MEDICAL INSIGHTS ePaper

Bronchoscopic removal of blood clots in the central airway

Role of cryoextraction for restoring of airway patency

Background

The COVID-19 pandemic has increased the global number of patients requiring intensive care including mechanical ventilation – sometimes with ECMO support. Blood clot formation with life-threatening airway obstruction has been reported in critically-ill patients on ECMO[1]. Other causes include tuberculosis, bronchiectasis, mycetoma, cancer, cystic fibrosis and bleeding after interventions (e.g. biopsies)[3,8,9].

Although there is no data on the incidence of airway obstruction by blood clots in the patient population severely affected by COVID-19 as yet, blood clot removal is a topic of high interest at the interface between intensive care medicine and bronchoscopy.

Challenges and goals

Blood clot removal can be achieved with different methodologies. However, guidelines as to when to choose which treatment option are not yet present.

Flexible bronchoscopy is now the main method used and can be carried out at bedside[3,8]. Most blood clots can be removed with suction, lavage and flexible forceps[3]. However, these methods include the risk of bleeding and airway trauma and might not be successful due to the fragile structure of blood clots[11-13]. Rigid bronchoscopy requires general anesthesia and bedside application can be challenging[2,3,14,15]. The use of balloon catheters increases the risk of bronchial injury and mucosa damage, and topical thrombolytic agents pose a risk for rebleeding[5,14].

With cryoextraction, large casts can be removed and bedside application is possible[2]. One case report describes bleeding after cryoextraction[16]. Current literature confirms a rapid removal of blood clots with flexible cryoprobes where other methods have failed[3]. Nevertheless, it is currently perceived as a back-up solution.

Method

A reasearch of the currently available literature was conducted by Erbe using PubMed, Livivo and Google Scholar. The terms "blood clot AND bronchial", "lung AND cryo" and "blood clot AND cryo AND broncho" were searched.

Results and key findings

Cryoextraction represents a standard treatment for blood clot removal in the airway according to the guidelines[6,7]. The success rate of cryoextraction ranges between 87.5 % and 100 %[1]. En bloc removal was frequently achieved. Extraction in a piecemeal fashion was also described[1] and the overall procedure time was between 7 and 15 minutes[3,5].

Conclusion

Cryoextraction of blood clots is a safe procedure[1,3]. Advantages of cryoextraction include performance with either flexible or rigid intubation. Absence of general anesthesia in flexible bronchoscopy can be beneficial in critically-ill patients, which makes cryoextraction an option in several procedural environments, including bedside application. Friable blood clots were described to be stabilized by freezing[2].

Taking into account current data with regards to safety, speed, recanalization rate and procedural environment, cryoextraction can be considered as a primus inter pares (first among equals) of the available options for blood clot removal.

Products

The evaluated studies were conducted with ERBECRYO® 2 and ERBOKRYO CA units together with flexible cryoprobes. To support the standardization of blood clot removal, single use cryoprobes with 1.7 mm (20402-410) and 2.4 mm (20402-411) can be used[10].

Freezing times between 10 and 20 seconds were reported[3,4].

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