60th Medical Group (AMC), Travis AFB, CA

INSTITUTIONAL ANIMAL CARE AND USE COMMITTEE (IACUC)

FINAL REPORT SUMMARY

(Please type all information. Use additional pages if necessary.)

PROTOCOL #: FDG20180028A **DATE:** 26 June 2019

PROTOCOL TITLE: The Physiologic Effects of Increasing Durations of Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) in a Pediatric Swine (Sus scrofa) Hemorrhage Model.

PRINCIPAL INVESTIGATOR (PI) / TRAINING COORDINATOR (TC): Capt Kaeli Yamashiro

DEPARTMENT: **Surgery**

INITIAL APPROVAL DATE: 16 August 2018 **LAST TRIENNIAL REVISION DATE:** N/A

FUNDING SOURCE: CIF

1. RECORD OF ANIMAL USAGE:

Animal Species:	Total # Approved	# Used this FY	Total # Used to Date
Sus scrofa	28	14	14

2. PROTOCOL TYPE / CHARACTERISTICS: (Check all applicable terms in **EACH** column)

___ Training: Live Animal	___ Medical Readiness	___ Prolonged Restraint
___ Training: non-Live Animal	___ Health Promotion	___ Multiple Survival Surgery
___ Research: Survival (chronic)	___ Prevention	___ Behavioral Study
_x__ Research: non-Survival (acute)	___ Utilization Mgt.	___ Adjuvant Use
___ Other ( )	___ Other (Treatment)	___ Biohazard

3. PROTOCOL PAIN CATEGORY (USDA): (Check applicable) ___ C _X_ D ___ E

4. PROTOCOL STATUS:

***Request Protocol Closure:**

___ Inactive, protocol never initiated

___ Inactive, protocol initiated but has not/will not be completed

_X_ Completed, all approved procedures/animal uses have been completed

5. Previous Amendments:
List all amendments made to the protocol. **IF none occurred, state NONE. Do not use N/A.**

For the Entire Study Chronologically

Amendment Number	Date of Approval	Summary of the Change
1	7 February 2019	Personnel, Animal use, Procedures, & Protocol objectives/design

6. FUNDING STATUS: Funding allocated: $ __$78,120___ Funds remaining: $ _____

7. PROTOCOL PERSONNEL CHANGES:

Have there been any personnel/staffing changes (PI/CI/AI/TC/Instructor) since the last IACUC approval of protocol, or annual review? ___ Yes __x_ No

If yes, complete the following sections (Additions/Deletions). For additions, indicate whether or not the IACUC has approved this addition.

ADDITIONS: (Include Name, Protocol function - PI/CI/AI/TC/Instructor, IACUC approval - Yes/No)

NAME	PROTOCOL FUNCTION	IACUC APPROVAL

DELETIONS: (Include Name, Protocol function - PI/CI/AI/TC/Instructor, Effective date of deletion)

NAME	PROTOCOL FUNCTION	DATE OF DELETION

8. PROBLEMS / ADVERSE EVENTS: Identify any problems or adverse events that have affected study progress. Itemize adverse events that have led to unanticipated animal illness, distress, injury, or death; and indicate whether or not these events were reported to the IACUC.

There were no problems or unanticipated adverse events that affected study progress. We were able to complete the study within the allotted time.

9. REDUCTION, REFINEMENT, OR REPLACEMENT OF ANIMAL USE:

REPLACEMENT (ALTERNATIVES): Since the last IACUC approval, have alternatives to animal use become available that could be substituted in this protocol without adversely affecting study or training objectives?

No alternative to animal use have become available that could be substituted in this protocol without adversely affecting study objectives.

REFINEMENT: Since the last IACUC approval, have any study refinements been implemented to reduce the degree of pain or distress experienced by study animals, or have animals of lower phylogenetic status or sentience been identified as potential study/training models in this protocol?

No study refinements have been implemented to reduce the degree of pain or distress experienced by the study animals, lower phylogenetic status or sentience been identified as potential study/training models in this protocol.

REDUCTION: Since the last IACUC approval, have any methods been identified to reduce the number of live animals used in this protocol?

No further reductions have been made to this protocol since the IACUC last met.

10. PUBLICATIONS / PRESENTATIONS: (List any scientific publications and/or presentations that have resulted from this protocol. Include pending/scheduled publications or presentations).

11. PROTOCOL OBJECTIVES: (Were the protocol objectives met, and how will the outcome or training benefit the DoD/USAF?)

The abstract of this experiment is being reviewed for presentation at Pediatric Trauma Society Conference. Title: "Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) in a Pediatric Swine Model: Is 60 Minutes Too Long?"

12. PROTOCOL OUTCOME SUMMARY: (Please provide, in "ABSTRACT" format, a summary of the protocol objectives, materials and methods, results - include tables/figures, and conclusions/applications.)

BACKGROUND: Zone 1 resuscitative endovascular balloon occlusion of the aorta (REBOA) is indicated in adults with non-compressible torso hemorrhage for less than 60 minutes. However, in children, the tolerable duration is unknown. We designed a pediatric swine controlled hemorrhage model to evaluate the physiologic effects of 30 and 60 minutes of REBOA.

METHODS: Pediatric swine weighing 20-30kg underwent splenectomy, a controlled 60% total blood volume hemorrhage over 30 minutes, followed by Zone 1 REBOA for 60 minutes (60R) or 30 minutes (30R). Swine were resuscitated with shed blood and received critical care for 240 minutes.

RESULTS: Compared to baseline, end creatinine and creatinine kinase were elevated in 60R swine (n=5, 0.97 vs 1.7mg/dL, $p<0.01$ and 335.4 vs 961U/L, $p<0.001$, respectively), but not 30R swine (n=3, 0.91 vs 1.2mg/dL, $p=0.06$ and 423.7 vs 769.5U/L, $p=0.15$, respectively). During critical care, the 30R swine's pH, HCO3, base excess and lactate no longer differed from baseline, while at the end of critical care, the 60R swine continued to differ from baseline and were worsening (7.4 vs 7.2, $p<0.001$, 30.4 vs 18.4mmol/L, $p<0.0001$, 5.6 vs -8.5mmol/L, $p<0.0001$, 2.4 vs 5.7mmol/L, $p<0.001$, respectively). There was no difference in survival in the 60R swine (60%) and 30R swine (66.7%), $p=0.85$.

CONCLUSION: The physiologic effects of Zone 1 REBOA for 30 minutes mostly resolve within 3 hours of balloon deflation, whereas the effects of 60 minutes persist and worsen after 4 hours of critical care. Sixty minutes of Zone 1 REBOA may be too long in children.

Kazi Yamashiro
(PI / TO Signature)

1JUL2019
(Date)

Attachments:
Attachment 1: Defense Technical Information Center (DTIC) Abstract Submission **(Mandatory)**

Attachment 1

Defense Technical Information Center (DTIC) Abstract Submission

This abstract requires a brief (no more than 200 words) factual summary of the most significant information in the following format: Objectives, Methods, Results, and Conclusion.

Objectives: Evaluate the physiologic effects of 30min and 60min of REBOA.

Methods: Pediatric swine weighing 20-30kg underwent splenectomy, a controlled 60% total blood volume hemorrhage over 30min, the Zone 1 REBOA for 60min (60R) or 30min (30R). Swine were resuscitated blood and received critical care for 240min.

Results: Compared to baseline, end creatinine and creatinine kinase were elevated in 60R swine (n=5, 0.97 vs 1.7mg/dL, $p<0.01$ and 335.4 vs 961U/L, $p<0.001$, respectively), but not 30R swine (n=3, 0.91 vs 1.2mg/dL, $p=0.06$ and 423.7 vs 769.5U/L, $p=0.15$, respectively). During critical care, the 30R swine's pH, HCO3, base excess and lactate no longer differed from baseline, while at the end of critical care, the 60R swine continued to differ from baseline (7.4 vs 7.2, $p<0.001$, 30.4 vs 18.4mmol/L, $p<0.0001$, 5.6 vs -8.5mmol/L, $p<0.0001$, 2.4 vs 5.7mmol/L, $p<0.001$, respectively). There was no difference in survival in the 60R swine (60%) and 30R swine (66.7%), $p=0.85$.

Conclusion: The physiologic effects of Zone 1 REBOA for 30min mostly resolve, whereas the effects of 60min persist and worsen after 4hrs of critical care. Sixty minutes of Zone 1 REBOA may be too long in children.

Grant Number:_____
From:_____
****If you utilized an external grant, please provide Grant # and where the grant came from. Thank you.**