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Understanding Ventilation Strategies for ECMO Patients at a Community Hospital

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Mentors: Dr. McCambridge and Kenneth Miller

Introduction

Extracorporeal Membrane Oxygenation (commonly abbreviated to ECMO) is a modified form of cardiopulmonary bypass utilized to patients with severe yet reversible respiratory and/or cardiac failure (1). The extracorporeal circuit is used to directly oxygenate and remove carbon dioxide from the patient's blood (2). This type of therapy is used as temporary support for heart and lung function leading to recovery or replacement. The New England Journal of Medicine, 365, 1905

Methods

• 42 patients were cannulated with ECMO at Lehigh Valley Health Network (LVHN) since January of 2013. All patients’ data was analyzed and a comprehensive ECMO database was created. All of these patients were also placed on mechanical ventilation during their treatment with ECMO. 21 of these 42 patients were treated with high frequency percussive ventilation (HFPV) and various aspects of their data were analyzed to better understand the efficacy of the VDR ventilator. If the high, strategic reasons for use of HFPV ventilation strategy, HFPV was determined to be inadequate, the patient has maintained secretions after frequent bronchoscopies, and the patients lung hypo inflation is marked be a compliance of less than or equal to 12cm H2O. HFPV has been shown to work as both an effective ventilator and a preservative mechanism.

In order to maintain the patient’s lung mechanics and inflation during extracorporeal membrane oxygenation it is necessary to incorporate one of the various forms of mechanical ventilation strategies. HFPV is a nonconventional form of ventilation which is utilized when PFOV and ECMO parameters are maximized and gas exchange remains inadequate. The patient’s lung hypo ventilation is marked be a compliance of less than or equal to 12cm H2O. HFPV has been shown to work as both an effective ventilator and a preservative mechanism.

• Data analysis and compilation of all ECMO patients who received High Frequency Percussive Ventilation by VDR prior to ECMO cannulation.

• Data analysis and compilation of all ECMO patients who received High Frequency Percussive Ventilation by VDR during ECMO management.

Results

• Comparisons and calculations of survival rates of all ECMO Patients and ECMO patients with VDR

• Data analysis and compilation of all ECMO patients who received High Frequency Percussive Ventilation by VDR prior to and during ECMO management.

• Data analysis and compilation of all ECMO patients who received High Frequency Percussive Ventilation by VDR prior to ECMO cannulation.

Discussion

Since January of 2013 Lehigh Valley Health network has utilized ECMO management on a total of 42 patients with Acute Respiratory Distress Syndrome (ARDS). Lehigh Valley Health network has maintained a survival rate of over 68.3%, which markedly higher than the national average recorded by the ELSO database of 57%. By utilizing various ventilation strategies and ECMO parameters were successfully maintained. By studying the success rate of high frequency percussive ventilation and the VDR ventilator on ECMO patients we hoped to show that not only is this mode of ventilation capable of maintaining lung mechanics during ECMO management, but that it could have improved patient outcomes for patients with whom PFOV is not sufficient.

Of the 42 ECMO patients, HFPV with VDR was utilized on a total of 21 patients. These patients were ventilated using PFOV with VDR for various reasons including gas exchange, all leaks lung, mechanical, and sustained secretions. The number of patients receiving HFPV with VDR was utilized as both an effective ventilator and a preservative mechanism. By maintaining the patients lung mechanics and inflation during extracorporeal membrane oxygenation it is necessary to incorporate one of the various forms of mechanical ventilation strategies. HFPV is a nonconventional form of ventilation which is utilized when PFOV and ECMO parameters are maximized.

42 patients were cannulated with ECMO at Lehigh Valley Health Network since January of 2013. All patients’ data was analyzed and a comprehensive ECMO database was created. All of these patients were also placed on mechanical ventilation during their treatment with ECMO. 21 of these 42 patients were treated with high frequency percussive ventilation (HFPV) and various aspects of their data were analyzed to better understand the efficacy of the VDR ventilator. If the high, strategic reasons for use of HFPV ventilation strategy, HFPV was determined to be inadequate, the patient has maintained secretions after frequent bronchoscopies, and the patients lung hypo inflation is marked be a compliance of less than or equal to 12cm H2O. HFPV has been shown to work as both an effective ventilator and a preservative mechanism.

This algorithm was designed to help the physicians better take care of patients after ECMO cannulation. For physicians or nurses who are unfamiliar with the ECMO system, this algorithm gives them step by step instructions on how to properly measure ventilator outputs, ventilation rates, fluid management, and gas analysis. By the complexity of some of the instructions, nodes were added alongside the text boxes which help the user locate the included explanations.

Thus, ECMO Ventilatory Management Algorithm

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ECMO Ventilatory Management Algorithm

• The survival rate of patients receiving ECMO cannulated with ECMO was 68.3%; one of the patients was not factored into the survival rate.

• Comparisons and calculations of survival rates of all ECMO Patients and ECMO patients with VDR

• Data analysis and compilation of all ECMO patients who received High Frequency Percussive Ventilation by VDR prior to and during ECMO management.

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REFERENCES

5. Mentors: Dr. McCambridge and Kenneth Miller
6. © 2014 Lehigh Valley Health Network

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