ORIGINAL RESEARCH

Evaluation of Incidence of 6th Nerve Palsy in Diabetics at a Tertiary Care Centre

Reenu Choudhary[1], Ravi Kumar[2]

[1]Assistant Professor, Department of Neurology, Dr S. N. Medical College, Jodhpur, Rajasthan, India
[2]Assistant Professor, Department of Neurology, NIMS University, Jaipur, Rajasthan, India

Corresponding Author
Dr. Ravi Kumar
Assistant Professor, Department of Neurology, NIMS University, Jaipur, Rajasthan, India
Email:dr.ravijakhar23@gmail.com

Received date: 02 February, 2024 Acceptance date: 09 March, 2024

ABSTRACT
Background:Diabetes mellitus (DM) is a disease of inadequate control of blood levels of glucose.This study was conducted to evaluate the incidence of nerve palsy in diabetic patients.**Materials and Methods**: In this study there were total 100 participants out of which 50 subjects had diabetes mellitus and 50 participants were controls. The subjects had been asked to give consent and were informed about the procedure. The subjects who did not want to give consent were excluded from the study while those who gave consent and those who wanted to participate had been included in the study. All the patients were examined for 6th nerve palsy and the incidence of the condition was noted. Statistical analysis had been performed using SPSS software. **Results**: 6th nerve palsy was evident in 12 (24%) patients and was absent in 38 (76%) patients. Mean duration of diabetes mellitus in diabetic patients with and without nerve palsy was 15.3 years and 7.6 years respectively. **Conclusion**: The incidence of 6th nerve palsy in diabetic patients in this study was 24%.
Keywords: Diabetes, Abducens Nerve, Incidence.

INTRODUCTION
The abducens nerve, the sixth cranial nerve (CN VI), is responsible for ipsilateral eye abduction. Dysfunction of the abducens nerve can occur at any point of its transit from the pons to the lateral rectus muscle, resulting in sixth nerve palsy.[1] To understand the causes of this palsy, it is essential to understand the nerve's anatomy as it transverses the brain.

The abducens nerve originates in the pons, near the seventh cranial nerve. It then exits the brainstem and enters the subarachnoid space, following a path along the skull called the clivus. Continuing its journey, the nerve reaches the petrous apex of the temporal bone in the basal skull, where it enters the cavernous sinus.[2]

Within the cavernous sinus, the abducens nerve is positioned medially to the internal carotid artery, while the trigeminal nerve is located laterally. After passing through the cavernous sinus, the abducens nerve enters the orbit via the superior orbital fissure. Once in the orbit, it innervates the lateral rectus muscle responsible for eye abduction.[3-5]When diagnosing a case of sixth nerve palsy, the patient's age plays a critical role in determining the underlying cause and the need for further evaluation, including neurological imaging.[6]

Diabetes mellitus (DM) is a disease of inadequate control of blood levels of glucose. It has many subclassifications, including type 1, type 2, maturity-onset diabetes of the young (MODY), gestational diabetes, neonatal diabetes, and steroid-induced diabetes. Type 1 and 2 DM are the main subtypes, each with different pathophysiology, presentation, and management, but both have a potential for hyperglycemia. This activity outlines the pathophysiology, evaluation, and management of DM and highlights the role of the interprofessional team in managing patients with this condition.[7]This study was conducted to evaluate the incidence of nerve palsy in diabetic patients.

MATERIALS AND METHODS
In this study there were total 100 participants out of which 50 subjects had diabetes mellitus and 50 participants were controls. The subjects had been asked to give consent and were informed about the procedure. The subjects who did not want to give consent were excluded from the study while those who gave consent and those who wanted to participate had been included in the study. All the patients were examined for 6th nerve palsy and the incidence of the

condition was noted. Statistical analysis had been performed using SPSS software.

RESULTS

6th nerve palsy was evident in 12 (24%) patients and was absent in 38 (76%) patients. Mean duration of diabetes mellitus in diabetic patients with and without nerve palsy was 15.3 years and 7.6 years respectively.

Table 1: Incidence of 6th nerve palsy in diabetic patients.

Prevalence	Number of cases	Percentage
Absent	38	76%
Present	12	24%
Total	50	100%

Table 2: Durations of diabetes in subjects with and without nerve palsy.

Groups	Mean duration of diabetes mellitus	p-value
With nerve palsy	15.3 years	0.001 (Significant)
Without nerve palsy	7.6 years	

DISCUSSION

Chronic metabolic disease diabetes mellitus affects millions of people worldwide. These metabolic diseases are characterized by a lack of insulin secretion and/or action, that leads to chronic hyperglycemia as well as abnormalities in carbohydrate, lipid, as well as protein metabolism. Over time, diabetes can damage several systems, including the eyes, kidneys, nerves, heart, as well as blood vessels. When describing diabetes in a few words, the phrase "Metabolic cum Vascular disorder" comes to mind.[8]

Diabetic ketoacidosis, hypoglycemia, as well as non-ketotic hyperosmolar diabetic coma are acute complications of diabetes, in comparison to retinopathy, neuropathy, nephropathy, atherosclerosis, hypertension, as well as peripheral vascular diseases, that are chronic manifestations of diabetes. A new set of diagnostic and categorization criteria has been lately presented by a team of experts from the American Diabetes Association as well as the World Health Organization.[8,9] Insulin-dependent as well as non-insulin-dependent diabetes mellitus (IDDM and NIDDM, respectively) are obsolete terminologies.This study was conducted to assess the incidence of nerve palsy in diabetic patients.

6th nerve palsy was evident in 12 (24%) patients and was absent in 38 (76%) patients.Mean duration of diabetes mellitus in diabetic patients with and without nerve palsy was 15.3 years and 7.6 years respectively. Watanabe K et al[10]studies the incidence of palsy in the third, sixth and seventh cranial nerves with regard to central nervous system involvement in diabetic patients. Among 1961 diabetic patients, 19 (0.97%) demonstrated cranial nerve palsies. Nine out of these 19 patients showed facial palsy; 6 palsy of the oculomotor nerve; 2 palsy of the abducent nerve; and 3 both oculomotor and abducent nerve palsies. In contrast, only 5 out of 3841 non-diabetic patients (0.13%) had any cranial nerve palsies; all 5 were cases of facial palsy. The incidence of cranial palsies in diabetic patients was significantly higher than that in non-diabetic patients (P less than 0.01). Concerning age, sex, the state of glycemic control, diabetic complications and method of treatment, there were no differences disclosed in the diabetic patients with cranial nerve palsy. The incidences of diabetic complications were compared between the patients with facial palsy and those with ophthalmoplegia. Only one out of 9 patients with facial palsy (11%) had diabetic complications, whereas 7 out of 10 patients with ophthalmoplegia (70%) demonstrated diabetic complications and the difference was significant. Thus, ophthalmoplegia appears to be more closely related to diabetic metabolism while facial palsy is less strongly correlated with diabetes.Patel SV et al (2005)[11] conducted a population-based case-control study to determine the presence and magnitude of any association of preexisting diabetes mellitus and systemic hypertension with isolated sixth nerve palsy.Participants were patients with new onset of neurologically isolated sixth nerve palsy or paresis (n = 76) in Olmsted County, Minnesota, from January 1, 1978, to December 31, 1992. Controls (n = 76) were selected from the same general population and were matched for age, gender, and length of medical follow-up.Using the Rochester Epidemiology Project medical records linkage system, which captures virtually all medical care provided to residents of Olmsted County, Minnesota, they identified all incident cases of neurologically isolated sixth nerve palsy/paresis (n = 76) among county residents between the given dates. An equal number (n = 76) of controls were randomly selected from the general population. They reviewed the entire medical record of each case and control, using stringent predetermined criteria to define the presence of diabetes mellitus and systemic hypertension. They compared the prevalence of diabetes and systemic hypertension between cases and controls by use of chi-square tests, and they calculated odds ratios (OR) with 95% confidence intervals (CI).Diabetes mellitus occurred more frequently in cases (23.7%) than in controls (5.3%; P = 0.001; OR, 5.59; 95% CI, 1.79-17.42). Systemic hypertension occurred with similar frequency in cases (51.3%) and controls (39.5%; P =

0.14; OR, 1.62; 95% CI, 0.85-3.08). Coexistent diabetes mellitus and hypertension were more common in cases (18.4%) than in controls (2.6%; P = 0.002; OR, 8.36; 95% CI, 1.83-38.18). They concluded that there is a 6-fold increase in odds of having diabetes in cases of sixth nerve palsy over controls, whereas systemic hypertension does not seem to be associated with increased odds. In contrast, there is 8-fold increased odds of having coexistent diabetes and hypertension in cases of sixth nerve palsy over controls. The much-cited association of systemic hypertension alone with sixth nerve palsy may be coincidental.

CONCLUSION

Diabetes is a condition associated with significant amount of morbidity. The incidence of 6th nerve palsy in diabetic patients in this study was 24%.

REFERENCES

1. Nguyen V, Reddy V, Varacallo M. StatPearls [Internet]. StatPearls Publishing; Treasure Island (FL): Nov 21, 2022. Neuroanatomy, Cranial Nerve 6 (Abducens).
2. Azarmina M, Azarmina H. The six syndromes of the sixth cranial nerve. J Ophthalmic Vis Res. 2013 Apr;8(2):160-71.
3. Parr M, Carminucci A, Al-Mufti F, Roychowdhury S, Gupta G. Isolated Abducens Nerve Palsy Associated with Ruptured Posterior Inferior Cerebellar Artery Aneurysm: Rare Neurologic Finding. World Neurosurg. 2019 Jan;121:97-99.
4. Ibekwe E, Horsley NB, Jiang L, Achenjang NS, Anudu A, Akhtar Z, Chornenka KG, Monohan GP, Chornenkyy YG. Abducens Nerve Palsy as Initial Presentation of Multiple Myeloma and Intracranial Plasmacytoma. J Clin Med. 2018 Sep 03;7(9).
5. Khan Z, Bollu PC. StatPearls [Internet]. StatPearls Publishing; Treasure Island (FL): Apr 10, 2023. Horner Syndrome.
6. Nair AG, Ambika S, Noronha VO, Gandhi RA. The diagnostic yield of neuroimaging in sixth nerve palsy--Sankara Nethralaya Abducens Palsy Study (SNAPS): Report 1. Indian J Ophthalmol. 2014 Oct;62(10):1008-12.
7. Sapra A, Bhandari P. Diabetes. [Updated 2023 Jun 21]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing.
8. Standards of medical care in diabetes-2016: Summary of revisions. Diabetes Care. 2016;39(Suppl 1):S4–5.
9. Orasanu G, Plutzky J. The pathologic continuum of diabetic vascular disease. J Am Coll Cardiol. 2009;53(5 Suppl):S35–42.
10. Watanabe K, Hagura R, Akanuma Y, Takasu T, Kajinuma H, Kuzuya N, Irie M. Characteristics of cranial nerve palsies in diabetic patients. Diabetes Res Clin Pract. 1990 Aug-Sep;10(1):19-27.
11. Patel SV, Holmes JM, Hodge DO, Burke JP. Diabetes and hypertension in isolated sixth nerve palsy: a population-based study. Ophthalmology. 2005 May;112(5):760-3.