To the editor,

Transesophageal echocardiography (TEE) is an important diagnostic and monitoring tool during pediatric cardiac surgery. Although minimally invasive and generally safe, TEE is not free from complications including dysphagia, esophageal perforation, airway and vascular compression, and accidental endotracheal (ET) tube dislodgement. Stevenson, in a study of 1650 patients, described airway obstruction in 1% and vascular compression in 0.6% of patients with TEE probe.[1]

A 2 and ½-year-old child weighing 7.5 kg presented for ventricular septal defect (VSD) closure. Anesthesia induction, ET tube insertion, and arterial and central venous line placement were uneventful. A 4.5-mm-ID ET tube was placed and fixed at an 11.5 cm mark at the level of incisor teeth. The patient was monitored with ECG, heart rate, SPO2, EtCO2, invasive blood pressure, and central venous pressure. TEE examination during prebypass period showed a large 12 mm perimembranous VSD. TEE probe was removed after the examination. After systemic anticoagulation with heparin 30 mg and ensuring activated clotting time of 480 s, aortobivacal cannulation-initiated cardiopulmonary bypass (CPB). Under mild hypothermia and cardioplegic cardiac arrest, VSD was closed with a PTFE patch. After rewarming to normothermia and resuming ventilation, weaning from CPB started. Before,
separating CPB, TEE probe was inserted. While inserting TEE probe mouth was opened using index finger and head was extended; laryngoscope was not used for the TEE probe insertion. Immediately after inserting the TEE probe, EtCO2 trace was lost and gurgling sound was heard during ventilation. Accidental extubation suspected and confirmed on manual bag ventilation. Immediately, full CPB was resumed. TEE probe was removed, and under direct laryngoscopy a 4.5 mm ID ET tube inserted and fixed at 13 cm mark. Thereafter, TEE probe was inserted and CPB was weaned without difficulty; TEE examination revealed no residual VSD and the post CPB period remained uneventful.

Use of TEE in open-heart surgery has become routine; however, the number of TEE machines has not increased in parallel. In our institute, the TEE probe is inserted after induction of anesthesia and placement of lines and it is removed after examination. TEE probe is reinserted after surgical repair to evaluate the adequacy of repair and myocardial function. In the present patient, the ET tube dislodged during TEE probe insertion after surgical repair but before the separation from CPB and decannulation of the venous drain lines. If the TEE probe was inserted after the decannulation of venous lines, the accidental extubation could have compromised oxygenation and ventilation and catastrophe, if not replaced immediately. Apparently, if the TEE probe is to be inserted for examining adequacy of repair, it should be inserted before the removal of venous drain lines, so that in case of accidental extubation CPB can be resumed without delay and ET tube can be repositioned/replaced without compromising oxygenation and ventilation. Moreover, in view of known complications such as airway and vascular compression one should monitor airway pressure and hemodynamics immediately before and after TEE probe insertion.

Another important point is to take measures against accidental extubation. The desirable position of the ET tube is midtracheal position which avoids the possibility of endobronchial intubation as well as accidental extubation. Several formulas based on age (age/2+12), ET tube ID (ID X 3), weight, and height of the child are described to ensure midtracheal position of the ET tube; additional techniques include positioning based on depth markers present on distal end of ET tubes, airway ultrasound and auscultation of breath sound. It is noteworthy that the formulas described do not consider the positioning of the patient during open-heart surgery; moreover, patients with congenital heart disease are often small for age. For open-heart surgery, a rolled towel or bolster is placed under the shoulder which results in extension of neck and lengthening of trachea causing cephalad movement of the ET tube meaning an appropriately placed ET tube can potentially become prone for accidental extubation. In the present patient, considering the patient was small for age (7.5 kg), the ET tube was fixed at 11.5 cm; however, as per age and ET tube ID formula, the depth should have been 13.5 cm. Apparently, the ET tube was positioned cephalad and accidental extubation was a possibility which increased further because of the positioning needed for open-heart surgery and the ET dislodged when the upper jaw was lifted and head was extended for TEE probe insertion. The depth determination of ET tube to arrive at midtracheal position during open-heart surgery should take all the factors into consideration including age, weight, ET ID, positioning for open-heart surgery, and likelihood of reinserting TEE probe if removed after TEE examination in the prebypass period.

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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