

University of Kentucky

UKnowledge

Ophthalmology and Visual Science Faculty
Publications

Ophthalmology and Visual Science

8-2019

Commentary: Recognizing Pupillary Dysfunction in Diabetic Autonomic Neuropathy

Padmaja Sudhakar

University of Kentucky, padmaja.sudhakar@uky.edu

Follow this and additional works at: https://uknowledge.uky.edu/ophthalmology_facpub



Part of the [Neurology Commons](#), and the [Ophthalmology Commons](#)

[Right click to open a feedback form in a new tab to let us know how this document benefits you.](#)

Repository Citation

Sudhakar, Padmaja, "Commentary: Recognizing Pupillary Dysfunction in Diabetic Autonomic Neuropathy" (2019). *Ophthalmology and Visual Science Faculty Publications*. 20.

https://uknowledge.uky.edu/ophthalmology_facpub/20

This Commentary is brought to you for free and open access by the Ophthalmology and Visual Science at UKnowledge. It has been accepted for inclusion in Ophthalmology and Visual Science Faculty Publications by an authorized administrator of UKnowledge. For more information, please contact UKnowledge@lsv.uky.edu.

Commentary: Recognizing Pupillary Dysfunction in Diabetic Autonomic Neuropathy

Digital Object Identifier (DOI)

https://doi.org/10.4103/ijo.ijo_794_19

Notes/Citation Information

Published in *Indian Journal of Ophthalmology*, v. 67, issue 8.

© *Indian Journal of Ophthalmology*

The *Indian Journal of Ophthalmology* is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License](#), which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Commentary: Recognizing pupillary dysfunction in diabetic autonomic neuropathy

Diabetes affects several million people across this universe. An early consequence of diabetes is autonomic dysfunction,^[1] which is often subclinical and the most common cause of an autonomic neuropathy in the developed world. Hyperglycemia causes a synaptic ganglionic transmission failure, thus leading to autonomic impairment.^[2]

Autonomic neuropathy can be a serious complication of diabetes mellitus. Unfortunately, it can remain asymptomatic for years. It causes a constellation of symptoms and signs affecting cardiovascular, urogenital, gastrointestinal, pupillomotor, thermoregulatory, and sudomotor systems.

Pupillary abnormalities from autonomic neuropathy are common in diabetes. The deficiency in the sympathetic innervation to the dilator muscles of the iris can cause difficulty in night vision in diabetic patients. Impairment of the parasympathetic control of the sphincter muscles accounts for a diminished reflex response to light. It has been shown that diabetic patients with mild autonomic dysfunction have significantly smaller pupil diameters than healthy controls.^[3] This suggests that pupillary involvement may be an early sign of diabetic autonomic neuropathy.^[4]

Studies have shown that pupillary abnormalities are worse in patients with diabetic autonomic neuropathy compared to patients with nondiabetic autonomic neuropathy.^[5] Preferential ganglionic involvement may explain the higher frequency of pupillary abnormalities in diabetic autonomic neuropathy compared to nondiabetic autonomic neuropathy, independent of the degree of diffuse autonomic failure.

Erectile dysfunction is the chronic inability to attain and maintain enough erection. Besides diabetes, there are several causes for erectile dysfunction such as vascular diseases, obesity, smoking, metabolic syndrome, hyperlipidemia, depression, and medication side effects. Erectile dysfunction appears to be common in diabetes, affecting more than half of men with the condition and with a prevalence odd of approximately 3.5 times more than controls.^[6]

The authors of the article through a prospective study using static and dynamic pupillometry were able to show that pupillary functions were worse in those with both diabetes and erectile dysfunction compared with healthy controls.^[7] Also, they have shown that the pupil was more miotic in those with severe erectile dysfunction than in those with mild or moderate erectile dysfunction. There is an important and sensitive message in this. While previous literature has revealed the relation between diabetes and both erectile dysfunction and pupil functions, none had studied the direct relation between erectile dysfunction severity and pupil functions in diabetes.

Pupillary abnormalities have been noted to precede the development of more serious symptoms such as cardiovascular symptoms. By recognizing the pupillary

dysfunction, the ophthalmologist could warn the primary care to look into more serious autonomic dysfunctions such as cardiovascular abnormalities and erectile dysfunction. Some of this could be life-saving. Apparently, it is possible that with longer duration of diabetes and more pupillary miosis, the primary care is likely to see more severe autonomic dysfunction including severe erectile dysfunction. In many circumstances, the patient may not vocalize this issue unless specifically questioned.

There are different tools to study autonomic dysfunction (quantitative sudomotor axon reflex test, heart rate response to deep breathing, tilt-table testing) especially in diabetes. This needs a thorough physical examination. Specific testing is not usually undertaken in the ophthalmology setting. Dynamic pupillometry is a cost-effective screening tool that is noninvasive and relatively easy to perform in the office.^[8] It can be used as an effective autonomic testing tool in the ophthalmology setting.

The authors have recognized that structural changes in the pupillary musculature could contribute to abnormal pupil functions in diabetes. Similarly, structural changes in the penis could play a role in erectile dysfunction in diabetes.

Thus, the article has two important messages. The first is the role that ophthalmologist may play in recognizing diabetic autonomic neuropathy early by identifying pupillary abnormalities. Thus, ophthalmologists should specifically look for pupillary abnormalities just like looking for diabetic retinopathy. Abnormal pupillary findings should be communicated with the primary care physician to address sensitive issues such as erectile dysfunction. The recognition of abnormal pupil examination can be life-saving too as it can lead to evaluation for serious cardiovascular issues.

The second message is that static and dynamic pupillometry could serve as an important autonomic testing tool. The examination of pupillomotor function through such techniques may improve diagnostic accuracy in the autonomic laboratory.

Padmaja Sudhakar

Department of Ophthalmology and Neurology,
University of Kentucky, Lexington, KY, USA

Correspondence to: Dr. Padmaja Sudhakar,
Department of Ophthalmology and Neurology,
University of Kentucky, 740 S Limestone, Lexington,
KY 40536, USA.

E-mail: sudhapaddy@yahoo.com

References

1. Pfeifer MA, Weinberg CR, Cook DL, Reenan A, Halter JB, Ensink JW, *et al.* Autonomic neural dysfunction in recently diagnosed diabetic subjects. *Diabetes Care* 1984;7:447-53.
2. Campanucci V, Krishnaswamy A, Cooper E. Diabetes depresses synaptic transmission in sympathetic ganglia by inactivating nAChRs through a conserved intracellular cysteine residue. *Neuron* 2010;66:827-34.
3. Pittasch D, Lobmann R, Behrens-Baumann W, Lehnert H. Pupil signs of sympathetic autonomic neuropathy in patients with type 1 diabetes. *Diabetes Care* 2002;25:1545-50.

4. Schwingshandl J, Simpson JM, Donaghue K, Bonney MA, Howard NJ, Silink M. Pupillary abnormalities in type I diabetes occurring during adolescence. *Comp Cardiovasc Reflex Diabetes Care* 1993;16:630-3.
5. Yuan D, Spaeth EB, Vernino S, Muppidi S. Disproportionate pupillary involvement in diabetic autonomic neuropathy. *Clin Auton Res* 2014;24:305-9.
6. Kouidrat Y, Pizzol D, Cosco T, Thompson T, Carnaghi M, Bertoldo A, *et al.* High prevalence of erectile dysfunction in diabetes: A systematic review and meta-analysis of 145 studies. *Diabet Med* 2017;34:1185-92.
7. Cankurtaran V, Ozates S, Ozler S. Association of pupil responses with severity of erectile dysfunction in diabetes mellitus. *Indian J Ophthalmol* 2019;67:1314-9.
8. Ferrari GL, Marques JL, Gandhi RA, Heller SR, Schneider FK, Tesfaye S, *et al.* Using dynamic pupillometry as a simple screening tool to detect autonomic neuropathy in patients with diabetes: A pilot study. *Biomed Eng Online* 2010;9:26.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Access this article online	
Quick Response Code:	Website: www.ijo.in
	DOI: 10.4103/ijo.IJO_794_19
Cite this article as: Sudhakar P. Commentary: Recognizing pupillary dysfunction in diabetic autonomic neuropathy. <i>Indian J Ophthalmol</i> 2019;67:1320-1.	