

IMAGES IN PULMONARY, CRITICAL CARE, SLEEP MEDICINE AND THE SCIENCES

Development of a Mask for Bronchoscopy to Prevent Infection during the COVID-19 Pandemic Image Evaluation

Hirotoshi Yasui¹, Shotaro Okachi¹, Noriaki Fukatsu², and Kazuhide Sato^{1,2,3,4,5}

¹Respiratory Medicine, Nagoya University Graduate School of Medicine, Nagoya, Japan; ²B3 Unit, Advanced Analytical and Diagnostic Imaging Center/Medical Engineering Unit, and ³S-YLC, Nagoya University Institute for Advanced Research, Nagoya, Japan; ⁴Institute of Nano-Life-Systems, Institutes of Innovation for Future Society, Nagoya University, Nagoya, Japan; and ⁵FOREST-Souhatsu, CREST, JST, Tokyo, Japan

ORCID IDs: 0000-0003-1869-7953 (S.O.); 0000-0003-3025-088X (K.S.).

The coronavirus disease (COVID-19) pandemic has led to the realization that infectious diseases are a threat to humankind. As coronaviruses are transmitted through contact and droplets, bronchoscopy is considered a high-risk procedure (1, 2). Owing to the increased risk of virus transmission through droplets and aerosols, strict infection-control measures are essential (3, 4).

To prevent droplets and aerosols during bronchoscopy, we created a simple disposable mask for patients who undergo bronchoscopy with the help of the Japanese mask industry. The mask has a 10-mm slit in the center for inserting a bronchoscope and a 6-mm slit on both sides for suction catheter (Figure 1A). The slits are closed with an electrified filter unless the tube is pierced.

To evaluate effectiveness in preventing droplet and aerosol dispersal from the mouth, particle visualization using a highly sensitive camera and a high-power light source (ViEST system) was performed under two conditions: with or without the mask (bronchoscope and one suction catheter inserted). This system can visualize airborne particles over 80 nm in size. Without the mask, droplets were airborne when patients coughed and could be observed for 5 seconds. With the mask, almost no droplets were observed (Figure 1B and Video 1).

Our mask has the same structure as a normal mask, and therefore patients can use it correctly with ease. Moreover, it is ideal to use for healthcare providers, as it is disposable and there is no need for disinfection.

However, using a mask during bronchoscopy may limit ventilation (5). There are two ways to ensure safety when using the mask. First, all patients are fitted with a nasal oxygen cannula under the mask to maintain the oxygen saturation as measured by pulse oximetry above 90%. Second, a CO₂ monitor is used to detect the increase in CO₂ concentration. Moreover, patients with a history of CO₂ narcosis are not suitable for this mask.

In conclusion, this new mask might be useful in preventing splashes and aerosols during bronchoscopy. ■

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The uncompressed video is accessible from this article's supplementary material page.

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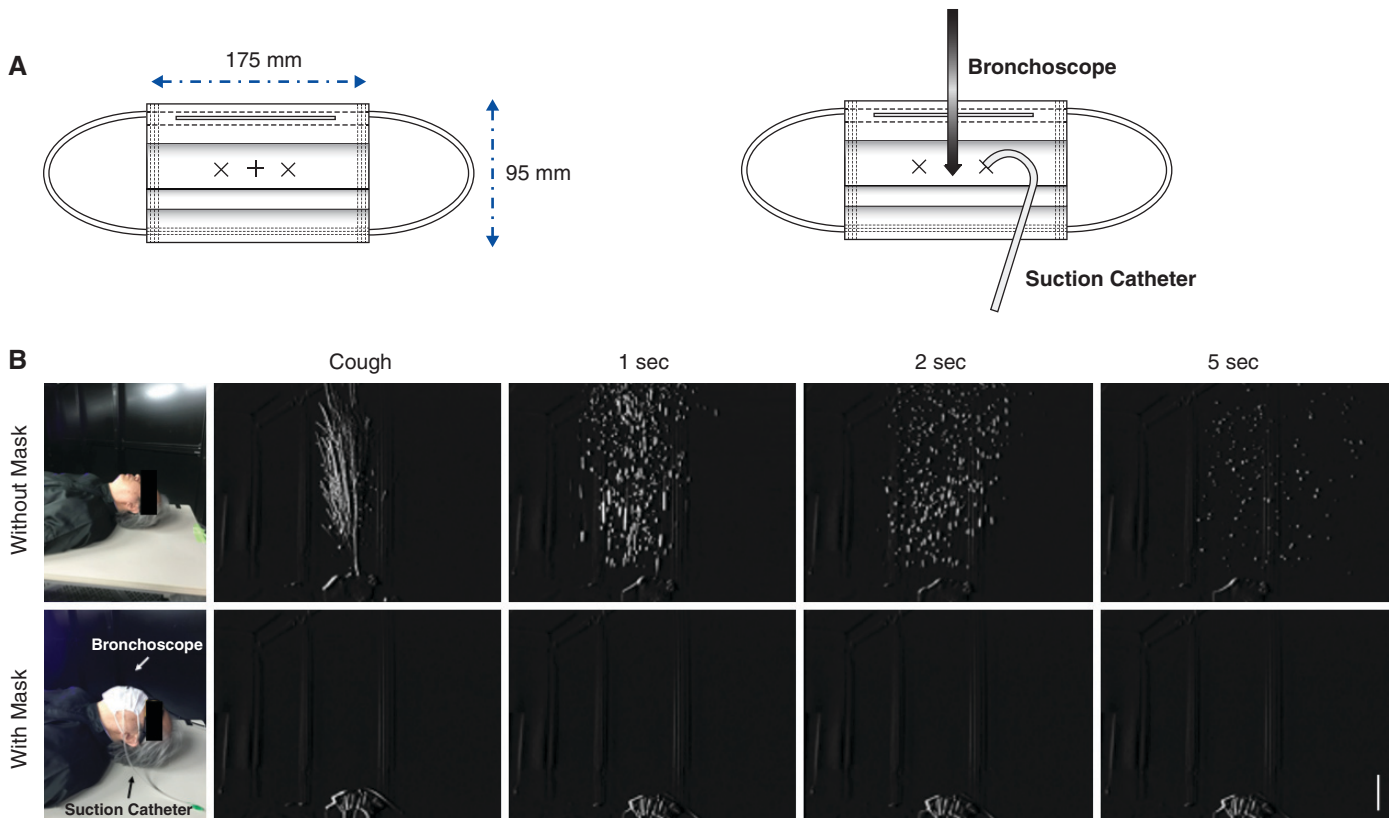
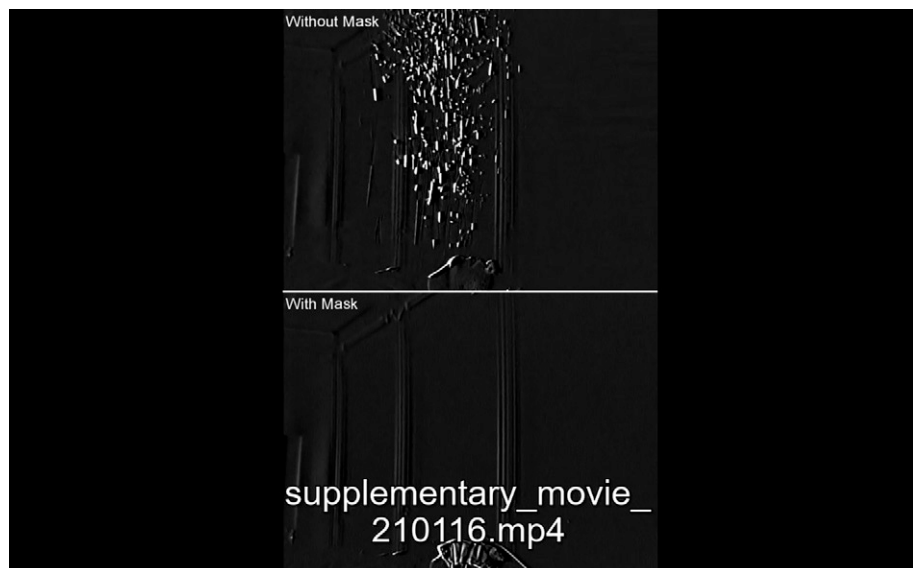


Figure 1. (A) Scheme of a mask for bronchoscopy (left). The mask had a 10-mm slit in the center for insertion of the bronchoscope and a 6-mm slit on both sides for the suction catheter (right). (B) Highly sensitive camera images (VIEST system) of splashes during coughing without and with the bronchoscopy mask. The mask can prevent the splashes and droplets. Scale bar, 10 cm. See Video 1.



Video 1. Video of the diffusion of droplets using a high-speed camera without mask and with mask under bronchoscope and suction catheter insertion.

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