

Quantitative evaluation of pupil light reflex in isolated oculomotor nerve palsy using an indigenous dynamic pupillometry - Case report of a rare disease

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Abstract:

Oculomotor nerve palsy is an isolated nerve injury that affects the pupillary muscles. Though pupil dysfunction is a hallmark of third nerve palsy, clinically evaluated using a pen torch test provides categorical data with huge interpersonal variability. Therefore, a quantitative analysis of pupil light reflex is warranted for objective assessment of pupil size and reaction for better perception. So, the current case report is aimed to evaluate the pupil dynamics in a patient with oculomotor nerve palsy. A 37-year-old male patient was admitted to the hospital with severe orbital pain and headache in the frontotemporal region with ptosis and diplopia. A mild light reflex was observed on both sides using a pen torch test. The patient was subjected to dynamic pupillometry where bilateral pupil light reflex was recorded after 5 minutes of dark stabilization. All PLR variables in both pupils Reflex Latency and duration of constriction as well as dilation were prolonged, whereas constriction amplitude and constriction velocity, dilation amplitude and dilation velocity were reduced significantly. The pupil diameter is small even after light stimulus. The current case report reveals that the patient has unilateral third nerve palsy with compromised PLR variables evaluated using dynamic pupillometry.

Keywords: oculomotor nerve palsy, pupillometry, pupil light reflex

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Introduction:

Oculomotor nerve palsy (ONP) is an uncommon clinical condition manifested with plegia of extraocular muscles as well as ptosis.¹ However, it may or may not be with pupillary dysfunction. The usual etiological factors could be due to

inflammatory, vascular, traumatic, infectious, neoplastic, or iatrogenic in origin.² There were numerous studies reported on PLR in ONP, however, there is limited data available on dynamic variables of PLR using infrared videographic dynamic pupillometry.³⁻⁵ Therefore, the current case report provides the quantitative

analysis of PLR using dynamic pupillometry in ONP which provides new insights into diagnosis and treatment modality.

Case details:

A 37-year-old male was admitted to our hospital with a complaint of severe ocular pain in the right eye and frontotemporal headache for 5 days. He had also complained of ptosis and diplopia. He has been using spectacles but has no history of ocular trauma and allergic to any medication. The patient had been diagnosed with diabetes but had not been on medication for the last 4 years. Extraocular eye movements were restricted.

The case was diagnosed with isolated oculomotor nerve palsy with sparing pupil. CNS examination was normal. The FBS was 143 mg/dl and PPBS was 229mg/dl with urine glycosuria (++) and HbA1C was 8.2%. He had been treated with dexamethasone, IV/4mg/BD, aceclofenac and paracetamol, p/o/TDS, Pantoprazole 40mg/BD, Ondansetron 4mg/TDS, metoprolol syrup 10ml/p/o/TDS and metformin 500mg/BD for 3 days.

Data acquisition:

For dynamic Pupillometry, the patient was subjected to a videographic recording of pupillary light reflex using dynamic Pupillometry in the early morning after being given the basic instructions as per the protocol.⁶ The video was analyzed for static and dynamic variables of PLR, the different parameters of pupillary light reflex are a relative measure of autonomic balance that supplies the pupil.⁷⁻¹⁰

Results:

The video graphic analysis of ONP patient for pupil size has shown a relatively small pupil in both eyes compared to the normative data. The reflex latency was prolonged significantly whereas the rate of constriction and dilation amplitudes in both pupils were negligible as there was little response to the application of light stimulus as shown in Figure no. 1. The static dynamic variables of PLR depicted in Table 1 which are significantly compromised compared with normative data.

Figure 1: Miotic and Mydriatic pupils of the left and right eyes

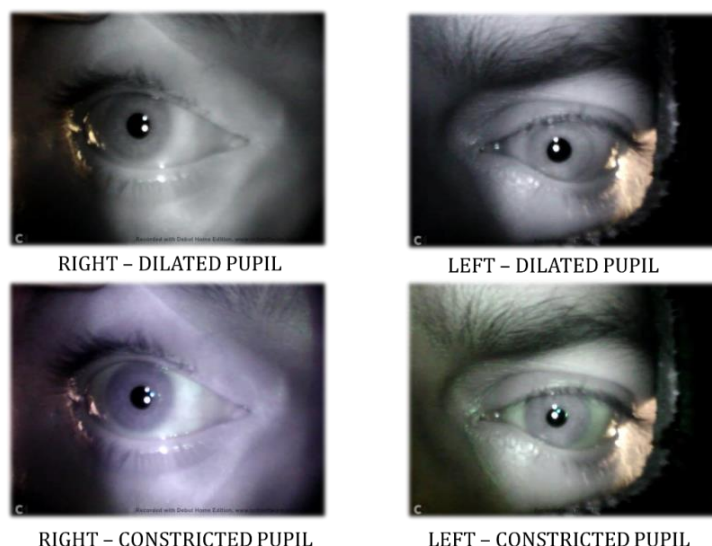


Table 1 : Static and dynamic variables of pupil light reflex obtained using dynamic pupillometry

PLR parameters	Right eye	Left eye	Normal range
Baseline pupil diameter	2.69 mm	2.76 mm	5.9 ± 0.7 mm
Reflex Latency	595 m.sec	428 m.sec	287.5± 26.7 m.sec
Absolute constriction amplitude	0.21 mm	0.59 mm	1.5-3 mm
Duration of constriction	1.3 sec	1.15sec	0.55± 0.35sec
Mean constriction velocity	0.1 mm/sec	0.25 mm/sec	5.88 ± 0.8 mm/sec
Minimum pupil diameter	2.38 mm	2.20 mm	2.3 ± 1.0 mm
Absolute dilation amplitude	0.16 mm	0.25 mm	1.2-2.5 mm
Duration of dilation	4.95 sec	4.62 sec	1.61± 0.82 sec
Recovered pupil diameter	2.54 mm	2.48 mm	4.2±0.4 mm
Mean redilation velocity	0.05 mm/sec	0.06 mm/sec	1.9 ± 0.3 mm/sec

Discussion:

The current case report intends to provide quantitative PLR variables in a patient with ONP which reveals that all static and dynamic variables of PLR were significantly compromised and indicate the severity of affected ONP. Though it is an isolated, unilateral nerve injury, the PLR response was affected on both sides in response to the application of stimulus, which is similar to other reported studies earlier.³⁻⁵

Quantitative PLR is a sophisticated videographic analysis to provide duration, amplitude, and velocity of constriction and dilation of the pupil. It is the first-ever Indian case report, with measurements of PLR variables in ONP using dynamic pupillometry. This is a simple, non-invasive technique that helps to distinguish with and without pupil-sparing third nerve palsy. Dynamic pupillometry provides an objective way to assess pupil responses, reducing potential biases associated with subjective evaluations. This method yields quantitative data, which can be valuable for tracking changes over time and comparing the affected eye's response with that of the unaffected eye. Dynamic pupillometry allows

for monitoring the progression of oculomotor nerve palsy, helping clinicians determine the effectiveness of treatments or rehabilitation strategies.

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Conflict of interest: Nil

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