LOOK CLOSER

SBIR-supported technology allows for quick diagnosis of brain injuries

An explosion, and a Marine is down. The battlefield corpsman rushes in. Fast, accurate diagnosis of potential head trauma will make a critical difference in this patient's future. The medic touches a hand-held device called an Infrascanner to the Marine's skull. Green lights glow on the screen, indicating no sign of internal bleeding. This Marine won't need a costly air evacuation, and can be treated in the field or evacuated by vehicle.

Elsewhere, a young Afghan boy caught in an explosion suffers a small laceration to his head. The Marine corpsman on the scene uses an Infrascanner to confirm frontal-lobe bleeding. The boy is air-lifted to a facility for further testing and life-saving surgery.

The revolutionary device that allowed those on-the-spot assessments was developed with support from Navy Small Business Innovation Research (SBIR) funding under the Defense Health Program. The device, Infrascanner, emits harmless near-infrared (NIR) light into the outer layers of a patient's skull. The device then

measures differences in light absorption, indicating where bleeding may be occurring. Results are displayed on the device's built-in screen.

Statistics from conflict zones in Iraq have revealed that 30 percent of all Warfighters wounded in action sustained head injuries. Brain hematomas (bleeding) were common in these injuries. Bleeding causes pressure on the brain, which, in a short amount of time, can cause serious, long-term impairment or even death. When a Warfighter is injured in the field and head trauma is known or suspected, the precautionary protocol has been to transport the injured via helicopter, which is both risky and costly. If medics can determine that no cranial bleeding is involved, the wounded may be able to stay put, or be transported by safer and less expensive means.

Researchers at University of Pennsylvania and Baylor College of Medicine (Houston, Texas) developed the NIR technology on which the Infrascanner is based. A former University of Pennsylvania physicist, Baruch Ben Do, started a company, InfraScan, Inc., with the goal of taking the technology to market. In 2005, the Defense Health Program, through the U.S. Navy's Office of Naval Research (ONR), awarded InfraScan SBIR funding to pursue a military application for the technology, in collaboration with the Biomedical Engineering department at nearby Drexel University in Philadelphia. The impetus was to improve battlefield triage for Warfighters and reduce the frequency of risky and expensive helicopter evacuations.

ONR serves as the medical research and development unit for both the Navy and Marines. The Marine Corps was chosen to field-test the technology in actual military situations—which it did with resounding success. Expensive air evacuations for 15 soldiers with suspected head injuries were circumvented when the Infrascanner verified no internal brain hemorrhage, allowing patients to be transported by the least risky and most cost-effective means.

Today, over 200 Infrascanners have been deployed to USMC Battalion Aid Stations as part of their standard trauma kit. The Army established a contract with InfraScan in 2017 to expand production and distribution to Army personnel, and Special Forces are also testing the device for use.

In addition to military applications, the Infrascanner is also making commercial inroads. Head trauma patients can be diagnosed on job sites, at athletic events, in ambulances, and in rural healthcare facilities that might not have CT scanning capabilities.

The DoD SBIR program paved the way for taking the scanner from idea to commercial product, said Ben Dor.

Infrascanner technology also shows promise in pediatric applications. Children and teenagers are among the groups most likely to experience traumatic brain injuries, and the Infrascanner exposes those young patients to none of the X-ray radiation of traditional CT scanning. Infrascanner is FDA approved for adults in the U.S., with approval for pediatric use in process.

Outside the U.S., the technology has received the European equivalent of FDA approval, and consequently the Infrascanner's use is growing in European pediatrics and children's hospitals.

The Department of Defense SBIR program paved the way for getting the scanner from idea to commercial product, said Ben Dor. "At the end of the day, technology at a university doesn't save lives. Commercialization is not a dirty word to make money, but the only pathway that exists to take that technology from university lab bench to patient's bedside."

And far beyond, as an Afghan boy and American battlefield survivors can attest.

InfraScan, Inc.
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