Small Defect - Big Anaesthetic Concern

Sir,

Anaesthesia machine and equipment check prior to use is an essential aspect of safe anaesthesia delivery. Manufacturing defects can go unnoticed and contribute to anaesthetic mishap during intraoperative period.

A 2 days neonate weighing 2 kg, with gastroschisis and no other comorbidities or congenital anomalies was posted for emergency laparotomy. In the operation theatre, noninvasive blood pressure monitoring, electrocardiography, temperature probe and oxygen saturation (SpO₂) probe were attached to the patient. Patient was premedicated intravenously with atropine (0.02 µg/kg) and fentanyl (2 µg/kg). After adequate pre-oxygenation and suctioning through nasogastric tube placed in situ, patient was induced with propofol (2 mg/kg). Neuro muscular relaxation was achieved with injection atracurium (0.5 mg/kg). Trachea was successfully intubated with a size 3.0 mm Internal Diameter (ID) Endotracheal Tube (ET) using size zero Miller's straight blade in first attempt. Tube was fixed after checking bilateral air entry. Intraoperative anaesthesia was maintained with sevoflurane. Patient was manually ventilated with Jackson Rees circuit as mechanical ventilator with airway pressures monitoring was not available in the emergency theatre.

Towards the end of surgery, as soon as abdominal contents were reduced and surgeons started closing the abdomen, there was a sudden drop in SpO₂ with an increase in tightness of the reservoir bag. Capnogram was not available in the emergency theatre. On auscultation, chest was bilaterally clear with equal but decreased air entry ruling out the possibility of bronchospasm and endobronchial intubation. The depth of anaesthesia was increased by increasing the concentration of sevoflurane, to rule out light plane of anaesthesia as a cause of tight bag. Patient condition did not improve even after this. Problem was diagnosed when we were not able to pass a five French gauge suction catheter through ET. On inspecting the ET connector, an unconventionally narrowed pinpoint opening was seen. Other same sized tubes of the same company had similar connectors with pinpoint opening. So, it was replaced with a same sized ET connector of a different company (Figure 1). The compliance of the bag improved significantly with improved bilateral air entry. Oxygen saturation returned back to normal. Neuro muscular blockade was reversed with neostigmine and glycopyrrolate in standard doses followed by uneventful extubation. Patient was shifted to neonatal intensive care unit for further management.

According to Poiseuille's Law, resistance offered to flow is inversely proportional to fourth power of radius of a tube. Therefore, even a small reduction in the radius of opening in ET connector can lead to a drastic increase in airway resistance resulting in a tight bag situation. Generally, obstruction due to defective ET connector presents immediately after successful endotracheal intubation. Few cases have been reported in literature regarding narrowing of ET connector but they all were detected at the start of surgery. In this case, we were able to detect it towards the end of surgery during closure of abdominal wall due to increase of intra-abdominal pressure.

Such a presentation may be attributable to three reasons. Firstly, raised intra-abdominal pressure and pushing up of the diaphragm on closure of abdomen may have led to a critical increase in airway pressure making ventilation through the pinpoint opening difficult. Secondly, as there was no airway pressure monitoring and bag compliance was the only guide, defective compliance of the bag must not have been appreciated by hands of anaesthetist until it finally presented as tight bag on closure of abdomen. Thirdly, capnogram facility which could have lead to earlier detection of the problem was not available in the emergency theatre.

Various common causes which can lead to intraoperative tight bag scenario include light plane of anaesthesia, bronchospasm, mechanical obstruction and recovery from relaxants. In this case, all possible causes were ruled out before reaching to an incidental diagnosis of defective ET connector.

Intraoperative tight bag scenario is an emergency. A systematic protocol based approach by a vigilant
anaesthetist with good observational and analytical skills is needed for timely detection and correction of cause to avoid any anaesthetic mishap. This incident reemphasizes the importance of complete pre-anaesthetic check of every anaesthetic equipment including ET along with connector and use of proper monitoring in addition to bag compliance as a guide to airway pressures especially in neonatal population.

REFERENCES


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