

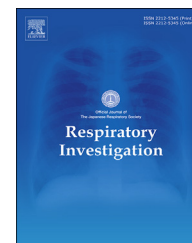


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## Rapid Communication

## A novel protective barrier enclosure for performing bronchoscopy

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## ABSTRACT

Healthcare workers performing bronchoscopy, especially in urgent cases, may be at risk of aerosol-transmitted infection with severe acute respiratory syndrome coronavirus 2. Therefore, such healthcare workers require thorough protection from aerosol droplets. To this end, we developed a novel handmade protective barrier enclosure for performing flexible bronchoscopy. The use of this enclosure did not entail any special technique for handling the bronchoscope during bronchoscopy. The enclosure may be helpful in protecting bronchoscopists from the risk of aerosol-transmitted infections, including coronavirus disease 2019.

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The American Association for Bronchology and Interventional Pulmonology (AABIP) recommends that nonessential and nonurgent bronchoscopy be postponed, if possible, as coronavirus disease 2019 (COVID-19) is transmitted via splash and aerosol droplets [1,2]. However, we sometimes encounter patients who require urgent bronchoscopy because of airway obstruction, massive hemoptysis, advanced lung cancer, or pulmonary infection.

Although testing for COVID-19, including reverse transcription polymerase chain reaction, should be performed

before bronchoscopy, test availability may be limited even for symptomatic patients. Studies have reported that asymptomatic patients can also contribute to the transmission of COVID-19 [3,4]. Therefore, adequate personal protective equipment (PPE) is essential during the COVID-19 pandemic, according to the Chest/AABIP Guidelines and expert panel report [1].

Healthcare workers performing bronchoscopy, which is an aerosol-generating procedure, are at a risk of aerosol-transmitted infections. Therefore, effective procedures to

Abbreviations: AABIP, American Association for Bronchology and Interventional Pulmonology; COVID-19, coronavirus disease 2019; PPE, personal protective equipment; PVC, polyvinyl chloride.

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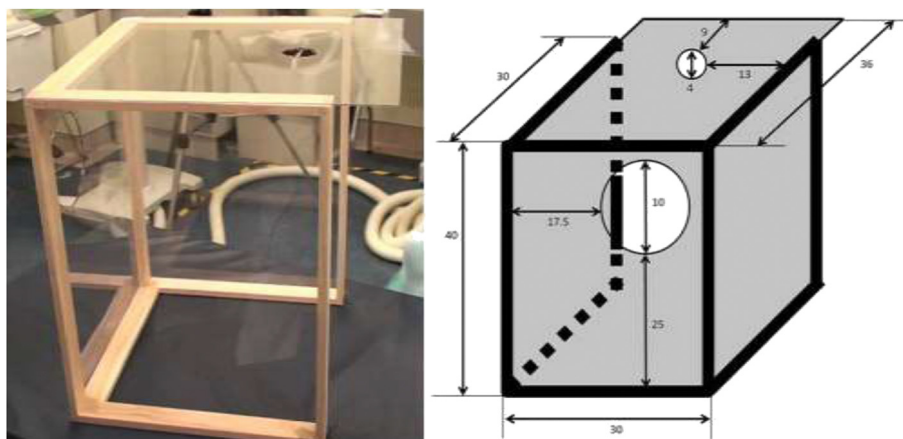
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protect them from aerosol droplets are required in addition to PPE [5]. We describe a novel handmade protective barrier enclosure for performing bronchoscopy.

We designed a transparent cube-shaped barrier enclosure to cover the heads of patients undergoing flexible bronchoscopy (Fig. 1). The frame of the barrier enclosure was made of  $1 \times 3$ -cm lumber. The frame was covered on 4 sides by 1-mm-thick polyvinyl chloride (PVC) sheets. The barrier enclosure had a 10-cm-diameter lateral port on the cranial side of the

if patients are asymptomatic and test negative for COVID-19 [3,4].

Barrier enclosures, in addition to PPE, are reported to protect healthcare workers from the spread of aerosol droplets during endotracheal intubation [8] and upper gastrointestinal endoscopy [9]. Our novel barrier enclosure will protect bronchoscopists from aerosol droplets generated via coughing and sneezing of the patients during bronchoscopy. The advantages of our enclosure are its low cost and ease of material



**Fig. 1 – A handmade protective barrier enclosure for performing bronchoscopy.**

patient, which allowed the right arm of the bronchoscopist to access the patient's face. The barrier enclosure also had a 4-cm-diameter top port on the upper side for introducing the bronchoscope. All construction materials were easily obtained from a “do-it-yourself” store for around 2000 yen (\$18.50), and the total construction time was 1 h.

The handmade barrier enclosure was set over the patient in the supine position (Fig. 2). All personnel wore standard PPE, including gown, gloves, N95 mask, and eye protection. The patient was intravenously administered 50  $\mu$ g fentanyl and 2 mg midazolam to maintain moderate sedation at a Ramsay Sedation Scale score of 3, at which the patient was cooperative and oriented [6]. Topical lidocaine was applied to the pharynx, larynx, trachea, and bronchus via a spray catheter [7] through the working channel during bronchoscopy to reduce the generation of aerosol droplets.

We performed diagnostic bronchoscopy by using the barrier enclosure in two cases. In one case, bronchoscopy was performed for observing a bronchial stump due to a suspected postoperative bronchopleural fistula. In the other case, bronchoscopy was performed for diagnosing tracheal stenosis due to suspected recurrent lung cancer. In both cases, bronchoscopy was performed without any adverse events, and no special bronchoscopic technique was necessary when using the barrier enclosure.

Bronchoscopy should be performed in a timely and safe manner in areas where community transmission of severe acute respiratory syndrome coronavirus 2 is present [1,2] even

acquisition and construction. Enclosures constructed using plexiglass appear durable [10], but these are difficult to set up at a low cost. Our inexpensive PVC and wood enclosure was



**Fig. 2 – Photograph depicting the use of the barrier enclosure during bronchoscopy. The handmade barrier enclosure is placed over the patient's head. The bronchoscopists perform bronchoscopy by inserting their right arm through the 10-cm-diameter lateral port and the bronchoscope through the 4-cm-diameter top port.**

strong enough for use during bronchoscopy and did not interfere with the handling of the bronchoscope.

Moreover, the novel barrier enclosure is reusable, as it can be sterilized with two disinfectants. The inside and outside surfaces of the enclosure could be wiped with 0.1% quaternary ammonium compound and 80% ethanol. This sterilization procedure recommended by the department of infection control was performed before each bronchoscopy.

We hope that our handmade barrier enclosure will protect many bronchoscopists and healthcare workers from COVID-19.

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### Consent

Informed consent was obtained for experimentation with human subjects.

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### Conflict of Interest

There is no conflict of interest.

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