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tic utility, both in hospitalised patients and in outpatient services. It constitutes a short- to mid-term predictive indicator of complications following hospital discharge, enabling the significant association between the number of B-lines and post-discharge complications (hazard ratio at 60, 90 and 180 days of 3.30 [95% CI, 1.52–7.17;  $p=0.002$ ], 2.94 [95% CI, 1.46–5.93;  $p=0.003$ ] and 2.01 [95% CI, 1.11–3.64;  $p=0.021$ ], respectively<sup>3</sup>).

Though protocols to integrate the technique have been put forward<sup>4,5</sup> and while we recognise the lack of standardisation of use in daily clinical practice, its diagnostic performance should not be questioned because of sufficient supporting scientific evidence.

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## Role of bronchoscopy in critically ill patients with COVID-19 pneumonia<sup>☆</sup>



### Papel de la broncoscopia en los pacientes críticos con neumonía por COVID-19

Dear Director:

On 31 December 2019, the World Health Organization (WHO) reported the presence of a series of cases of viral pneumonia in Wuhan, China. In early January 2020, a novel coronavirus, SARS-CoV-2, was identified as the causal agent. At the time, the disease caused by this new coronavirus had already spread outside of China and was declared a pandemic in early March 2020.

From the start, the WHO warned of the risk of disease transmission in relation to aerosol-generating procedures, including bronchoscopy<sup>1</sup>. The Spanish Societies of Pneumology and Thoracic Surgery and of Respiratory Endoscopy quickly published consensus guidelines on the use of bronchoscopy in patients with COVID-19<sup>2</sup>. The initial experience confirmed the critical role of bronchoscopy in diagnosing coinfections and managing airway secretions in patients with COVID-19 admitted to critical care units<sup>3</sup>. However, since the onset of the pandemic, we have observed that the thera-

peutic role of bronchoscopy in these patients would be more important than it had been to date in severe pneumonia.

At our centre, between 26 March and 29 May, we performed a total of 94 bronchoscopies on 51 patients out of the 216 who were admitted to the critical care units during that period. All the procedures were performed with a single-use flexible bronchoscope (Ambu<sup>®</sup> aScope<sup>TM</sup> 4 Broncho Regular 5.0/2.2). A total of 52% of the bronchoscopies were performed on patients with orotracheal intubation, 46% via tracheotomy, and only 2% on patients with non-invasive ventilation. Ventilation difficulty was the main indication for bronchoscopy in 80% of the cases, although atelectasis was observed in only 28%. The majority of the patients with COVID-19 presented abundant secretions.

These secretions were bloody in an appreciable number of cases (22%), which could be explained by the elevated number of patients receiving anticoagulant treatment as they were receiving extracorporeal membrane oxygenation (ECMO), or because they presented high blood levels of D-dimer. Although the majority of clots could be removed via facilitated aspiration, occasionally, following instillation of hyaluronic acid, in two procedures it was necessary to cryoextract the clots using a 1.9 mm cryoprobe which was carried out through the same single-use bronchoscope (Fig. 1).

Nevertheless, the most noteworthy characteristic of the bronchoscopies performed on COVID-19 patients was the presence of a large number of cases (23%) of very thick secretions that were difficult to aspirate and which, in some cases, managed to form endobronchial casts. This observation coincides with the experience reported by other centres<sup>4,5</sup>. As these authors mention, the elevated presence of mucus plugs in critical patients with COVID-19 would be

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**Figure 1** Cryoextraction of a large, organised blood clot extending from the right bronchial tree to the trachea.

explained by the limitations placed on humidity and aerosol therapies according to the recommendations at the time<sup>6</sup>. Managing these thick mucus plugs required manoeuvres that considerably prolonged procedure times despite the instillation of saline solution, mucolytics, and/or hyaluronic acid, with procedure times reaching to upwards of 45–60 min, even when these were performed by trained bronchoscopy technicians.

Despite the fact that the leading scientific societies recommended limiting humidity and aerosol therapies due to the risk of airborne coronavirus transmission, the decision was made to start active humidification in all patients with mechanical ventilation to try to minimise the presence of these plugs. Despite the fact that bronchial secretion management remained the main indication for bronchoscopy in these patients, after starting said therapy, the secretions became more liquid and easier to aspirate, drastically reducing bronchoscopy time to the 10–20 min that is usually required to perform toilet bronchoscopy.

In conclusion, the therapeutic use of bronchoscopy for airway secretion management in severe patients with COVID-19 was critical in a large percentage of patients. In our experience, implementation of active humidification measures facilitated the management of secretions, minimising the time needed for bronchoscopy.

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