

# Is intraoperative endoscopy safe in a child with Kasai procedure?

Vinayak S Pujari, Mathews K Thomas, Yatish Bevinaguddaiah, Tejesh C Anandaswamy

Department of Anesthesiology, M S Ramaiah Medical College and Hospital, Bangalore, Karnataka, India

## Abstract

We report a case of venous air embolism which occurred during intraoperative endoscopy in a five-year-old boy who had undergone Kasai procedure in his infancy. The child had a cardiac arrest during the procedure from which he could not be resuscitated. The awareness about this complication would allow rapid diagnosis, which is vital to provide specific treatment and prevent fatal outcome.

**Key words:** Biliary atresia, embolism, endoscopy, intraoperative complications, Liver surgery, portoenterostomy, venous air embolism

## Introduction

The use of intraoperative endoscopy for diagnostic and therapeutic procedures is increasing. Venous air embolism (VAE) is a rare complication of endoscopic procedures.<sup>[1]</sup> Portal VAE can occur during endoscopy due to insufflation of air under pressure and may be missed if it is small. Although it may be absorbed spontaneously, serious complications have been reported, including cerebral air embolism<sup>[2]</sup> and fatal venous air embolism.<sup>[3,4]</sup> We present a case of VAE during intraoperative endoscopy which resulted in fatality in a child who had undergone Kasai procedure.

## Case Report

A 15-kg, five-year-old boy presented with complaints of bleeding per rectum for which laparotomy and endoscopy were scheduled. The boy had been diagnosed to have biliary atresia in the first week of life and had undergone Kasai's

procedure (Hepatoportoenterostomy) at three months of age. The patient had repeated episodes of bleeding per rectum requiring multiple blood transfusions in the last two years. He had undergone multiple endoscopies and also a laparotomy for identifying the site of bleeding ten months earlier, but the bleeding site could not be identified. Technitium-99 scan indicated the site of gastrointestinal bleed to be in the sub-hepatic area around the hepatoportoenterostomy. Systemic examination and investigations were normal.

In the operating room, a 22G intravenous (IV) cannula was secured with difficulty. Rapid sequence induction was performed using fentanyl 30 mcg, thiopentone sodium 75 mg and succinyl choline 30 mg IV. Anesthesia was maintained with air-oxygen mixture (FiO<sub>2</sub> 0.5) enriched with isoflurane (1-2%), and atracurium 0.5 mg/kg was used for muscle relaxation. One hour into the procedure following adhesiolysis the small bowel near the anastomotic site was identified for introducing an endoscope. The patient was stable with heart rate of 128/min, non-invasive blood pressure 98/54 mmHg, oxygen saturation (SpO<sub>2</sub>) 100%, end-tidal carbon dioxide (EtCO<sub>2</sub>) of 28 mmHg and temperature 36.2°C.

A pediatric gastroscope was introduced into the bowel using room air for insufflation. Within a minute the heart rate fell to 68/min, blood pressure was not recordable, SpO<sub>2</sub> was 98% and EtCO<sub>2</sub> reduced to 14 mmHg and later the tracing disappeared. The surgeon was asked to stop the procedure and remove the endoscope. After reconfirmation of the position of the tracheal tube, 100% oxygen was given along with atropine 0.2 mg IV. The child was placed in Trendelenburg

Address for correspondence: Dr. Vinayak Seenappa Pujari,  
Department of Anaesthesiology, M S Ramaiah Medical College,  
New BEL Road, MSR Post, Bangalore, Karnataka, India.  
E-mail: drvinayak@hotmail.com

Access this article online	
Quick Response Code:	Website: www.joacp.org
	DOI: 10.4103/0970-9185.101943

position and cardiopulmonary resuscitation (CPR) was started. A fluid bolus of 150 ml of Ringer's lactate was administered. The monitor showed pulseless electrical activity (PEA). A central venous line could not be secured but an 18G IV cannula was inserted into the right external jugular vein (EJV) from which frothy blood was aspirated. We could not negotiate a guide wire through the IV cannula in the EJV to access a central venous line. PEA converted into asystole after 20 min. Pediatric advanced life support was continued for the next 1 h but the patient could not be revived.

## Discussion

VAE is a catastrophic complication and has a dramatic presentation that often catches the anesthesiologist unawares. There are many reports of VAE occurring during endoscopies<sup>[2-5]</sup> but we could find only three cases of VAE occurring in patients who have undergone Kasai's procedure.

Lowdon *et al.*, have reported a fatal VAE during intraoperative endoscopy in a four-month-old infant.<sup>[6]</sup> There is another report of a 10-year-old girl who had undergone a Kasai procedure in her infancy, who was found to have numerous adhesions and dilated varices at laparotomy. The descending loop of the Kasai was exteriorized to enable percutaneous endoscopic manipulation of the stone but the patient collapsed and died during manipulation of the jejunal loop by an endoscope.<sup>[7]</sup> The only reported survival was a 17-year-old girl who had undergone Kasai procedure in her childhood and had cardiovascular collapse due to VAE during intraoperative intestinal endoscopy. Trans-esophageal echocardiography (TEE) detected air bubbles in the left ventricle 1 h after the event. The patient survived without any morbidity.<sup>[8]</sup>

TEE can play an important role in diagnosing and managing an air embolism in anesthetized patients. In our case, a TEE or a precordial Doppler could have diagnosed the air embolism, however, they were not available. The incidence of portal hypertension is about 75% after Kasai's procedure and may cause clinically significant variceal formation in the esophagus, stomach, Roux-loop and/or rectum. In both the children with fatal outcome, varices and large veins were found at autopsy.<sup>[9]</sup> Medical air under pressure possibly entered an open bleeding blood vessel or varices around the portoenterostomy site causing massive VAE. A commercial gastroscope has maximum flow rates of 2000 ml/min for air.<sup>[10]</sup> Air insufflation by the gastroscope may result in a critical VAE within few seconds when a connection with the vascular system exists. An autopsy could have definitely demonstrated the site

and probably the mechanism in our patient, but the parents did not give consent for it.

In children who have undergone Kasai procedure precautions to prevent and detect air embolism during endoscopy must be taken. Use of carbon dioxide rather than air and use of low pressure for gastrointestinal insufflation may increase the safety of the procedure. It would be prudent to place a multilumen central venous line for potential aspiration of entrained air in children undergoing intraoperative endoscopy following Kasai's procedure. The use of TEE and precordial Doppler aid in the rapid diagnosis of air emboli as small as 0.02–0.05 ml/kg of air.<sup>[11]</sup>

To conclude, we would like to emphasize that children who have undergone Kasai procedure are at a high risk for VAE during intraoperative endoscopy. The use of intraoperative endoscopy will increase in the future and therefore recognizing procedures at risk for VAE, planning the appropriate level of monitoring and management algorithms hold the key to patient safety.

## References

1. Mirski MA, Lele AV, Fitzsimmons L, Toung TJ. Diagnosis and treatment of vascular air embolism. *Anesthesiology* 2007;106:164-77.
2. Akhtar N, Jafri W, Mozaffar T. Cerebral artery air embolism following an esophagogastroscopy: A case report. *Neurology* 2001;56:136-7.
3. Nayagam J, Ho KM, Liang J. Fatal systemic air embolism during endoscopic retrograde cholangio-pancreatography. *Anaesth Intensive Care* 2004;32:260-4.
4. Kennedy C, Larvin M, Linsell J. Fatal hepatic air embolism following ERCP. *GastrointestEndosc* 1997;45:187-8.
5. Mohammed I, Ber C, Peguet O, Ould-Aoudia T, Duperret S, Petit P. Cardiac air embolism after endoscopic retrograde cholangiopancreatography in a patient with blunt hepatic trauma. *J Trauma* 2002;53:1170-2.
6. Lowdon JD, Tidmore TL Jr. Fatal air embolism after gastrointestinal endoscopy. *Anesthesiology* 1988;69:622-3.
7. Desmond PV, MacMahon RA. Fatal air embolism following endoscopy of a hepatic portoenterostomy. *Endoscopy* 1990;22:236.
8. Park YH, Kim HJ, Kim JT, Kim HS, Kim CS, Kim SD. Prolonged paradoxical air embolism during intraoperative intestinal endoscopy confirmed by transesophageal echocardiography - a case report. *Korean J Anesthesiol* 2010;58:560-4.
9. Sinha CK, Davenport M. Biliary atresia. *J Indian Assoc Pediatr Surg* 2008;13:49-56.
10. Katzgraber F, Glenewinkel F, Fischler S, Rittner C. Mechanism of fatal air embolism after gastrointestinal endoscopy. *Int J Legal Med* 1998;111:154-6.

**How to cite this article:** Pujari VS, Thomas MK, Bevinaguddaiah Y, Anandaswamy TC. Is intraoperative endoscopy safe in a child with Kasai procedure?. *J Anaesthesiol Clin Pharmacol* 2012;28:508-9.  
**Source of Support:** Nil, **Conflict of Interest:** None declared.