

Quantitative Pupillometry and Radiographic Midbrain Compression

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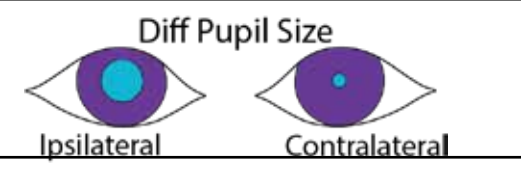
INTRO

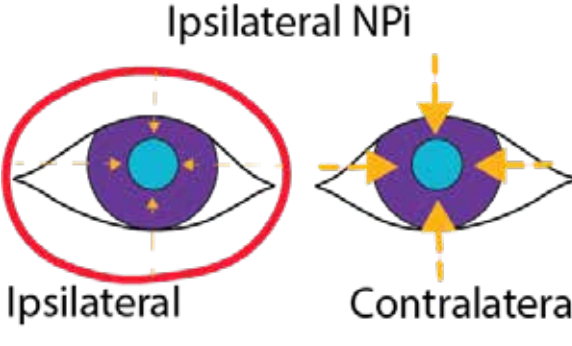
- ◆ Cerebral Edema (CE) is pathologic brain swelling that can result in mortality after ischemic and hemorrhagic stroke.
- ◆ Unilateral compression of pupillary pathways can lead to subjective increased pupil size and decreased reactivity.
  - Bedside Quantitative pupil measurements may be an indicator of increasing mass effect from Cerebral Edema or hemorrhage.
- ◆ We hypothesized that we would find a significant association between decreased pupil reactivity & radiographic markers of mass effect.

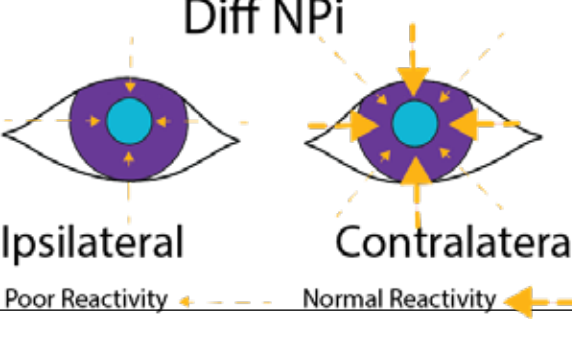
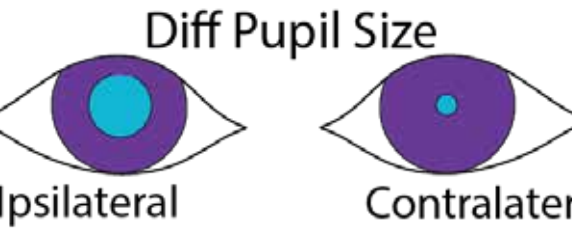
METHODS

- ◆ N = 35, 15 Supratentorial Intraparenchymal Hemorrhage (IPH) and 20 Anterior Ischemic Stroke (AIS) patients.
- ◆ Collected quantitative pupil measurements and radiographic markers of edema from patient head CT scans that occurred within 2 hours of each other.
- ◆ Constructed mixed effect linear models showing significant effects of radiographic markers on pupil reactivity and size adjusting for age, lesion volume (IPH), MCA stroke burden and hemorrhagic conversion (ECASS score) (AIS).

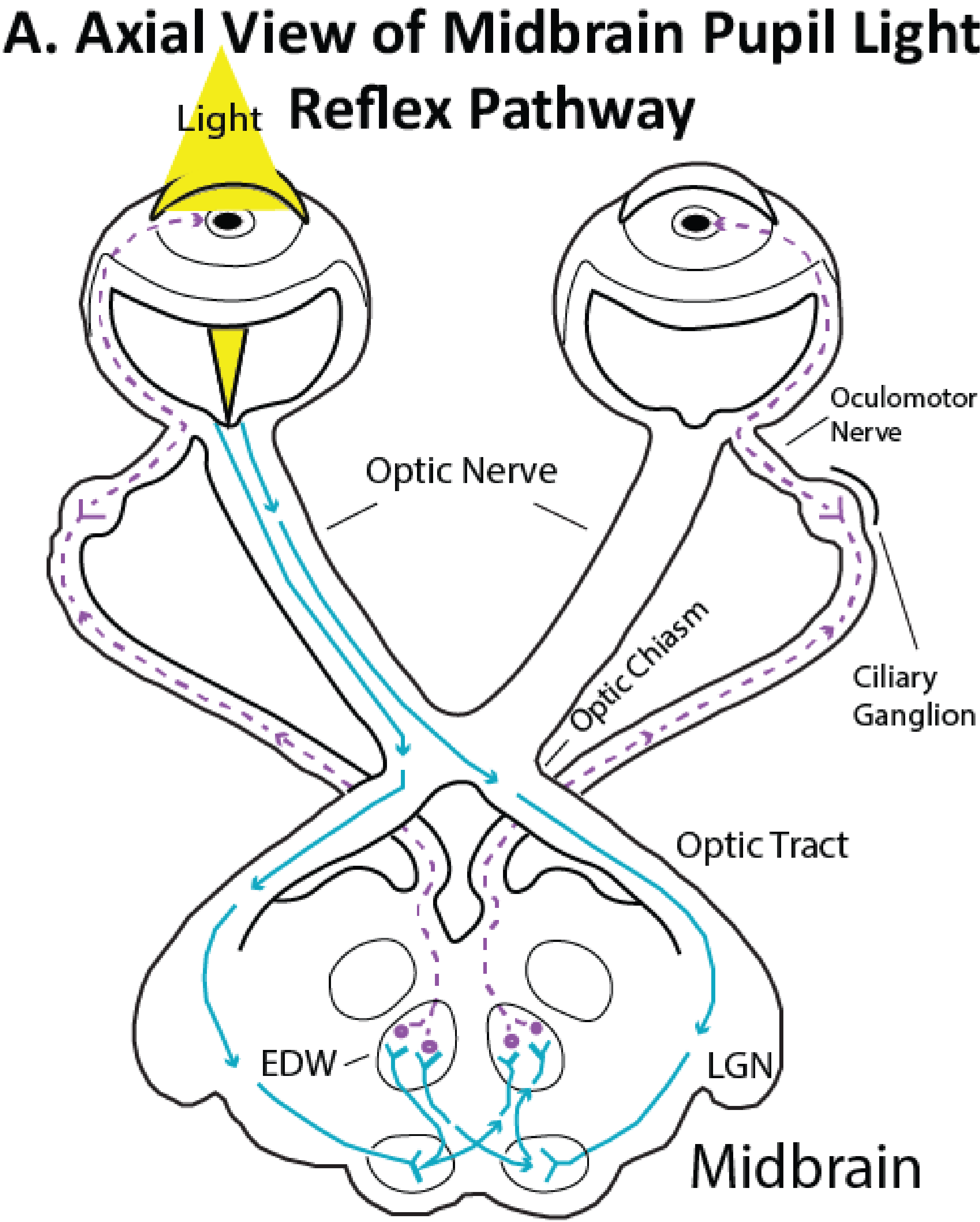
RESULTS

ENTIRE COHORT				
Pupil Measure	Rad Measure	Adjustment	$\beta$	p
 Diff Pupil Size Ipsilateral   Contralateral	#\$\$&'\$\$"	Age	1.7337	0.0109

SUPRATENTORIAL IPH				
Pupil Measure	Rad Measure	Adjustment	$\beta$	p
 Ipsilateral NPI Ipsilateral   Contralateral	'(& ! "#!	Age	-0.0588	0.0177
		Lesion Volume	-0.0512	0.0442
		Age	0.0139	0.0119
		Lesion Volume	0.0142	0.0068

ANTERIOR CIRCULATION ISCHEMIC STROKE				
Pupil Measure	Rad Measure	Adjustment	$\beta$	p
 Diff NPI Ipsilateral   Contralateral	\$\$&! !	Age	0.1647	0.0051
		MCA Stroke Burden	0.2284	0.0007
		ECASS Score	0.1556	0.0077
		Age	2.7293	0.0024
 Diff Pupil Size Ipsilateral   Contralateral	#\$\$&'\$\$"	MCA Stroke Burden	2.7179	0.0027
		ECASS Score	2.7018	0.0019

Pupil metrics are significantly associated with increasing markers of mass effect in ischemic and hemorrhagic stroke.

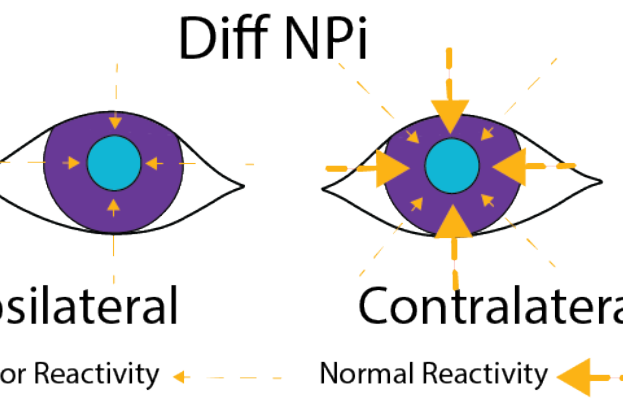
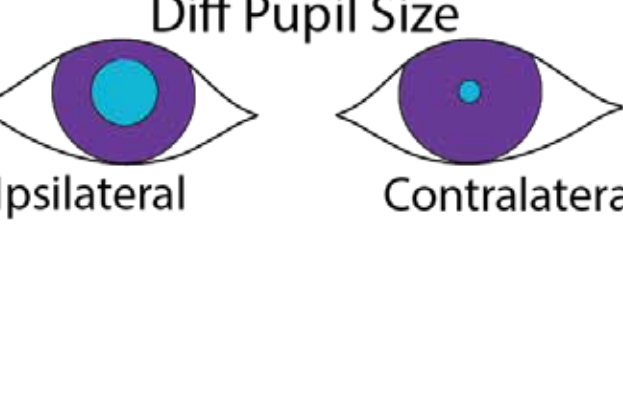


MEASUREMENTS

**MLS** – Maximum distance from bony midline to septum pellucidum.  
**PGS** – Distance from bony midline to furthest edge of Pineal Gland  
**IA** – Angle between cerebral peduncles  
**IPS** – Max distance from bony midline to midline of cerebral peduncle  
**IMW/CMW** – ratio of length from edge of midbrain to midline of midbrain on the ipsilateral side to the contralateral side

Variability of radiographic measurements was taken between two raters to evaluate measurement reliability of measurements. Average Intraclass Correlation Coefficient was >90%.

ADDITIONAL RESULTS

SUPRATENTORIAL IPH				
Pupil Measure	Rad Measure	Adjustment	!"	p
 Diff NPI Ipsilateral   Contralateral	MLS	Age	-0.0045	0.907
		Lesion Volume	-0.0142	0.719
	PGS	Age	0.0203	0.738
		Lesion Volume	0.0011	0.987
	IPS	Age	-0.0199	0.826
		Lesion Volume	-0.0099	0.918
 Diff Pupil Size Ipsilateral   Contralateral	IA	Age	0.0096	0.266
		Lesion Volume	0.0093	0.268
	IMW/CMW	Age	0.1713	0.839
		Lesion Volume	0.2929	0.723
	MLS	Age	0.0325	0.378
		Lesion Volume	0.0345	0.373
	PGS	Age	0.0434	0.462
		Lesion Volume	0.0469	0.476
	IPS	Age	0.0424	0.627
		Lesion Volume	0.0385	0.684
	IA	Age	0.0004	0.963
		Lesion Volume	0.0007	0.934
	IMW/CMW	Age	1.2625	0.101
		Lesion Volume	1.3351	0.081

(A) MLS- Midline Shift; (B) PGS – Pineal Gland Shift; (C) IA- Interpeduncular Angle; IPS – Interpeduncular Shift; (D) IMW/CMW– ratio between Ipsilateral Midbrain Width and Contralateral Midbrain Width.!

