



University of Texas Southwestern Medical Center

Introduction

Understanding the value of quantitative pupillometry (QP) to provide early warning signs of clinical deterioration in patients with neurologic injury is still being explored. MRI and CT allow for a whole brain dynamic investigation but are costly and time-consuming assessment. QP could provide insight when brain imaging is indicated, but there is little research on the efficacy of obtaining QP readings before or after neuroimaging.

Methods

This is an observational, pragmatic study to evaluate the efficacy of obtaining QP readings within 30 minutes before and after CT or MRI in the inpatient setting with patients with neurologic injury. Nurses, advanced practice providers, and physicians were engaged to obtain QP readings before and after neuroimaging. Data were downloaded into a .csv file and linked to subject demographic data. Analyses were completed in SASv9.4. Spearman test was used to explore associations between continuous variables. Paired t-test models were used to examine QP values before and after imaging.

Results

Fifty patients were enrolled over a period of 5 months. Mean left eye neurological pupil index (NPi) was 3.98 (1.12) before imaging and 4.13 (1.08) after imaging ($P = .0044$). The mean right eye NPi was 3.96 (1.00) before imaging and 4.08 (0.93) after imaging ($P = 0.514$).

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Table 1. Demographics

Age years		58.16 (17.31)
Sex	Female	22 (44%)
Ethnicity	Non-Hispanic	37 (74%)
	Hispanic	10 (20%)
	Other/Not Given	3 (6%)
Race	White	37 (74%)
	Black	5 (10%)
	Asian	1 (2%)
	Native American	1 (2%)
	Other/Not Given	6 (12%)
Primary Diagnosis		
	Subarachnoid Hemorrhage	27 (54%)
	Ischemic Stroke	8 (16%)
	Intracerebral Hemorrhage	4 (8%)
	Brain Tumor	2 (4%)
	Lower Motor Neuron Lesion	3 (6%)
	Spinal Surgery	1 (2%)
	Hydrocephalus	1 (2%)
	Other	4 (8%)

Table 2. QP Metrics

Pupillometry Variables	Right Eye			Left Eye		
	Before Imaging	After Imaging	p-value	Before Imaging	After Imaging	p-value
NPi	3.96 (1.00)	4.08 (0.93)	0.051	3.98 (1.12)	4.13 (1.08)	0.004
Initial Size (mm)	3.58 (0.99)	3.53 (1.06)	0.631	3.61 (1.11)	3.53 (1.14)	0.385
Minimum Size (mm)	2.63 (0.70)	2.58 (0.72)	0.370	2.57 (0.72)	2.46 (0.64)	0.049
Percent change	24.82 (9.75)	25.39 (10.34)	0.599	25.35 (10.46)	26.63 (10.60)	0.171
Constriction Velocity (mm/sec)	1.72 (0.94)	1.72 (0.83)	0.998	1.70 (0.94)	1.74 (0.92)	0.557
Dilation Velocity (mm/sec)	0.76 (0.42)	0.73 (0.41)	0.760	0.74 (0.39)	0.75 (0.43)	0.800
Latency (sec)	0.26 (0.10)	0.25 (0.07)	0.248	0.27 (0.11)	0.26 (0.07)	0.279

Conclusion

Patient recruitment into this study was relatively short, supporting feasibility of obtaining readings. There is a trend towards improved NPi values after imaging. Notably, some patients had much lower values after imaging and some patients had much higher values after imaging. It is quite possible to detect acute changes in NPi over short periods of time. The results support that a randomized or large-scale study to evaluate correlations between NPi change and acute changes found in neuroimaging is feasible.