Novel dedicated plastic cube for infection prevention during gastrointestinal endoscopy and endoscopic retrograde cholangiopancreatography

Controlling infections during upper gastrointestinal endoscopy (GI endoscopy) and endoscopic retrograde cholangiopancreatography (ERCP) is important to prevent the transmission of infection among and through medical staff. The infection caused by the novel severe acute respiratory syndrome coronavirus 2, is transmitted by inhalation, contact with infected droplets, or possibly infectious aerosol.^{1–3}

Barrier enclosure has already been reported as a preventive measure against aerosol exposure during endotracheal intubation.⁴ Herein, we introduce the first dedicated transparent plastic cube (Aerosol box-Tokyo Medical University type-, DBYM company, Hyogo, Japan) which has a small insertion hole enabling the attachment of the disposable glove for reducing the exposure to droplets and aerosols during GI endoscopy and ERCP.

In the experimental study, an operator with standard personal protective equipment (PPE) was positioned to perform GI endoscopy in front of the dummy in a left lateral decubitus position (Fig. 1a–d). To imitate the patient's cough experimentally when the endoscope is inserted, a small balloon containing 5 mL of fluorescent dye (Novartis Pharma K.K., Tokyo, Japan) is inflated with air, placed in the mouth of the simulated patient, and ruptured with a needle device that passed through the endoscope. Then, we examined the spread of fluorescent dye visualized by ultraviolet light with and without the plastic cube.

As a result, dye was found on the operator's gown, gloves, face mask, hat, and floor without the plastic cube (Fig. 2a,b). In contrast, the plastic cube showed that only the inner surface of the box at the endoscopic insertion port was contaminated (Fig. 2c). At present, based on these results, we perform emergent GI endoscopy and ERCP with the plastic cube.

Figure 1 Dedicated plastic cube. (a) A plastic cube designed to cover the patient's head, with two large cavities on the patient's foot side and the back side for assistants to insert their hands to control patient's head movement. (b) Plastic sheets are hung in the orifices on both cavities to enhance the hermeticity. (c) A smaller endoscope insertion port is provided in front of the patient's face (outer side of the plastic cube). The size of the endoscope insertion port is 11 cm in length and 3 cm in width. The distance between the endoscopic insertion port and the patient's mouth about 5 cm. (d) A disposable glove with a small hole [similar to endoscope diameter; approximately 1.0 cm (gastrointestinal endoscopy) to 1.5-cm (ERCP)] cut by scissors fixed to the insertion port of the endoscope with tape (inner side of the plastic cube).

Figure 2 Outcome of the experimental study. (a) Fluorescent dye was found on the floor occurred within approximately 100-cm from the head of the bed without plastic cube. (b) Microscopic fluorescent dye was found even on the operator's mask. (c) Operator's side view visualized by ultraviolet light with the plastic cube. Microscopic fluorescent dye was found only in the inner side of the plastic cube at the endoscopic insertion port.

This is the first report of a dedicated plastic cube enabling the attachment of a disposable glove fitted on smaller insertion hole to reduce the exposure to not only infected droplets but also aerosols during GI endoscopy and ERCP.

Authors declare no conflicts of interest for this article.

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