Effect of Jaw Thrust on Transesophageal Echocardiography Probe Insertion and Concomitant Oropharyngeal Injury

Jee-Eun Chang, MD,* Seong-Won Min, MD, PhD,* Chong-Soo Kim, MD, PhD,* Jung-Man Lee, MD,* Hyunjoung No, MD,† and Jin-Young Hwang, MD, PhD*

Objective: **The aim of this study was to evaluate the effect of jaw thrust on transesophageal echocardiography probe insertion and concomitant oropharyngeal injury.**

Design: **A prospective, randomized study**

Setting: **Medical center governed by a university hospital**

Participants: **Forty-two adult patients undergoing cardiovascular surgery were included.**

Interventions: **After the induction of anesthesia, a transesophageal echocardiography probe was inserted using an anterior jaw lift technique (conventional group, n = 21) or a jaw thrust-assisted technique (jaw thrust group, n = 21).**

Measurements and Main Results: **The incidence of oropharyngeal injury, number of insertion attempts, blood on the probe tip, and presence of persistent oropharyngeal bleeding were evaluated. In the conventional group, oropharyngeal injury occurred more frequently than in the jaw-thrust group (52.4% *v* 9.5%, respectively; p = 0.006). Regarding transesophageal echocardiography probe insertion, the conventional group required more attempts than the jaw-thrust group (p = 0.043). The incidence of blood on the probe tip was higher in the conventional group than in the jaw-thrust group (p = 0.020), but the presence of persistent oropharyngeal bleeding was similar between the 2 groups.**

Conclusions: **The jaw-thrust maneuver facilitated the insertion of the transesophageal echocardiography probe and reduced concomitant oropharyngeal injury.**

KEY WORDS: transesophageal echocardiography probe, oropharyngeal injury, jaw-thrust

TRANSESOPHAGEAL ECHOCARDIOGRAPHY is a useful monitoring tool during cardiac surgery. It is considered relatively safe. However, insertion of a transesophageal echocardiography probe in sedated or anesthetized patients may be difficult due to the loss of voluntary swallowing and a pharyngeal space collapse resulting from the loss of muscle tone.[1] Additionally, patients routinely are anticoagulated during cardiac surgery, and oropharyngeal injury following transesophageal echocardiography probe insertion may cause bleeding in the oropharyngeal space.

Transesophageal echocardiography probe insertion using direct visualization devices, including a rigid laryngoscope[2] or a videolaryngoscope,[3] has been suggested to reduce oropharyngeal mucosal injury in anesthetized patients. However, the presence of a tracheal tube may disturb direct visualization of the esophageal inlet, and the use of a laryngoscope may cause dental injury in patients with weak teeth.

The jaw-thrust maneuver elevates the tongue base from the posterior pharyngeal wall, providing more space in the pharynx.[4] In addition, the jaw-thrust maneuver lifts the larynx and intubated tracheal tube anteriorly and widens the esophageal inlet.[5] The authors hypothesized that the jaw-thrust maneuver might facilitate the advancement of the transesophageal echocardiography probe into the esophageal inlet and reduce the incidence of oropharyngeal injury and compared the insertion attempts and incidence of concomitant oropharyngeal injury between the conventional and jaw-thrust-assisted techniques for transesophageal echocardiography probe insertion in patients undergoing cardiovascular surgery.

METHODS

The present study was approved by the ethics committee of the authors' hospital (no. 16-2013-72). Written informed consent was obtained from all the patients. The trial was registered at the Clinical Research Information Service (KCT0001077).

Adult patients undergoing cardiovascular surgery were enrolled. Patients were excluded if they had a sore throat, oropharyngeal infection, esophageal injury or anatomic abnormalities, or a history of esophagectomy or esophagogastrectomy. Patients also were excluded if they had a known or predicted difficult airway.

Patients were assigned randomly to 1 of the following 2 groups: transesophageal echocardiography probe insertion using a traditional blind insertion technique (conventional group) or a jaw-thrust-assisted technique (jaw-thrust group), using opaque sealed envelopes opened when the patient transferred to the operating room.

The standardized practice for the management of anticoagulated patients scheduled for cardiovascular surgery at the authors' institution was to discontinue aspirin 3 days preoperatively, clopidogrel and warfarin 5 days preoperatively, and cilostazol 2 days preoperatively. Heparin therapy was stopped 6 hours before surgery, and low-molecular-weight heparin was discontinued 24 hours before surgery.

No premedication was administered to the patient. Standard monitoring included electrocardiography, pulse oximetry, gas analysis, and non-invasive blood pressure monitoring. After the administration of midazolam, 0.02 to 0.05 mg/kg, the radial artery was cannulated with a 20-G cannula (BD angiocath Plus™; Becton Dickinson Korea Ltd., Seoul, Korea) for continuous arterial pressure monitoring and blood sampling. Anesthesia was induced using midazolam, 0.02 to 0.05 mg/kg;

*From the *Departments of Anesthesiology and Pain Medicine, SMG-SNU Boramae Medical Center; and †Anesthesiology and Pain Medicine, Seoul National University Hospital, Seoul, Republic of Korea.*

Address reprint requests to Jin-Young Hwang, MD, PhD, Department of Anesthesiology and Pain Medicine, SMG-SNU Boramae Medical Center, Boramae-ro, Dongjak-gu, Seoul, 156-707, Republic of Korea. E-mail: mistyblue15@naver.com

1053-0770/2601-0001$36.00/0

http://dx.doi.org/10.1053/j.jvca.2015.02.003

etomidate, 0.2 mg/kg; and sufentanil, 1.5 to 2.0 μg/kg. After achieving maximal neuromuscular blockade using rocuronium, 0.6 to 1.0 mg/kg, the patient's head was extended on the neck by pressure from the right hand at the vertex, and the laryngoscope blade was inserted into the right side of the mouth. The blade was advanced simultaneously forward toward the base of the tongue and the tip directed centrally toward the midline so that the tongue was displaced completely to the left side of the mouth by the flange of the laryngoscope blade. Then, the laryngoscope was lifted to expose the epiglottis. Once the epiglottis was visualized, the laryngoscope tip was placed in the vallecula, and the laryngoscope was lifted forward and upward to expose the vocal cords. After confirming the vocal cords, tracheal intubation was performed using a tracheal tube (TaperGuard^{TM}; Covidien, Mansfield, MA) (an internal diameter of 7.5 mm in male patients and 7.0 mm in female patients). If tracheal intubation was difficult, the patient was excluded from the study. Anesthesia was maintained using a continuous infusion of midazolam, vecuronium, and sufentanil. A central venous catheter and a pulmonary catheter were placed through the internal jugular vein. The distal end of the transesophageal echocardiography probe (Acuson TE-V5Ms) (Siemens Medical Solutions USA, Inc., Mountain View, CA) was coated with a lubricating gel before insertion. The probe tip size was 14.5 × 11.5 mm, and the tip was 35-mm long. The shaft was 10.5 mm in diameter and 110 cm in length. In the conventional group, the transesophageal echocardiography probe was inserted through the midline with the right hand after the mandible was lifted by putting the thumb of the left hand into the mouth and gripping the mandible and slightly flexing it. In the jaw-thrust group, while jaw-thrust was achieved by an assistant, the transesophageal echocardiography probe was inserted (Fig 1). During the probe insertion in both groups, the probe was inserted with control knobs in the neutral and unlocked position, the distal shaft of the probe was held by assistants, and the patient's neck was not controlled intentionally. If resistance was felt during the probe advancement, insertion was stopped, and the probe was withdrawn while allowing the tip of the probe to be in neutral position and be reinserted. The transesophageal echocardiography probe was inserted by a single anesthesiologist experienced in transesophageal echocardiography monitoring (more than 500 insertions of transesophageal echocardiography probes). The number of insertion attempts was recorded. If the insertion failed after 3 attempts, the insertion was recorded as a failure, and the probe was inserted by the technique used in the other group or by another experienced anesthesiologist. During surgery, patients were anticoagulated with heparin (300 u/kg for cardiopulmonary bypass and 150 u/kg for off-pump coronary artery bypass graft surgery). After the main surgical procedure, protamine was administered for the reversal of anticoagulation. At the end of the surgery, the transesophageal echocardiography probe was removed, and the presence or absence of blood on the probe tip was recorded by anesthesiologists blinded to the insertion technique. Oropharyngeal injury was defined as laceration or hematoma that can be observed with a fiberoptic bronchoscope.[2] Using a fiberoptic bronchoscope, the presence of oropharyngeal injury or persistent oropharyngeal bleeding was evaluated by a board-certified anesthesiologist blinded to the group allocation. The presence of oropharyngeal injury was assessed in the posterior wall, uvula, vallecula, pilla, and tonsilar fossa, and then other injury sites in the oropharyngeal space were evaluated. If oropharyngeal injuries existed, the location and number of injury sites

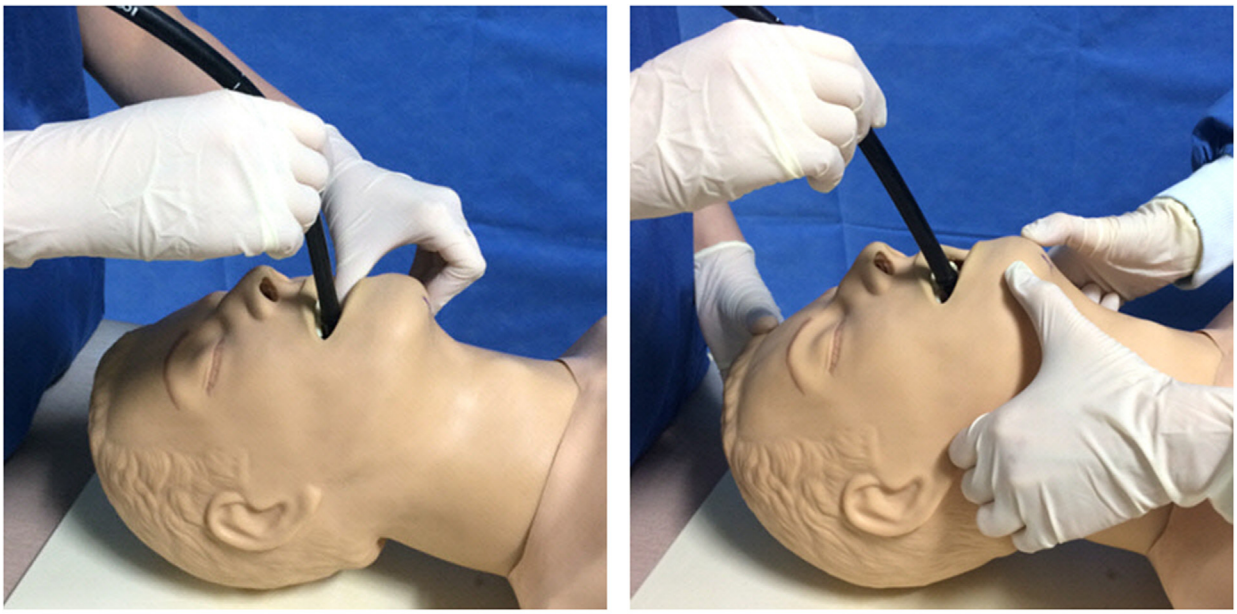

Fig 1. Methods of inserting the transesophageal echocardiography probe. In the conventional group, the transesophageal echocardiography probe was inserted blindly through the midline after the mandible was lifted and slightly flexed (A). In the jaw-thrust group, while jaw thrust was achieved by an assistant, the transesophageal echocardiography probe was inserted (B).