Ocular Bioimpedance: Seeing the Brain through the Eyes

AWARD AMOUNT: $1.48M

THE TEAM

Hakam Tiba, MD  
Principal Investigator

Kevin Ward, MD  
Co-Principal Investigator

Venkatakrishna Rajajee, MBBS  
Co-Investigator

Craig Williamson, MD  
Co-Investigator

Hasan Alam, MD  
Co-Investigator

THE PROBLEM

The challenges of caring for TBI patients are further heightened by the austere and resource-constrained combat environment. Delays in diagnosing the severity of TBI can result in an increase in TBI-related death and disability.

No practical solutions for the battlefield

Current techniques need specialists

Techniques are invasive

No continuous readings

New tool uses the eye as a window to the brain to help monitor and treat traumatic brain injury (TBI)

This non-invasive tool uses ocular bioimpedance and ultrasound to assess cerebrovascular autoregulation and intracranial pressure to help inform TBI diagnosis and treatment.

- Technology is non-invasive
- Does not require an experienced operator
- Compact in size for easy portability
- Can be used through all echelons of care

THE SOLUTION

THE TECHNOLOGY

Ocular bioimpedance (small electrical currents applied to the eye) tracks changes in cerebral blood flow to predict cerebrovascular autoregulation impairments, while ultrasound images of the eye using automated image analysis enables a non-invasive estimation of intracranial pressure.
Department of Defense Prolonged Field Care Research Award Winners

Gastroesophageal Resuscitative Occlusion of the Aorta (GROA)

AWARD AMOUNT: $3M

THE TEAM

Kevin Ward, MD
Emergency Medicine

Stewart Wang, MD, PhD
Surgery

Hakam Tiba, MD
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Jonathan Eliason, MD
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Albert Shih, PhD
Mechanical Engineering & Biomedical Engineering

Steven White, PhD
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Albert Shih, PhD
Mechanical Engineering & Biomedical Engineering

Steven White, PhD
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THE PROBLEM

Uncontrollable hemorrhage is a significant cause of preventable death on the battlefield. It is particularly difficult to stop bleeding in the abdomen and pelvis, with traditional treatments such as applying direct pressure or using tourniquets often rendered useless.

No effective options for aortic zone 1 & 2
No battlefield-tailored solutions
Current options not scalable
Lack of rapid treatments

THE SOLUTION

GROA is a minimally invasive device that can be used to rapidly stabilize a patient by controlling severe non-compressible abdominal hemorrhage at the point of impact.

- Easily implemented in austere environments
- Minimally invasive device placed orally
- Works in tandem with secondary treatments
- Preliminary experiments proven successful

THE TECHNOLOGY

The device allows partial to full mechanical occlusion of the aorta through the esophagus and/or stomach to stop hemorrhage.

GROA leverages the anatomical relationship between the esophagus and stomach to the thoracic and abdominal aorta.
Valproic Acid in Prolonged Damage Control Resuscitation

AWARD AMOUNT: $3M

THE TEAM

Hasan Alam, MD
Principal Investigator

Yongqing Li, MD, PhD
Co-Principal Investigator

Patrick Georgoff, MD
Co-Investigator

Vahagn Nikolian, MD
Co-Investigator

THE PROBLEM

There are currently no treatments that can be used in the austere battlefield with delayed evacuation to minimize organ injury and prolong survival until the injured can receive definitive treatment at higher echelons of care.

- No treatments for TBI & hemorrhage
- Blood products not always available
- Difficult to store medicines
- No immediate treatments

THE SOLUTION

Therapeutic treatment to mitigate the adverse consequences of prolonged damage control resuscitation

This therapeutic approach uses valproic acid and dried plasma products to minimize organ injury and prolong survival.

- Easy to administer
- Requires no special storage
- Inexpensive and widely available
- Has been in clinical use for >40 years
- Used in small volumes

THE THERAPEUTIC

Valproic acid is an FDA-approved anti-seizure medicine that has been shown to reduce brain lesion size, inflammation, and swelling.

Valproic acid has also been demonstrated to improve long-term neurological recovery and healing in large animal models of TBI and hemorrhagic shock.

Valproate