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Sponsored By: Omneya Medical Company, Kuwait
Reported By: Dr. Samar Haitham Position: Key Account Manager
Supported By: Mr Jarrah Almutairi Position: Managing Director
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Results from case reports are not predictive of results in other cases. Results in other cases may vary.

Case Report

**Airway Clearance using the Frequencer[®]
for Mechanically Ventilated COVID-19
Patients in Kuwait**

Abstract

This case report describes the use and potential benefit of using the Frequencer®, an acoustic airway clearance device, in mechanically ventilated COVID-19 patients. The Frequencer® has been traditionally used with success in Cystic Fibrosis, a disease which produces thick mucus secretions which are difficult to expectorate. It has been hypothesized that the Frequencer® could also be useful in treating COVID-19 patients. The following cases demonstrate the ability of the Frequencer® to improve pulmonary function and airway clearance.

Brief Summary

Treatment for the recent increase of COVID-19 cases heavily relies on supportive management. New studies and autopsy reports demonstrate that the lungs of some COVID-19 patients show mucus plugging. In this report the Frequencer®, a non-invasive oscillating / acoustic airway clearance device, was utilized to provide airway clearance and help in mobilizing the thick mucus from lower airways. It was hypothesized that this revolutionarily device could improve breathing function in COVID-19 patients as it allows airway clearance for the extra mucus, especially with critical patients in intensive care who are unable to expectorate. It is a privilege to provide front line healthcare providers with better alternatives and treatment during this global pandemic.

This report summarizes the results from patients by Dr. Samar Haitham conducted during the period of 19-26 June 2020. The Frequencer® was used for four coronavirus patients in ICU with specific complications. We were pleased with the results in regard to its efficiency for clearing the airways and assisting patients to recover sooner.

Case Report No. 1:

- Patient information: Female – 49 Y.O. – COVID19- Obese- Heavy smoker.
- Procedure: Frequencer® Machine application.
- Duration: One week for 20 minutes per day.
- Notes to be considered: Closed catheter suctioning after the session.
- Results: Patient showed improvement after application of this device - it could help her breathe better as she is a heavy smoker. Breathing function showed improvement after treatment.
- Doctor's conclusions: Using this device helped the patient to remove excess secretions and thick mucus from lower airways.

Case Report No. 2:

- Patient information: Female – COVID19 – Obese – with tracheotomy.
- Procedure: Frequencer® Machine application.
- Duration: Two treatments for 20 minutes per day.
- Notes to be considered: Closed catheter suctioning after the session.
- Results: Due to the recent replacement of tracheotomy there was bleeding. Treatment was limited to avoid complication. The device was used, and suction applied twice. The patient requires more sessions after the tracheostomy wound healed.
- Doctor's conclusions: Inability to conduct closed suction due to tracheostomy bleeding prevent device use since newly replaced tracheostomy needed to heal first.

Case Report No. 3:

- Patient information: Female – COVID19- Hypertensive – diabetes.
- Procedure: Frequencer® Machine application.
- Duration: One week for 20 minutes per day.
- Notes to be considered: Closed catheter suctioning after the session.
- Results: Patient showed improvement immediately after session. Application of the device could help her breathe better as she was having extra thick mucus.
- Doctor's conclusions: Using this device helped the patient's breathing function.

Case Report No. 4:

- Patient information: Female – COVID19- Diabetes – ECMO.
- Procedure: Frequencer® Machine application.
- Duration: One week for 20 minutes per day.
- Notes to be considered: Closed catheter suctioning after the session.
- Results: No significant improvement due to many other complications.
- Doctor's conclusions: Patient has many other complications making it difficult to determine if the Frequencer® helped airway clearance and breathing function.

Discussion

Airway clearance in mechanically ventilated patients can be challenging. The patient's physiologic mechanisms like cough and mucociliary activity is often suppressed or greatly reduced. Devices requiring active participation from the patient (e.g. flutter valve) are simply unusable. High frequency chest wall oscillation also known as "the vest" cannot really be used for practical consideration and has not been

shown effective. This leaves clinicians with a limited set of options like manual chest physiotherapy, insufflation/exsufflation devices (cough assistance devices), direct airway suctioning and broncho-alveolar lavage. Chest PT is often difficult to practice in this setting and carries risk to the patients and caregivers. Insufflation/exsufflation devices have a hard time reaching the smaller airways and fail to liquify thick secretions. Direct suctioning is useful only once secretions have reached the larger airways. Broncho-alveolar lavage requires a skilled bronchoscopist, cannot be repeated easily and carries risks. The Frequencer® is easy to use and specifically targets the smaller airways and has been shown to liquify thick secretions allowing them to move up the bronchial tree.

Conclusion

Frequencer® acoustic airway clearance should be used for most of the patients with COVID-19, especially those having high amounts of thick mucus. It provides easy, consistent and effective therapy. It was also very safe to use for patients on ventilators or having tubes. It is suggested that use of the Frequencer® become part of the standard protocol of treatment for COVID-19 as it has the potential to help many patients to breathe better and speed their recovery in ICU.

Authors

Sponsored By: Omneya Medical Company, Kuwait

Reported By: Dr. Samar Haitham Position: Key Account Manager

Supported By: Mr Jarrah Almutairi Position: Managing Director

Independently Reviewed By: Laura McIntosh, PhD.

A handwritten signature in black ink that reads "Laura McIntosh".