



VEIN VIEWING TECHNOLOGY PROVIDES LIFE SAVING IMAGERY FOR BATTLEFIELD WOUNDED

6



Payoff

The technology embodied in the Vein Viewer device is a breakthrough for applications in which a patient's veins must be viewed rapidly and accurately to facilitate critical medication, particularly on the military battlefield where conditions range from less than optimal to abysmal. For military applications, prompt intravenous (IV) administration on the battlefield can save the lives of thousands of soldiers. Moreover, the Vein Viewer device is a platform technology that will lead to numerous applications.

Accomplishment

Scientists from the Air Force Research Laboratory's (AFRL's) Materials and Manufacturing Directorate (ML) made a medical breakthrough in the technology used to locate and clearly view blood veins in a broad range of lighting conditions. Their device dramatically shortens the time between occurrence of a wound on a battlefield and intravenous administration of life-sustaining fluids, a factor that could save many soldiers' lives. The device also has the potential for a broad range of civilian medical applications.

Background

According to military medical personnel, the most pressing need on the battlefield is the ability to insert an IV needle into a wounded soldier to administer life-sustaining fluids, especially during the first, most critical hour after the wound occurs. Statistics from the Vietnam conflict indicate that 10,000 soldiers bled to death from wounds to their extremities. An estimated 20 percent of them could have been saved if more effective first aid were administered right on the battlefield. A critical problem is that prompt insertion of an IV can be difficult to impossible under low ambient lighting or nighttime conditions on the battlefield. Conventional methods for finding a patient's veins rely on tactile and visual cues, a stab and guess process using available visible light only. Scientists at AFRL addressed the problem by seeking another light source. The solution is a device, called the Vein Viewer, which uses night vision goggles (NVGs) equipped with special filters developed by the Air Force. These goggles enable the wearer to see infrared light that passes through the patient's body, but is partially blocked by blood in the veins. During initial experiments, the AFRL scientists used a TV remote control infrared light source and standard military NVGs to be able to clearly see the network of veins in fingers, hands, lower arms, and feet. Studies showed this ability is due to the absorption of infrared light by deoxygenated hemoglobin traveling in veins. Bone, muscle, and other tissue are not viewed since they transmit or scatter the infrared light instead of absorbing it. Researchers also verified that skin color does not affect the ability to view veins. Further experiments using various light sources and filters were performed to determine the optimum imaging characteristics of the device. Other experiments verified that a needle inserted beneath the skin is clearly visible because metal blocks infrared light. As a result, many foreign objects under the skin such as bullets or shrapnel may also be detected. Researchers demonstrated a prototype device at Wright-Patterson Medical Center, Cincinnati Children's Hospital Medical Center, and Columbus Children's Hospital.