Neonate with congenital cystic adenoid malformation of lung for lobectomy: Anesthesia concerns

Madam,

Full-term 17-days-old male neonate, weighing 3 kg presented with congenital cystic adenomatous malformation (CCAM) of lung, diagnosed during antenatal period. On examination, baby was tachypneic and having increased chest retractions with normal room air saturation. Computerized tomography chest revealed large multiseptated and multicystic lesion of 4.1 × 3.5 × 3.6 cm in size involving left upper lobe. Cardiac evaluation revealed 3 mm atrial septal defect with left to right shunt without pulmonary hypertension.

Neonate was planned for thoracotomy with cyst excision under general anesthesia and epidural analgesia. Standard noninvasive monitors were attached. Intravenous (IV) infective endocarditis prophylaxis was given. Trachea was intubated with 3.5 mm ID uncuffed endotracheal tube after deepening plane with sevoflurane. Anesthesia was maintained with 100% oxygen (due to nonavailability of air at our institute), sevoflurane, and intermittent IV doses of atracurium. Caudal thoracic catheter is non specific; without details the readers will not know the position of the catheter tip and hence, the logic of using 0.1% bupivacaine boluses of 2 ml; these are major anesthesia concerns in this neonate

Under all aseptic precautions, caudal thoracic epidural catheter was placed in left lateral position with loss of resistance to saline technique. Test dose of 0.3 ml of 1% lignocaine with adrenaline was administered followed by intermittent bolus of 2 ml 0.1% bupivacaine for intraoperative analgesia. Intraoperative course was uneventful with stable hemodynamic parameters. Transient desaturation occurred intermittently due to lung compression and was managed with temporary removal of lung retractors. Ventilatory techniques such as positive end expiratory pressure with or without high tidal volume were adapted to prevent atelectasis as well as to reopen collapsed lung secondary to lung compression. Neonate required left lung upper lobectomy as the involved lung was nonaerated and cyst was compressing near hilum [Figure 1]. On completion of surgery neuromuscular block was reversed and trachea was extubated. Postextubation, neonate was maintaining its inspiratory blast, heart rate, and reflex activity but the chest indrawing persisted, hence nasal continuous positive airway pressure (CPAP) was given with oxygen at flow of 5 l/min and pressure at 5 cm H₂O. On second postoperative day, oxygen was given by nasal prongs at 2 l/min. Postoperative analgesia was maintained with bolus dose of 0.1% bupivacaine 2 ml every 8 hourly for 3 days. Follow-up chest X-ray showed good lung expansion. Intercostal drain was removed after 10 days.

CCAM is a rare congenital anomaly with an estimated incidence of 1:25,000 to 1:35,000 live births.[1] It can be diagnosed in antenatal ultrasonography between 18 and 36 weeks of gestation. It develops during the pseudoglandular and saccular period of the lung development leading to overgrowth of terminal bronchiole with reduced alveoli.[2] Renal, intestinal, bony, and cardiac anomalies are seen in 25% of neonates with CCAM.[1] Cyst excision remains the standard treatment of choice. Neonates usually present with respiratory distress, decreased feeding, and chest retractions.

During anesthesia, positive pressure ventilation may lead to cyst expansion leading to compression of lung and mediastinal shift with possibility of spontaneous pneumothorax. Hence ventilation should be gentle in these patients. Surgeon’s presence during induction is mandatory for emergency wide bore needle thoracocentesis in the event of spontaneous pneumothorax or hyperinflation of cyst.[3] During excision of the cyst, cystic fluid may spoil the opposite lung if connected to main tracheobronchial tree warranting lung isolation. Additionally, one lung ventilation (OLV) also helps in reducing blood loss, providing better surgical field and reducing trauma to adjacent lung tissue. Institution of OLV is technically challenging in neonatal age group. Various options for providing OLV are Marraro double-lumen tube, right endobronchial intubation, and bronchial blockers (Fogarty catheter, balloon angioplasty catheter, and Arndt endobronchial block). [4] In our case, OLV was not performed as the most of upper lobe was nonaerated and the cyst was not communicating with the bronchus. We used low tidal volume and high respiratory rate to improve access to surgical field. During maintenance of anesthesia, nitrous oxide was not used to avoid cyst expansion in view of its faster diffusion capacity.[5] Additional intraoperative concerns are trauma to adjacent structure, hemorrhage, ventilatory changes due to positioning and lung retraction, compression of major vessel, and mechanical arrhythmia.

Nasal CPAP is a noninvasive method for applying a constant distending pressure (above atmospheric) during inhalation and exhalation to support spontaneously breathing newborn predisposed to develop airway instability, edema, and atelectasis. [6] It helps to maintain functional residual capacity of lung and support gas exchange, thus reducing work of breathing. Caudal thoracic epidural was very useful as it provides effective analgesia and facilitates breathing, early extubation, and smooth recovery.
Declaration of patient consent
The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest
There are no conflicts of interest.

Vrushali Rajgire, Sushama Raghunath Tandale, Kalpana Kelkar, Rahul Band
Department of Anesthesiology, BJMC and SGH, Pune, Maharashtra, India

Address for correspondence: Dr. Sushama Raghunath Tandale, Department of Anaesthesiology, BJMC and SGH, Pune, Maharashtra, India.
E-mail: docsushma.shitole@gmail.com

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Figure 1: Portion of affected left-side nonaerated lung with cyst

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