaesthesia for a bleeding tonsil.

The two common choices are:

1. Inhalational induction in the head down, lateral position.
2. Modified rapid sequence induction with cricoid pressure.

The pros and cons of each technique are discussed below. The anaesthetist should adopt an approach with which they are comfortable, cognizant of the potential hazards.

Inhalational induction

Pro: Inhalational induction is a technique that is familiar to anaesthetists and oxygenation is well maintained during spontaneous ventilation. Inhalational induction in the lateral position helps drain blood from the airway by means of gravity and clots can be gently suctioned from the airway once an adequate depth of anaesthesia is achieved. Suxamethonium may be given prior to intubation, either with the child remaining on their side, or the child may be turned into the supine position and cricoid pressure applied.

Con: Inhalational induction with a volatile agent in an anxious child who is bleeding can be difficult. Deep anaesthesia may be induced inadvertently, particularly in a child recovering from anaesthesia a few hours earlier. Deep anaesthesia is a risk factor for cardiac arrest in a child who may still be hypovolaemic, particularly if halothane is used. Laryngoscopy and intubation under deep anaesthesia should be avoided. Intubating in the lateral position is unfamiliar to most anaesthetists and many would turn the child into the supine position prior to intubation.

Intravenous rapid sequence induction

Pro: Anaesthesia can be induced in the supine position with the application of cricoid pressure to reduce the risk of aspiration. The use of muscle relaxants helps produce ideal conditions for intubation. Intravenous induction is less stressful for the child who should already have an intravenous cannula in situ.

Con: A modified rapid sequence induction is required as it is impossible to adequately preoxygenate an anxious child who is bleeding – facemask ventilation will be required after the administration of suxamethonium. Care must be taken not to inflate the stomach during facemask ventilation, as this will encourage regurgitation and aspiration. There is a risk of hypoxia if intubation is difficult and spontaneous respiration has been lost.

During the operation further fluid and blood should be given as guided by clinical monitoring – heart rate, capillary refill, core-peripheral temperature difference and blood pressure. Near patient testing using a Hemocue® or the WHO haemoglobin scale can guide transfusion requirements if available.

The child may become cold during surgery due to large volume transfusion. The child should be kept well covered to maintain body temperature, and if possible a warming blanket used with temperature monitoring. Hypothermia may exacerbate coagulopathy.

Once haemostasis is achieved, a large-bore gastric tube should be passed under direct vision to empty the stomach. Non-depolarising neuromuscular blockade should be reversed. The trachea should be extubated with the child fully awake in the left lateral, head down position. Alternatively, particularly in the absence of a tipping trolley, the ‘tonsil’ position may be used - a bolster is placed

under the child's chest in the lateral position so that the head is below the level of the chest, and fluids drain from the mouth.

Postoperative care

Postoperatively it is important to monitor the child closely in a well-lit area (do not return them to a dark ward area at night), with regular observation of vital parameters. Blood transfusion may need to be continued in recovery. The haemoglobin should be measured and coagulation screen sent if possible. Minimum haemoglobin of 8 g/dl is acceptable provided there is no further bleeding – such a child will require iron supplements for the next six weeks.

Discharge from hospital will be possible once the child shows no further signs of bleeding, they have no further transfusion requirements, they have resumed normal eating and drinking, and their pain is well controlled. They should remain in hospital for at least 24 hours after surgery for bleeding tonsil.

ANSWERS:

1) What are the specific problems in this case?

- a) Hypovolaemia
- b) Aspiration (blood/food)
- c) Difficult intubation (bleeding, laryngeal oedema)
- d) Second general anaesthetic
- e) Management of an anxious child/parents

2) How would you assess hypovolemia?

- a) Cardiovascular - tachycardia and low blood pressure with prolonged (>2secs) capillary refill time
- b) Skin - cold, mottled skin.
- c) Cerebral signs - agitation, confusion, drowsiness and depressed conscious level.
- d) Renal signs - low or absent urine output.
- e) Respiratory signs - Tachypnoea then acidotic sighing respirations.
- f) Laboratory - low haemoglobin, metabolic acidosis with or without compensatory respiratory alkalosis and a high blood lactate.

3) What is the immediate management in the ward?

The aim of ward management is to treat hypovolemia without delaying transfer to theatre for haemostasis. It is important to optimize a child before a general anaesthetic to avoid cardiovascular collapse during induction, starting with assessment of 'ABC':

- a) High flow oxygen via facemask if the child tolerates
- b) Assess for respiratory distress
- c) Assess volume status
- d) Obtain intravenous access.
- e) Send for full blood count, cross match and coagulation.
- f) Resuscitate with intravenous fluids and blood products as needed.
- g) Prepare for theatre.
- h) Call for senior help.

References:

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Further reading

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2. Hatch and Sumner's Textbook of Paediatric Anaesthesia, 3rd edition Editors: Bingham R, Lloyd-Thomas A, Sury M. Hodder Arnold London 2008