Thoracotomy in a spontaneously breathing neonate undergoing tracheo-oesophageal fistula repair

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Introduction

Tracheo-oesophageal fistulae present a unique ventilator problem in the neonatal population. We describe the use of a caudal epidural catheter in a neonate who had to undergo carinal tracheo-oesophageal fistula repair. The epidural administration of a local anaesthetic enabled the provision of optimal analgesia, while simultaneously allowing maintenance of comfortable spontaneous ventilation during the thoracotomy.

Case study

A three-day-old term neonate (2.8 kg) presented with coughing and choking while feeding. On chest X-ray, the nasogastric tube was seen to be coiling in a blind-ending upper oesophageal pouch, and a diagnosis of a tracheo-oesophageal fistula with oesophageal atresia was made. Preoperative investigations did not reveal any other associated congenital anomalies. The neonate was booked for urgent repair of the defect.

After initiation of standard anaesthetic monitoring and aspiration of secretions from the upper oesophageal pouch, an inhalational induction was performed, using sevoflurane in oxygen. Peripheral intravenous access was established using a 24 G cannula. Direct laryngoscopy was performed and the airway topicalised with lignocaine (3 mg) to facilitate rigid bronchoscopy and tracheal intubation. Bronchoscopy failed to demonstrate the site of the tracheo-oesophageal fistula. The trachea was intubated via the nasal route with a size 3 tracheal tube, secured to a depth of 11 cm. Spontaneous ventilation was maintained throughout induction of anaesthesia and tracheal intubation.

Anaesthesia was maintained with sevoflurane in oxygen and air. A central venous catheter was inserted in the right subclavian vein. A caudal epidural catheter was placed under aseptic conditions and secured at a depth of 12 cm (approximately at the T5/T6 vertebral level). An initial bolus of bupivacaine (2 mg/kg, diluted to a 2 ml volume) was given, followed by intermittent boluses (0.4 mg/kg) at one-hour intervals. The neonate also received antibiotic prophylaxis for surgical site infection and a single dose of paracetamol (7.5 mg/kg) intravenously, approximately one hour prior to completion of surgery.

The surgical approach was via a right thoracotomy. There was no response to the surgical incision and comfortable spontaneous ventilation was maintained throughout the fistula ligation part of the procedure. A carinal tracheo-oesophageal fistula was identified and successfully ligated. Subsequent to fistula ligation, the neonate was paralysed with a nondepolarising muscle relaxant, and ventilation supported with a pressure mode while anastomosis of the oesophagus was performed. The reason for supported ventilation was to prevent hypoventilation and fatigue of the neonate during this major surgery. The operative time was 2 hours, 25 minutes.

Following completion of the surgery, the caudal epidural catheter was removed because of unfamiliarity with management of these catheters in our neonatal intensive care unit. The neonate was transferred to the intensive care unit, intubated, and ventilated as per intensive care unit policy.

The subsequent postoperative course was uneventful and the neonate was extubated six hours later. No complications were reported.

Discussion

Tracheo-oesophageal fistula and oesophageal atresia are common congenital anomalies which occur in one in every 3 000-5 000 live births.[1] A number of anatomical configurations are described by the Gross and Vogt classifications.[1] The most common one is an oesophageal atresia with a distal trachea-oesophageal fistula (Gross type C or Vogt type IIIb).

The management of neonates undergoing tracheo-oesophageal fistula, and oesophageal atresia, repair, is challenging. Preoperative priorities include maintaining hydration with intravenous fluids and correcting electrolyte imbalances.[2] Blood glucose should be monitored regularly as hypoglycaemia is common and should be treated. Keeping the neonate *nil per os,* and maintaining low-grade suctioning of the upper oesophageal pouch decreases secretions and the risk of aspiration. Nursing in a semi-upright or lateral position may also reduce this risk.

Intraoperative anaesthetic considerations include induction of anaesthesia, securing the airway and maintenance of oxygenation and ventilation, while avoiding insufflation of the gastrointestinal tract. Numerous techniques have been described, including positioning the tip of the tracheal tube distal to the fistula, occluding the fistula with the cuff of a tracheal tube or fogherty catheter, and even endobronchial intubation.[3] If the position of the fistula is uncertain, or it is difficult to isolate, maintenance of spontaneous ventilation is considered to be the technique of choice until the fistula has been identified and successfully ligated.

The provision of adequate analgesia in a spontaneously breathing neonate undergoing a thoracotomy poses additional challenges. Regional analgesia, in the form of a caudal epidural or paravertebral block, has been described.[3] We elected to place a caudal epidural catheter. The epidural administration of local anaesthetic enabled the provision of optimal analgesia, while simultaneoulsy allowing maintenance of spontaneous ventilation.

Leaving the caudal epidural catheter in-situ for use in the postoperative period is ideal, and allows for extubation in theatre or early postoperatively. Importantly, it is important to be alert to the potential complications of these catheters, and particularly sepsis. Unfortunately, our neonatal intensive care unit is not familiar with management of these catheters. We elected to remove the catheter in theatre because of safety concerns.

Conclusion

The use of a caudal epidural catheter for the administration of local anaesthetic is a useful analgesic option in a spontaneously breathing neonate undergoing a thoracotomy, and should be considered for the safe management of these challenging cases.

References

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