CNS Voltage-gated Calcium Channel Gene Variation And Prolonged Recovery Following Sport-related Concussion

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Objectives: To examine the association between concussion duration and two calcium channel, voltage-dependent, R type, alpha 1E subunit (CACNA1E) single nucleotide polymorphisms (i.e., rs35737760 and rs704326). A secondary purpose was to examine the association between CACNA1E single nucleotide polymorphisms (SNPs) and three acute concussion severity scores (i.e., vestibule-ocular reflex test, balance error scoring scale, and Immediate Post-Concussion Assessment and Cognitive Testing).

Methods: Forty athletes with a diagnosed concussion from a hospital concussion program completed a standardized initial evaluation. Concussion injury characteristics, acute signs and symptoms followed by an objective screening (i.e., vestibular ocular assessments, balance error scoring system test, and Immediate Post-Concussion Assessment and Cognitive Testing exam) were assessed. Enrolled participants provided salivary samples for isolation of DNA. Two exon SNPs rs35737760 and rs704326 within CACNA1E were genotyped.

Results: There was a significant difference found between acute balance deficits and prolonged recovery group (X² = 5.66, p = 0.017). There was an association found between the dominant model GG genotype (X² = 5.41, p = 0.027) within the rs704326 SNP and prolonged recovery group. Significant differences were identified for the rs704326 SNP within the dominant model GG genotype (p = 0.030) for VOR scores by recovery. A significant difference was found between the rs704326 SNP codominant model AA (p = 0.042) and visual memory. There was an association between acute balance deficits and prolonged recovery (X² = 5.66, p = 0.017) for the rs35737760 SNP. No significant associations between concussion severity and genotype for rs35737760 SNP.

Conclusion: Athletes carrying the CACNA1E rs704326 homozygous genotype GG are at a greater risk of a prolonged recovery. Athletes that reported balance deficits at the time of injury were more likely to have prolonged recovery. These polymorphisms within CACNA1E could alter the CACNA1E protein and allow for an increase of calcium leading to deficits to the granule cells within the brain.

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