

Valsalva maneuver barrier mouthpiece during upper endoscopy

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Endoscopists with inadequate access to standard personal protective equipment (PPE) are being exposed to droplets from patients, some of whom may be positive for COVID-19, during upper endoscopy. Herein, we describe how a ready-made mouthpiece with a barrier (Valsa-mouth [Fig. 1A]; Sumitomo Bakelite Co, Ltd, Shinagawa-ku, Japan) may help protect endoscopists during endoscopic procedures. The mouthpiece was designed for the Valsalva maneuver, a forceful attempted exhalation against a closed airway to allow observation of the hypopharynx. The mouthpiece consists of a small hole through which an endoscope is attached and is able to close the patient's airways with the exception of the nose.

In our simulation (Video 1, available online at www.VideoGIE.org) an endoscopist in standard PPE took position to the left side of a cardiopulmonary resuscitation mannequin (Little Anne [Fig. 1B]; Laerdal Medical, Stavanger, Norway). To approximate a forceful cough and generate a spread of droplets and aerosols, water with fluorescent and soluble dye was sprayed from the oral cavity of the mannequin through the mouth and nose with atomizer (Fig. 1D).

The experiment was run with a normal mouthpiece (MAJ-674 [Fig. 1C]; Olympus, Tokyo, Japan), both a normal mouthpiece and a surgical mask covering the nose, a Valsa-mouth, and both a Valsa-mouth and a surgical mask covering the nose. After each simulation, the spread distance of the dye was recorded and droplets on the PPE pictured.

With the normal mouthpiece (Fig. 2A), dye was found on the endoscopist's gown and glove. In addition, dye was detected on the bed from both the mouth and nose of the mannequin (Fig. 3A). With the use of both the normal mouthpiece and the surgical mask (Fig. 2B), contamination was found on the endoscopist's gown and gloves and on the bed from the mouth of the mannequin (Fig. 3B). With the use of Valsa-mouth (Fig. 2C), contamination from the simulated cough was observed on the endoscopist's glove and on the bed from mannequin's nose; however, contamination on the endoscopist's gown or on the bed from the mannequin's mouth was not observed (Fig. 3C). With the use of both the Valsa-mouth and a surgical mask (Fig. 2D), no contamination on the

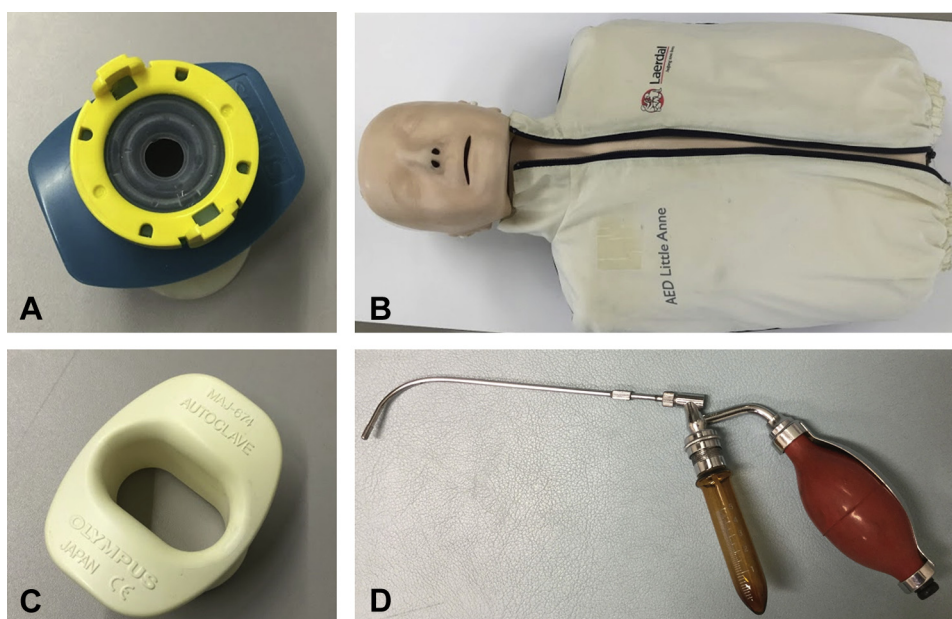


Figure 1. Simulation equipment. **A**, Valsalva maneuver mouthpiece. **B**, Cardiopulmonary resuscitation mannequin. **C**, Normal mouthpiece. **D**, Atomizer.

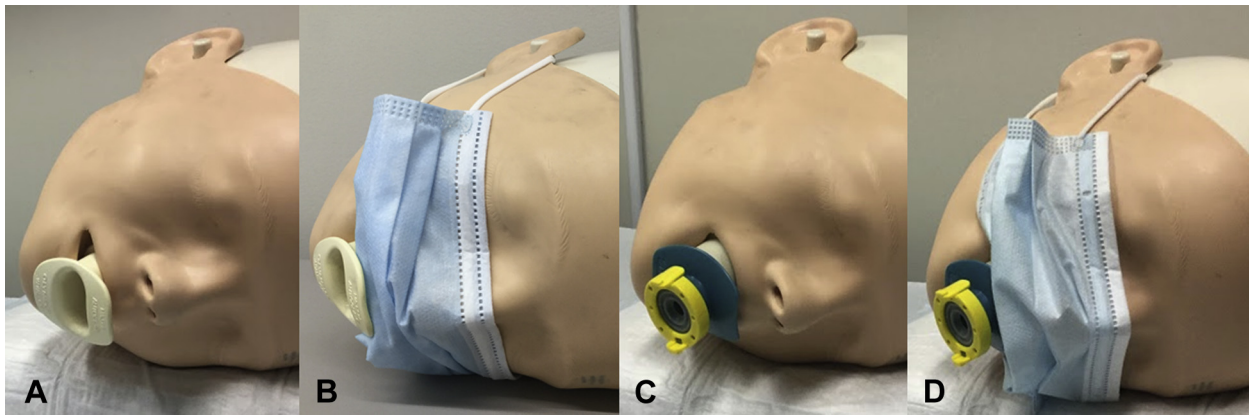


Figure 2. Mannequin and simulation equipment. **A**, With normal mouthpiece. **B**, With normal mouthpiece and surgical mask. **C**, With Valsalva-mouth. **D**, With Valsalva-mouth and surgical mask.

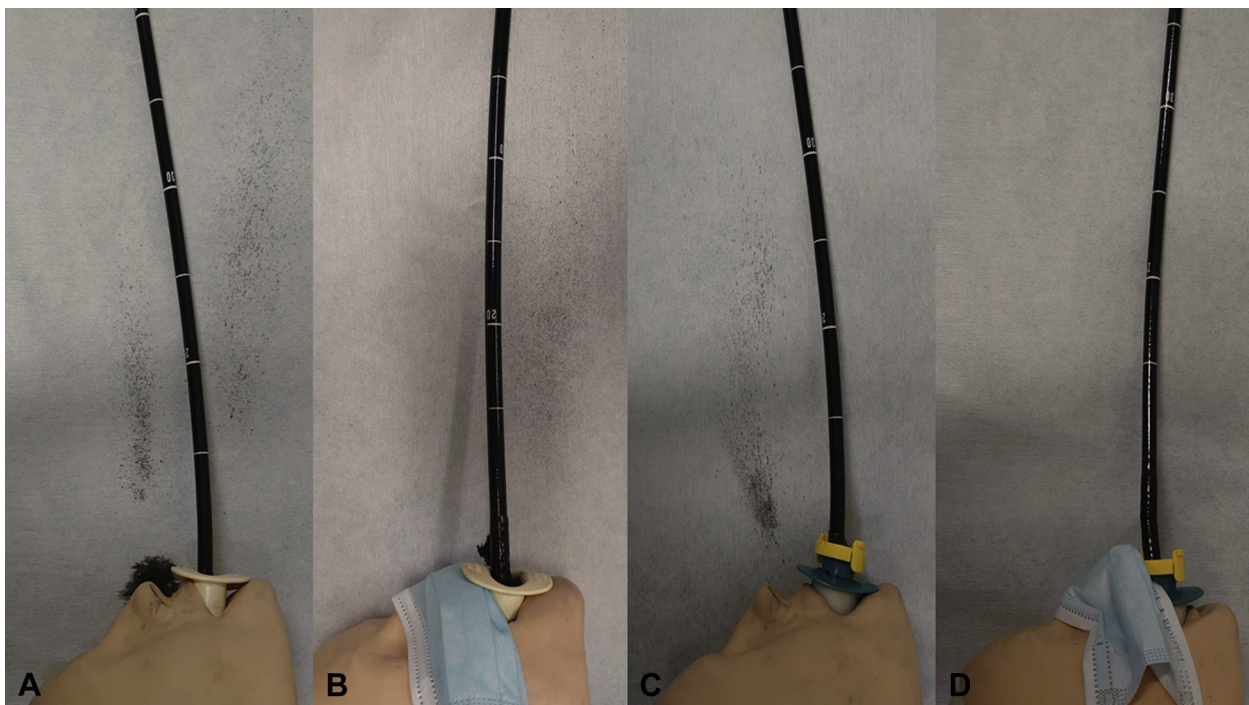


Figure 3. Simulation result. **A**, With normal mouthpiece. **B**, With normal mouthpiece and surgical mask. **C**, With Valsalva-mouth. **D**, With Valsalva-mouth and surgical mask.

endoscopist or the bed was observed (Fig. 3D). Furthermore, we made use of an ultraviolet light to search for small-particle splatter; however, the contamination area of both the soluble and fluorescent dyes were the same.

Our simulation method was inspired by a previous report¹ referring to barrier use during endotracheal intubation, using a balloon and a mannequin. As the report stated, the simulation was not validated for direction, speed, or particle size. The results of our simulation, using spray and a mannequin, might differ

from those with real patients; although the results showed that macroscopic droplets can be avoided, there was no evidence for a decrease in microscopic droplets. Furthermore, only a nasal cannula, which might generate a high amount of aerosol, was used for oxygen supplementation when using this combination.² Therefore, standard PPE should not be disregarded.

However, our simulation suggests that combined use of the Valsalva-mouth and a surgical mask could reduce contagious droplets from patients; this combination could

provide better protection in addition to standard PPE, especially when the patient seems to have a contagious infection.

DISCLOSURE

All authors disclosed no financial relationships.

Abbreviation: PPE, personal protective equipment.

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