

Outcomes of Patients on Extracorporeal Membrane Oxygenation (ECMO) for Periods of Time without Anticoagulation at LVHN in the Past 3 Years

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Outcomes of Patients on Extracorporeal Membrane Oxygenation (ECMO) for Periods of Time Without Anticoagulation at LVHN in the Past 3 Years

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Background

Extracorporeal membrane oxygenation (ECMO) is an aggressive life support technique that utilizes extracorporeal circuits and oxygenators to support severe lung injury such as acute respiratory distress syndrome (ARDS), as well as severe cardiac disorders like cardiogenic shock and cardiac arrest. Veno-Venous (VV) ECMO is primarily used in respiratory distress.¹ Clots can form within the oxygenator or circuit, and can be pushed into the patient, ultimately causing a thrombus, or in severe cases, a stroke. To prevent this, patients undergo anticoagulation (AC) therapy and are uniformly heparinized. However patients can develop bleeding complications, and therefore must have their AC discontinued. There is no significant body of literature regarding safety and outcome of patients on ECMO in whom anticoagulation is held secondary to bleeding complications.

Methods

A retrospective study was done involving 57 patients in 2013-2015 within the Lehigh Valley Health Network that were on VV ECMO. Data was examined for each patient from electronic medial records. Outcomes of patients whose anticoagulation was held for at least one period over 24 hours (Group A) were compared to those of patients whose anticoagulation was not held (Group B). The overall exclusion criteria were being less than 18 years old or not having been on VV ECMO within LVHN since 2013.

Results

Table 1. LVHN VV ECMO Data 2013-2015

	Group A	Group B
Total # of patients	19	38
Gender (% male)	47% (9/19)	42% (16/38)
Average age	46	49
Average time on ECMO (days)	25	10
Median time on ECMO (days)	21	7
Average time heparin held (hr)	175	N/A
Median time heparin held (hr)	113	N/A
Oxygenator/circuit changes	58% (11/19)	7.8% (3/38)
Rate of oxygenator/circuit changes (total #/days on ECMO)	0.034 (16/475 days)	0.0079 (3/379)
LE DVT	26% (5/19)	13% (5/38)
Rate of LE DVT (#/days on ECMO)	0.017 (8/475 days)	0.013 (5/379 days)
UE DVT	26% (5/19)	11% (4/38)
Rate of UE DVT (#/days on ECMO)	0.017 (8/475 days)	0.026 (10/379 days)
Mortality	47% (9/19)	29% (11/38)
Family withdrew care	67% (6/9)	64% (7/11)
Discharged to home	11% (2/19)	18% (7/38)
Discharged to rehab facility	42% (8/19)	55% (21/38)

Group A – heparin held >24 hrs. Group B – Control. LE: Lower extremity. UE: Upper extremity. DVT: Deep Venous Thrombosis.

Figure 1. Patient Outcomes

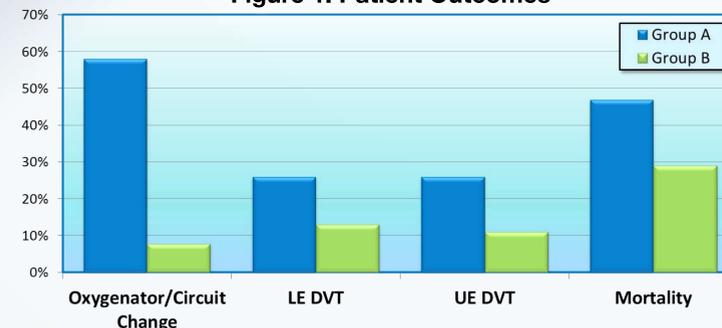


Figure 2. Reasons for Stopping Heparin

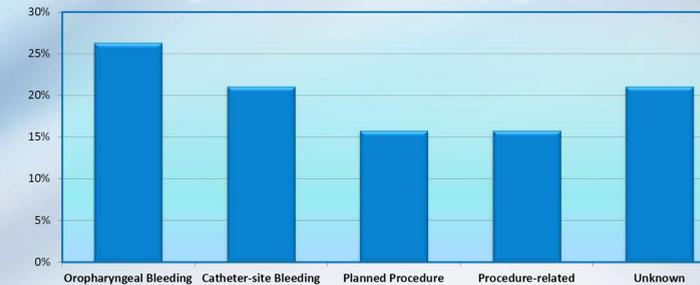


Table 2. Causes of Death for Heparin-held Patients

Pt #	Cause	Outcome
1	Bleeding	Family w/d care
2	Sepsis	Family w/d care
3	Shock/ cardiac arrest	Family w/d care
4	Air embolism and hypoxia leading to brain death	Death
5	Sepsis	Family w/d care
6	Prolonged ECMO w/o improvement	Family w/d care
7	Prolonged ECMO w/o improvement	Family w/d care
8	Bleeding	Death
9	Brain edema and herniation	Death

Figure 3. Timing of Oxygenator/circuit Change for Group A



Conclusions

Patients whose heparin was held for period(s) of at least 24 hours required oxygenator and circuit changes much more frequently. They also experienced more DVTs and had a higher mortality rate; however, their overall rate of DVTs per day on ECMO is similar that of the control group, indicating that the increased incidence of DVT is likely due to the significantly longer average amount of time those patients spent on ECMO relative to control patients. Patients in the non-heparinized cohort mostly died when the families withdrew care because of prolonged ECMO without improvement, worsening sepsis, and/or severe bleeding complications. Based on these findings there is no direct evidence that temporarily discontinuing AC resulted in increased patient mortality. This was more likely due to increased severity of illness and bleeding complications, requiring more time on ECMO.

References:

1. D Brodie, M Bacchetta. Extracorporeal Membrane Oxygenation for ARDS in Adults. *N Engl J Med* 2011;365:1905-14.

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