Pneumomediastinum following iatrogenic pharyngeal perforation during tracheoesophageal fistula repair

Sir,

Pneumomediastinum is a rare entity in the neonatal period, with the incidence of 0.1%–0.2% of the births.\(^1\) It is being associated with prematurity, positive pressure ventilation, pneumonia, meconium aspiration syndrome with multiple attempts of intubation and following injury of the trachea during normal vaginal delivery in cases of shoulder dystocia.\(^1\) Pathophysiology includes the egress of air from the alveoli owing to the leak consequent to the pressure difference between the lung and pulmonary interstitium.\(^2\) We report an uncommon occurrence of pneumomediastinum following attempted intubation and ventilation postoperatively through an iatrogenic opening made in the hypopharynx during tracheoesophageal fistula (TEF) repair in a premature neonate.

A 32-week, preterm neonate weighing 1.5 kg was born vaginally due to premature rupture of membranes, presented at birth with respiratory distress. On evaluation, the neonate was diagnosed as TEF type C with screening for other congenital anomalies being negative. Right posterolateral thoracotomy was planned. Appropriate preparation of the operation theater was done keeping in mind the preterm neonate and the ambient temperature was kept between 24°C and 25°C. Standard monitoring ensued followed by inhalational induction with sevoflurane. Airway was secured with 3.0-mm uncuffed endotracheal tube (ETT) which was fixed at 8-cm mark at the lip. ETT position was confirmed both clinically and with the capnograph in supine as well as in the left lateral positions before surgery. The anesthesia was maintained with sevoflurane (minimum alveolar concentration, 1.2%), oxygen with air, and the saturation of oxygen was targeted between 88% and 94%.

During the passage of the 8 Fr feeding tube (FT) orally for identification of the blind upper pouch, it iatrogenically created false passage and perforated the hypopharynx. FT was seen in the operative field beneath the upper blind pouch. The FT was withdrawn and repositioned in the blind pouch and successful anastomosis of both the ends of the esophagus was completed uneventfully with the right intercostal drainage (ICD) tube left in situ. The patient was reversed following the appearance of spontaneous breath and was extubated. However, postextubation intermittent apneas occurred followed by desaturation (SpO\(_2\) of 79%–80%) and bradycardia (89 beats/min). Immediately, endotracheal intubation was done with 3.0-mm ETT, but on gentle ventilation, there were no breath sounds heard on either side with absent waveform on capnograph and the air being observed leaking into the intercostal drainage bag. Monitoring showed desaturation (SpO\(_2\) of 68%–70%) and bradycardia (70 beats/min). Corrective measures were taken, direct laryngoscopy was performed, and the ETT was removed from the false opening in the hypopharynx. It was reinserted and positioned correctly in the trachea. The oxygen saturation improved to 98% with heart rate of 144 beats/min. The neonate was shifted to Neonatal surgical ICU on ventilator. Postoperative X-ray revealed air in the mediastinum and small pneumothorax on the right upper zone with ICD in situ [Figure 1]. Conservative management was done with respiratory support and broad-spectrum antibiotics. Outcome was fatal on the sixth postoperative day with leak at the anastomotic site leading to sepsis.

Pneumomediastinum in neonates develops following air leaks from alveoli due to overdistension and tracking of the air along the perihilar tissues into the...
Incidence of both the spontaneous and secondary pneumomediastinum increases in the presence of prematurity with surfactant-deficient alveoli, increasing its susceptibility to rupture. However, air leaks secondary to the lung pathology or the tracheal injury were completely ruled out in our case as the incident occurred only once the neonate was re-intubated and ventilated through ETT introduced erroneously through the opening created in hypopharynx post pharyngeal perforation by FT. This had led to the ingress of gases into the mediastinum and in the thoracic cavity, creating both pneumomediastinum and pneumothorax [Figure 1].

Prematurity, with weak friable pharyngeal musculature support, increases the chances of pharyngoesophageal perforation following repeated attempts of FT insertion, suctioning, and intubation. Parelkar et al. reported iatrogenic perforation of the proximal pouch in pure esophageal atresia leading to pneumothorax which required ventilator support with right ICD. Ben Aoun et al. reported a case of esophageal perforation mimicking esophageal atresia resulting in negative thoracotomy. Majority of cases of both pneumomediastinum and pharyngeal esophageal rupture require conservative management with respiratory support, antibiotics, and ICD for pneumothorax. Mediastinal drainage for pneumomediastinum is rarely required as it resolves spontaneously. Our patient was electively ventilated primarily in wake of recurrent apnea with pressure control mode. However, symptomatic patients secondary to lung pathology may require mechanical ventilation with ventilatory strategy of permissive hypercapnia preventing barotrauma.

To conclude, prematurity comes with a plethora of challenges, and gentle handling of the neonate can forestall iatrogenic life-threatening complications such as pneumomediastinum, pharyngeal perforation, and pneumothorax, which further increases the morbidity and mortality.

Declarations 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.

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Sir,

Unanticipated difficult airway and absence of guidelines for its management in neonates is a piquant situation for an anesthetist. Presentation of congenital subglottic stenosis (SGS) in neonates may vary from asymptomatic to frank stridor. We present rescue airway management of a 2-day-old newborn who presented with intestinal obstruction secondary to high anorectal malformation.

A 2-day-old full-term male neonate weighing 2.5 kg who had an uneventful vaginal delivery, was listed for exploratory laparotomy. Antenatal history of the mother was inconspicuous. The routine evaluation was unremarkable. Standard protocols for anesthesia care were followed. Rapid sequence induction was done using intravenous thiopentone (5 mg/kg) and succinylcholine (2 mg/kg). Intubation attempts using Miller's blade (size 0) with endotracheal tube (ETT) of size 3, 2.5, and 2 mm internal diameter (ID) failed as none of them could be negotiated beyond the subglottic area. Gentle bag and mask ventilation was initiated, and depth of anesthesia was maintained. Facing nonavailability of the pediatric fiberoptic bronchoscope and ear-nose-throat (ENT) specialist, we prepared a modified smaller ETT with a 6 French gauge (Fr) sized infant feeding tube (IFT) whose length was reduced to 10 cm [Figure 1]. The proximal end of the IFT was attached to a 3 mm ET tube [Figure 2a]. A stylette obtained from hydrocephalus shunt system [Figure 1] was used to aid intubation. Intubation was successful in the first attempt and with the presence of adequate air leak, the tube was secured at 6 cm [Figure 2b]. Anesthesia was maintained on sevoflurane, O₂ and air with FiO₂ of 0.5.

Asymptomatic congenital subglottic stenosis in a neonate – infant feeding tube as a “Guardian angel!” No intra-operative complication was observed during the surgery which lasted for 45 min. At the end of surgery, adequate airway patency was revealed by application of positive pressure with a closed circuit pressurized to 25 cm of H₂O. The baby was reversed and extubated in the presence of an ENT surgeon. The postoperative course was uneventful. Subsequently, the baby was diagnosed with Grade II SGS on rigid bronchoscopy and was managed accordingly.

SGS is characterized by subglottic diameter <4 mm in term newborn and <3.5 mm in preterm neonates. Congenital SGS may be asymptomatic, and infants may not present for treatment for weeks after birth. SGS can be suspected on the basis of gestational age, antenatal history of polyhydramnios, previous intubation, other congenital disorders or history of recurrent URTI.

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