Venous air embolism during air arthrogram of hip in an infant with arthrogryposes multiplex congenita

A 4-month-old (4.5 kg) infant who was born preterm at 34 weeks of gestation, and diagnosed with arthrogryposes multiplex congenita, presented with bilateral development dysplasia of hip (DDH) and bilateral congenital dislocation of knee (CDK). She was initially managed using Pavlik Harness; but as the hip dislocations were not reducible, she was scheduled for bilateral arthrogram of hip, bilateral adductor tenotomy, bilateral quadricepsplasty and bilateral femoral osteotomy.

Preoperative clinical evaluation by an anaesthesiologist and a paediatrician ruled out presence of any congenital cardiac, respiratory and neuromuscular anomalies. Airway examination revealed no visible facial anomaly. The investigations (complete hemogram, renal function test and chest X-ray) were within normal limits. The patient was accepted for surgery as ASA Grade 2 physical status. Informed consent for anaesthesia and caudal epidural analgesia was obtained. Anaesthesia was induced with fentanyl, propofol and atracurium; airway was secured with number 3 uncuffed endotracheal tube and anaesthesia maintained with sevoflurane, oxygen and nitrous oxide, to maintain a MAC of 0.8. Caudal epidural block was performed with 22 G hypodermic needle and 2.5 ml of 0.25% bupivacaine. Intra-operative monitoring was carried out using ECG, pulse oximetry, NIBP and ETCO$_2$. 

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Patient was positioned supine with legs adducted and externally rotated at hip joint and an air arthrogram was performed using 1 ml of air through a 22 G spinal needle, after ensuring negative aspiration [Figure 1]. Arthrogram of the left hip was uneventful. Immediately following air injection in the right hip, a sudden fall in end-tidal CO$_2$ from 32 to 8 mmHg and in SPO$_2$ from 100 to 30% was observed. Heart rate decreased from 135/min to 60/min. The surgeon was informed, and the procedure stopped. 100% oxygen was given, and inhalational agents were switched off. Patient was given a head low and left lateral decubitus position followed by an intravenous fluid bolus of 20 ml. Within 2 minutes, the end-tidal CO$_2$ increased to 25 mmHg and SPO$_2$ to 92% and to 100% in 10 minutes. No pharmacological intervention was required. As the patient improved clinically a central venous access was not obtained. Once haemodynamically stable, the surgery was continued. At the end of the procedure, neuromuscular blockade was reversed, and the trachea was extubated. Post-operative evaluation did not reveal any neurological deficit.

Hip arthrography is used in patients with DDH to evaluate the factors responsible for DDH. Air is occasionally injected instead of dye, e.g., in patients with dye allergy or compromised kidney function. Infants are susceptible to developing air embolism$^{[1-4]}$ even with the use of a small amount (<5 ml) of air [Figure 2]. Anaesthetists should be aware of this possibility and allow use of minimum amount of air. Air embolism is a disastrous complication and can be potentially fatal especially in children with cardiac septal defects. Therefore, in a child with multiple skeletal anomalies posted for a procedure with possibility of air embolism, a thorough investigation of cardiovascular system including a preoperative echocardiography should be done. In case of any anomalies, radio opaque dye can be used or alternative methods to delineate the hip anatomy for correction of DDH should be considered.

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.

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Sir,

A five-year-old 19 kg female child diagnosed with an ectopic lingual thyroid with subclinical hypothyroidism was planned for a contrast-enhanced magnetic resonance imaging (MRI) of the neck for further evaluation under sedation. She was on follow-up for seizure disorder on tablet sodium valproate since 20 months of age and had an additional complaint of a swelling at the back of the tongue noticed around a month back. There was a history of the child preferably sleeping in lateral or prone position. Airway examination revealed a globular mass at the base of tongue visible on tongue protrusion [Figure 1a]. Neck X-ray lateral view showed an irregular shadow at the base of the tongue with the backward displacement of epiglottic shadow [Figure 1b].

On the day of the procedure, after appropriate counselling of the child, an intravenous catheter was secured facilitated by the application of EMLA™ cream. Tip of the tongue was topicalised with lignocaine 10% spray and 20 µg inj fentanyl was given intravenous (IV). While the parents held the patient comfortably, a stay suture was taken with a silk 2-0 suture at the tip of the tongue with a margin of 1 cm to prevent tongue fall [Figure 2]. Both the ends of suture were left outside the mouth. Emergency cricothyroidotomy equipment was kept ready before starting the procedure. Patient was shifted on the patient table of machine in the parents’ presence. MRI compatible pulse-oximetry and electrocardiography monitor were applied. Humidified oxygen was given at 4 L/min using a nasal cannula. IV propofol was given in aliquots till deep sedation was achieved and maintained at 50–75 µg/kg/min using a compatible infusion pump. Both ends of the suture thread were gently pulled and fixed using adhesive tape in such a manner that tip of the tongue covered the vermilion border of the lower lip. Patient’s respiratory movements were monitored throughout by visual examination and trans-thoracic impedance monitor with the aim to maintain spontaneous breathing. The procedure lasted for around 20 min, and the patient regained consciousness within 3–4 min of stopping the infusion. The suture was pulled out at this time and the child was observed in the recovery area for 1 h. She was discharged home in the evening uneventfully. Appropriate consent was obtained from the legal guardian of the patient for presenting this case report and related pictures in academic forums and journals.

Numerous diagnostic and therapeutic procedures are now being performed outside the operation theatre constituting non-operating room anaesthesia (NORA). Paediatric NORA requires more immobility and deeper levels of sedation for children who cannot endure the long and/or uncomfortable procedures. Sedation is a continuum, and it is not always possible to predict the response of an individual patient. Thus, practitioners should be ever ready and able enough to rescue the airway in those patients in whom the level of sedation becomes deeper than intended, and may require...