Characterizing Symptom Profiles following Concussion in the Adolescent Population

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PURPOSE: We characterized the symptom profile of adolescent concussion patients using the convergence insufficiency symptom survey (CISS) and explored if CISS symptom reporting is impacted by visual function, sex, time since concussion (TSC), and method of administration.

METHODS: A retrospective chart review was conducted for patients seen with a concussion diagnosis of <1 year (sub-acute: 15-120 days, chronic: 121-<1 year) in the Ophthalmology Department between July 2014 to December 2021 through the multi-disciplinary concussion clinic (MDCC) or a direct referral (REF). Inclusion criteria comprised of near point of convergence (NPC) and accommodative amplitude (AA) measures, completion of the Convergence Insufficiency Symptom Survey (CISS), at least 20/30 best-corrected visual acuity at distance and near, and no ocular disease, strabismus, or amblyopia. Patients seen through the MDCC self-reported the CISS on an iPad, and REF patients responded verbally to a clinician administered CISS. The CISS consists of a 15-item questionnaire: 5 performance (CISS-P), 7 somatic (CISS-S), and 3 vision (CISS-V) related questions. Patients were grouped as having abnormal visual function if they had an NPC measurement of ≥7 cm and/or an AA measurement of 2 diopters below their age expected value (15-1/4[age]) for either or both eyes. CISS sub-scores were normalized for comparison. Continuous data is presented as means and standard deviations. Multiple regression analyses were performed for total CISS scores and sub-scores.

RESULTS: 210 patients (67.6% female, mean age 15.0 ± 2.17 years), had an average total CISS score of 27.8 ± 12.8. The regression model for total CISS scores was statistically significant (R^2 = 0.09, F = 5.25, p < 0.001). Clinic type (β = 7.15 p < 0.001, 95% Confidence Interval (CI): 4.29 - 11.2) and visual function (β = 4.60, p = 0.03, CI: 0.91- 9.03) had significant effects on total scores with MDCC and abnormal visual function patients showing higher scores. Sex and TSC were not significant. The highest mean sub-score was CISS-P (2.04 ± 1.03) followed by CISS-S (1.98 ± 0.98), and CISS-V (1.26 ± 0.98). CISS-P scores were not significantly affected by any of the predictors. CISS-S scores had significant effects from clinic type (β = 0.59, p < 0.001, CI: 0.32-0.86) with MDCC patients scoring higher. CISS-V scores had significant effects from clinic type (β = 0.586, p < 0.001, CI: 0.33 to 0.84), visual function (β = 0.552, p < 0.001, CI: 0.24 to 0.86), and TSC (β = 0.367, p = 0.0057, CI: 0.11 to 0.63). MDCC, abnormal visual function, and sub-acute patients scored higher.

CONCLUSION: All concussed patients had high symptom reporting on the CISS. Total scores and CISS-V sub-scores could help screen for abnormal visual function following concussion and aid timely referral to a vision specialist. Clinician administered CISS can help limit exaggerated symptom reporting.