



US DEPARTMENT OF DEFENSE
BLAST INJURY RESEARCH PROGRAM
COORDINATING OFFICE

Protective Equipment

Blast-related Eye Injuries

A growing body of laboratory evidence suggests that the primary blast wave may cause significant ocular as well as higher visual system injuries. Researchers from USAARL are engaged in two studies addressing blast-related eye injuries. In the first study, research performed and sponsored by USAARL evaluated the performance of currently available protective eyewear with respect to primary blast wave. Pressure wave dynamics were measured at the cornea using an instrumented headform fitted with different protective eyewear. Eyewear protection coefficients were calculated using peak and integrated pressure readings. With respect to frontal blast, eyeglasses were slightly effective and goggles provided the greatest frontal blast protection. For oblique blast angles, eyeglasses potentiated the blast wave by creating higher pressures at the cornea. Furthermore, some eyewear produced oscillations in the time-pressure recordings indicative of increased turbulence that could lead to increased shear forces on ocular tissue. These findings suggest that current eye protection, designed to reduce secondary and tertiary blast injuries, may provide insufficient protection against primary blast waves.

In a second study, USAARL researchers sponsored by USAMRMC assessed the frequency and types of visual field (VF) defects seen at different testing stages following non-blast and blast-induced mTBI. The researchers performed a retrospective review of 500 electronic health records for military personnel sustaining mTBI during deployment. Of the records examined, 166 patients were tested with both confrontation VF and 30-2 Humphrey Matrix Frequency Doubling Technology (FDT) perimetry. Key study results were: (1) scatter defects (48%) were the most predominant deficits in both blast and non-blast mTBI injuries and over post-injury test timeframes; (2) confrontation VF was a poor qualitative predictor of VF defect; (3) a profound decrease in VF sensitivity was noted in comparison to previously reported FDT normative data, and (4) a significant trend of decreasing VF defects was seen over time, indicating the potential usage of FDT as a visual biomarker for monitoring mTBI recovery. These findings, described in a recently-accepted journal manuscript (*Military Medicine*), highlight the importance of performing threshold perimeter testing in those who have suffered an mTBI or concussion-like event.