

Title: PUPILLOMETRY MEASURES AS A PREDICTOR OF PATIENTS THAT EXPERIENCE PROLONGED POST CONCUSSIVE SYMPTOMS AFTER MILD TRAUMATIC BRAIN INJURY

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Background/Aims: Autonomic dysfunction is not uncommon with brain injury and pupillometry is one simple way to assess the level of autonomic dysfunction. We investigated whether pupillometry can be used to predict whether patients were more likely to experience prolonged symptoms from their mild traumatic brain injury (m-TBI) incident.

Methods: We performed a retrospective cohort study of 55 patients who visited a private concussion clinic for initial presentation for a concussion within 28 days from the m-TBI incident. The patients were between the ages of 12-25 and had their initial appointment between the dates of 11/01/2018 and 04/30/2019. Patients were only included if they were selected for additional oculomotor testing (OMT), We only included patients tracked until diagnosed with PPCS, symptoms longer than 6 weeks, or cleared. The majority of OMT tests were conducted on average 26 days from the initial visit. The OMT test involves eye movement-tracking device along with pupillometer, capable of measuring the changes in pupil's contraction speed and size as it reacts to a brief flash of light.

Results: The majority of patients had a maximum pupillary contraction between 1.5 and 3mm with a mean of 2.44 mm. Patients with a pupillary contraction diameter greater than 3mm were all diagnosed with PPCS and all had prolonged symptoms beyond 100 days. The majority of patients had pupillary time to full contractions between 800ms and 1100 ms with a mean of 895 ms. All patients who recorded a time to maximum contraction longer than 950 ms, were eventually diagnosed with PPCS and were more likely to have prolonged symptoms beyond 100 days.

Conclusion: These results suggest that pupillary autonomic dysfunction is a predictor of PPCS. Patients with longer contraction times and larger contraction volumes beyond these thresholds present a high risk of developing PPCS, and have a prolonged symptom experience.

| Pupillary Max Contraction (mm) | # Of Patients | PPCS % | Days Tracked | Clearance within 100 days |
|--------------------------------|---------------|--------|--------------|---------------------------|
| 1.4-2 | 12 | 91.70% | 95.25 | 4/12 (33.3%) |
| 2-2.5 | 21 | 76.20% | 100.57 | 8/21 (38.1%) |
| 2.5-3 | 14 | 78.60% | 92.79 | 5/14 (35.7%) |
| 3+ | 8 | 100% | 131.75 | 0/8 (0%) |

| Time to Full Contraction (ms) | # Of Patients | PPCS% | Days Tracked | Cleared with 100 DAYS |
|-------------------------------|---------------|--------|--------------|-----------------------|
| <850 | 17 | 76.50% | 103.24 | 6/17 (35.3%) |
| 850-950 | 24 | 79.20% | 94.92 | 9/24 (37.5%) |
| 950+ | 14 | 100% | 112.5 | 2/14 (14.3%) |