Autologous Extracorporeal Resuscitation Using the MACE™ System Following Severe Hemorrhagic Collapse in Swine Models

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INTRODUCTION

- Non-compressible hemorrhage leading cause of preventable death in combat casualties
- Operational capability gap - restoring perfusion in severe hemorrhagic shock when blood products, evacuation, and definitive surgical care are unavailable
- Rugged, field-deployable resuscitation system to address non-compressible hemorrhage through salvage and retransfusion of a patient's own shed blood
- Applicable across care at Roles 1-3

METHODS

- Pilot feasibility study using two (n = 2) Yorkshire swine models was conducted
- Percutaneous femoral veno-arterial cannulation
- Rapid extracorporeal exsanguination cardiac arrest (target estimated blood loss 50-60% total blood volume) simulating catastrophic battlefield hemorrhage
- 15-minute unsupported cardiac arrest period followed by resuscitation using the MACE™ device with autologous blood transfusion
- Serial laboratory evaluations, return of spontaneous circulation, and hemodynamic response were recorded

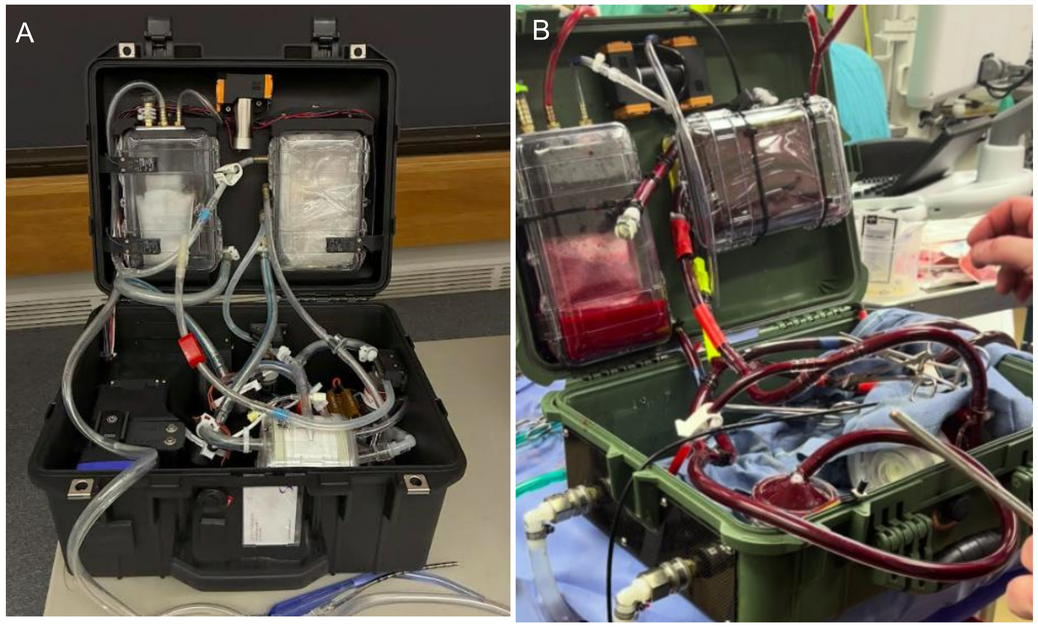

Figure 2. A) MACE™ device B) Utilization of the MACE™ device during resuscitation C) Cannulation strategy, including 17 French arterial cannula in left common femoral artery and 21 French venous cannula in right common femoral vein

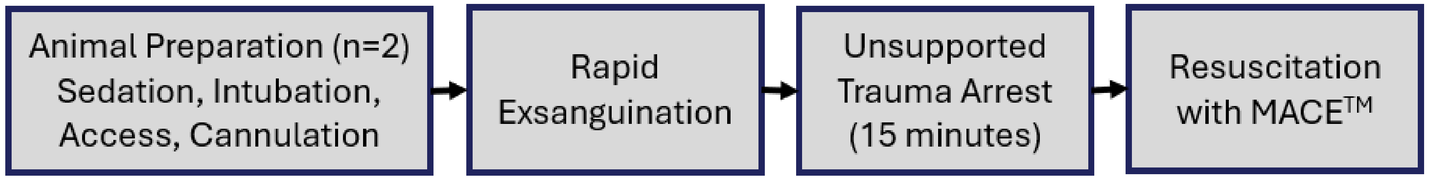

Figure 1. Schematic of experimental design for this pilot feasibility study.

RESULTS

Variable	Model 1	Model 2
Terminal Rhythm	Pulseless Electrical Activity	Pulseless Electrical Activity
Time to ROSC	464 seconds	444 seconds
Number of Defibrillations	1	2

Table 1. Terminal rhythm, time to return of spontaneous circulation (ROSC), and number of required defibrillations for each of the models. .

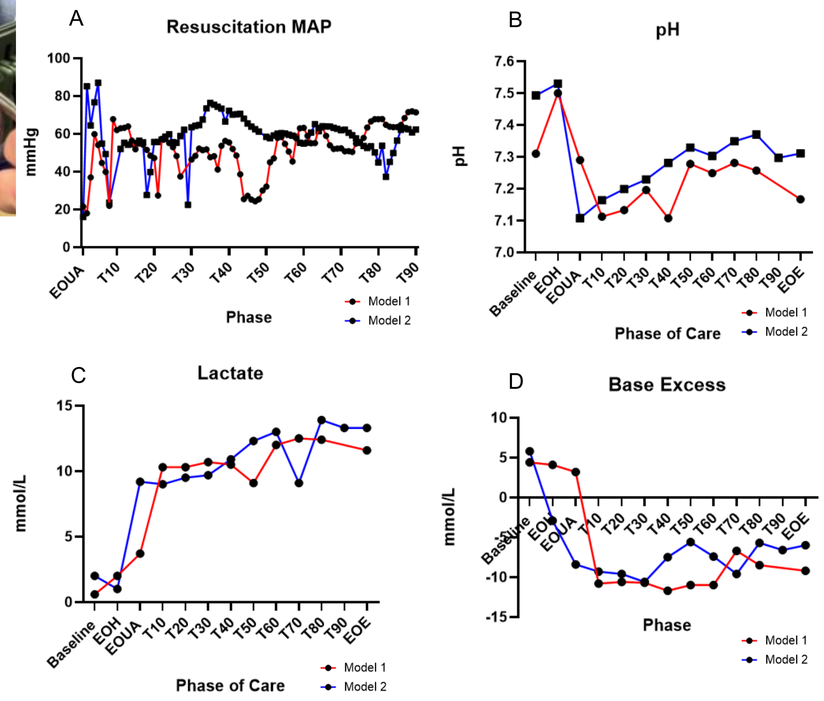

Figure 3. A) Mean arterial pressure (MAP) during resuscitation period B) pH C) lactate, and (D) base excess across study period, indicative of sustained perfusion during study period; EOH = end of hemorrhage, EOUA = end of unsupported arrest, EOE = end of experiment

CONCLUSION

- Autologous blood salvage using MACE™ achieved ROSC in swine model of catastrophic hemorrhage, suggesting feasibility for far-forward resuscitation