Automated Eye Tracking For Detection of Blast Brain Injury After a Natural Gas Explosion

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Introduction

The purpose of this work is to describe the capacity for automated eye tracking performed while watching a short film clip to detect blast brain injury due to a natural gas explosion.

Methods

Design: Prospective observational study.

Setting: University-affiliated level one trauma center.

Participants: Approximately 70 civilian children and adults were accidently exposed to a natural gas explosion at a school. 36 subjects, including 4 of the hospitalized agreed to participate in this research. These blast subjects were compared to an age and gender matched cohort selected from among 561 controls recruited at a state fair.

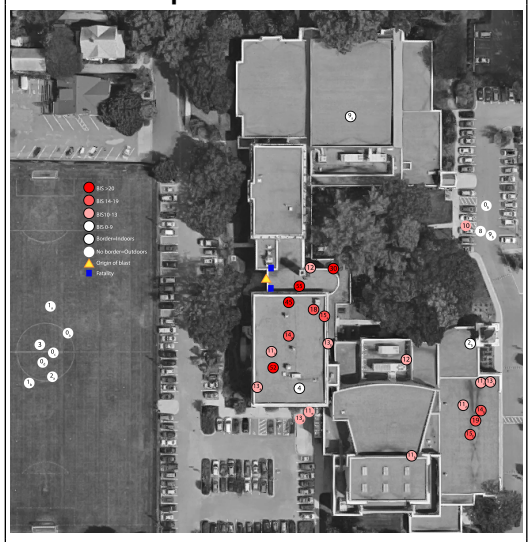
Exposure: The study test group was exposed to a natural gas blast explosion.

Primary outcome measure: automated eye tracking metrics.

Results

Thirty-six blast exposed subjects [age (mean±sd)=35.6±17.5, 23 females] were compared using Wilcoxon signed-rank test to thirty-six age and gender matched controls. Five eye tracking metrics were significantly different between all blast survivors and age and gender matched controls selected from among the community controls. In order to create a Blast Impact Score (BIS), the subjects inside the building [N=22; 17 females] were compared to controls with no prior history of TBI [N=306; 120 females]. BIS provided an AUC of 0.835, sensitivity of 86.4% and specificity of 77.4% to discriminate between blast patients and controls. BIS also correlated with distance from the epicenter of the blast (spearman correlation=0.73; p<0.001).

Map of blast location



Map of the blast location, with each subject's blast impact score (BIS) displayed in a circle corresponding to his / her location. Notice the subjects inside the building and closer to the epicenter of the blast have much higher BIS compared to the counterparts in open space or away from the blast site.

Conclusions

Our data supports the use of automated eye tracking for assessment of blast brain injury. This finding is particularly relevant to military personnel who may be exposed to blast, which was previously dubbed “an invisible injury.” The ability to detect blast brain injury using an automated non-invasive technique will enable early identification of afflicted subjects and protection from repeated exposure as well as development of therapeutics.

Learning Objectives

Can an automated eye tracking algorithm performed while viewing a short film clip detect blast brain injury?

References

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