Editorial

Otorhinolaryngological Studies in Diabetics

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Abstract

A total of 50 patients with diabetes mellitus were the subject matter of this study. Of these, 13 patients had diabetic neuropathy on clinical evaluation. Amongst the group of patients without diabetic neuropathy, 64.86% had sensorineural hearing loss and 21.6% patients had conductive deafness as compared to patients with diabetic neuropathy having sensorineural hearing loss in 69.2% and conductive deafness in 23% cases. The hearing threshold were found to be within normal limits in diabetics with or without neuropathy at lower frequencies but it was significantly increased at higher frequencies (4000 Hz and 8000 Hz) in patients with diabetic neuropathy when compared with diabetic patients without neuropathy. The hearing threshold were increased at higher frequencies in uncontrolled diabetics. This was significant when compared with diabetics with normal fasting plasma glucose. The values of these tests as diagnostic and prognostic tools presently remains of no avail. However, it is hoped that with better precision and sophistication they may be utilised to detect finer sensorineural loss in diabetics, much before the development of long term complication inflicting the nervous system. This study also underlies the importance of looking for the hearing defects in diabetics which may be insignificant to the patient in face of apprehension for the disease itself.

Diabetes mellitus is a chronic metabolic disorder causing considerable morbidity and mortality. However, it is evident that good control and regular surveillance for complications enables the patients to lead lives

approaching normal expectations. It is general belief that an organ or tissue before showing any organic changes loses its functional activity and therefore it is presumed that the functional loss almost always precedes the organic tissue damage. This observation has been implicated

in diagnosing some of the body ailments with many sophisticated electro diagnostic procedures (Evoked Response Audiometry is currently in use to predict or confirm the functional loss of of neuro-otological element). The highly involved senses like auditory functions are often tested by simple method in the disorder of ear. Extensive investigations were carried out to evaluate auditory functions in inner ear disorders as well as in certain neurological conditions. However, there are stray reports on hearing in systemic diseases like diabetes (Jorgenson, 1961 and Axelsson, 1968).

The peripheral neuropathy associated with diabetes mellitus is responsible for myriad syndromes. When autonomic nerves are involved such diverse abnormalities as postural hypotension may result. Progressive somatic neuritis affects principally sensory fibres and may lead to neuro-osteoarthropathy and marked incoordination of the hands. It is reasonable to presume that such audiquitious lesion might involve sensory element of cranial nerve in insidious manner. Patients with diabetes mellitus develop the long term complications involving the micro and the macro vasculature. Diabetic neuropathy is important complication of metabolic and vascular etiology. Various nerve function studies in patients with diabetes mellitus are available in the literature describing subclinical and clinical stages of the neuropathy.

Material and Methods

The present study was undertaken on the patients who attended the Endocrinology and E.N.T. outpatients of S.S. Hospital, Institute of Medical Sciences, Banaras Hindu University, Varanasi.

Otorhinolaryngological functions were investigated in 50 cases of diabetes (37 cases of diabetes without neuropathy-Group A; 13 cases of diabetes with neuropathy-Group B). These cases were selected from diabetic clinic of the Endocrinology Section of the Department of Medicine, Sir Sunder Lal Hospital, Banaras Hindu University, Varanasi. The criteria for selection of the patients was as follows :

1. Diagnosis of diabetes mellitus was confirmed by the standard oral G.T.T.
2. Cases receiving anti-diabetic treatment and on the roll of diabetic clinic showing even a normal range of blood sugar.
3. No history of congenital deafness in family.
4. No history of head injury and intake of oto-toxic drugs.

In all the cases a detailed history was taken and a thorough physical, systemic and Otorhinolaryngological examinations were done. The neurological examination was meticulously done to find out evidence of peripheral neuropathy. Then all of these examinations were recorded. In diabetes mellitus, history of duration of diabetes, type of

Table-1
Age & Sex Distribution of Diabetic Patients

Sl. No.	Age Range (Years)	Patient with Diabetes			
		Male	Female	Total	%
1.	20 - 35	3	1	4	8.00
2.	36 - 50	15	6	21	42.0
3.	51 - 65	17	3	20	40.0
4.	66 - 80	5	-	5	10.0
Total		40	10	50	100.00
Mean = 50.76 $\pm$ SD = 11. 78908					

Table II
Distribution of Disease with Complication

Sl. No.	Male		Female			
	No.	%	No.	%	Total	%
1. Freshly detected NIDDM	22	88.0	3	12.0	25	50.0
2. NIDDM with Neuropathy	10	77.0	3	13.0	13	26.0
3. NIDDM with other complication	7	70.0	3	30.0	10	20.0
4. Young Diabetic	2	100.00	-	-	2	4.0
Total	41		9		50	100.0

Table III
Duration and Complication Profile

Sl. No.	Duration of Diabetes	Diabetes Without Neuropathy (GPA)	%	Diabetic with Neuropathy (GPS)	%
1.	1-5 Years	19	51.35	2	15.38
2.	6-10 Years	11	29.73	5	38.46
3.	6-15 Years	7	18.19	6	46.15
Total		37		13	
Mean Years - 6.28			± S. D. (GPA)	= 2.37230	
Mean Years = 9.3076			± S. D. (GPB)	= 3.388	

treatment, regularity of treatment and result of specific investigations (Fasting and Post-prandial blood sugar) were particularly noted down. In all cases a thorough neurological check up was done. The patients were thoroughly interrogated and examined in detail for any specific disorder of the external, middle and inner ear. All the hearing tests were done in the Department of Otorhinolaryngology.

Observations

The total number of patients studied was fifty. In group 'A' 37 patients (Male 31, Female 6) with diabetes mellitus and in group 'B', 13 patients (Male 10, Female 3) with clinical evidence of diabetic neuropathy were included. The age

range of all these cases was between 20-80 years (Mean age 50.76 ± 11.7 years). The majority of the patients (82%) were in the age range of 36-65 years (Table 1).

The duration of the diabetes mellitus after detection ranged between 1-15 years. Patients in group 'B' and group 'A' had mean duration of the disease 9.30 ± 3.38 years and 6.28 ± 2.37 years respectively (Table III). The neuropathy was commonly seen in patients with longer duration of diabetes mellitus.

The clinical evaluation revealed that both types of deafness i.e. sensorineural and conductive are common in patients with diabetes mellitus. Sensorineural deficit was

Table IV
Range, Mean ($\pm$ S. D.) Value of Hearing Threshold in decibel (dB) at Different
Frequencies in Diabetic with and without Neuropathy

	250	500	1000	2000	4000	8000
Group A						
Diabetic without Neuropathy						
Range	15-20	20-60	20-60	20-60	30-80	30-85
Mean	29.05	34.594	36.622	30.081	44.459	49.865
$\pm$ S. D.	8.963	8.927	9.133	9.511	11.413	12.443
Group B						
Diabetic with Neuropathy						
Range	20-40	25-55	30-45	30-50	25-55	35-55
Mean	31.154	36.923	37.308	39.615	36.538	43.846
$\pm$ S. D.	6.504	8.789	5.250	6.279	9.216	7.183
t. Value	0.9023	0.8185	0.3279	1.5099	2.498	2.1074
P Value	7 0.3	7 0.3	7 0.5	7 0.2	$< 0.05^*$	$< 0.05^*$

more frequent than conductive deafness in this disease. The sensorineural deficit was found in 69% and 64% of the diabetics with (Group B) and without (Group A) neuropathy respectively. The conductive deafness was observed in 23% of the cases in group B and 21.6% in group A. Remaining patients had no abnormality of hearing. The pure tone audiometry showed that there is significant decrease in intensity of sound perceived in group B patients at higher frequency as compared to the patients of group A.

The audiogram in the two groups showed that there is loss of hearing intensity in group B at 4000 Hz and 8000 Hz frequencies. The difference in the loss of hearing intensity in the two groups was significant ($P 0.05$) only at higher frequencies (i. e. 4000 Hz and 8000 Hz). However, that pattern of audiogram in diabetic subjects was suggestive of sensorineural deficit. There was significant sensorineural deficit in patients with abnormal fasting plasma glucose (140 mg%). The sensorineural deficit was more obvious at higher frequencies in patients with increased fasting plasma glucose.

Discussion

The study entitled 'Otorhinolaryngological studies in diabetics' was undertaken in the Departments of Otolaryngology and Endocrinology, Institute of Medical Sciences, Banaras Hindu University, Varanasi as there is hardly any work reported in the literature on this problem.

Diabetic neuropathy is an important complication of metabolic and vascular etiology. Neurologic disorders represent important practical and theoretical facets of diabetes mellitus. From a practical stand point, they are a common source of morbidity in diabetes. Severe pain, distressing visceral symptoms, paralysis and invalidism may be suffered by the diabetic patient. From a theoretical stand point, diabetic neurological disorders must be accounted for in any discussion of the nature and pathogenesis of diabetes mellitus. Though central nervous system is affected in long standing diabetes (Colby et al., 1965) but the peripheral nerve involvement is most common

clinical problem. Various classifications of peripheral neuropathy have been proposed based on anatomical and functional characteristics. The cranial nerve involvement as a consequence of metabolic and structural abnormality in diabetics has been described. It is speculative to consider the possibility of involvement of nerve and end organ of hearing. Sensorineural hearing loss has been reported in many clinical studies. Acoustic neuritis similar to peripheral neuropathy is a likely possibility (Wittmack, 1908).

In addition to the nerve involvement, end organ of acoustic nerve, the cochlea, a complex structure may also be affected by the long term metabolic and structural changes occurring in diabetics. Ischaemia due to endarteritis (Edger, 1915; Jannulis, 1936), angiopathy (Roseer et al., 1971) and disturbances of glucose metabolism have been implicated in the causation of sensorineural loss of hearing. The conductive deafness due to the infection of the middle ear as a result of decreased immunity is also very common in diabetic subjects (Cody, 1964). Our study suggests that the incidence of conductive deafness was a common feature in diabetic patients. 23% of the cases had abnormality of conductive deafness. However, none of these patients presented with suppuration of middle ear, neither they remembered the middle ear disease in past.

Sensorineural deafness was also very common in diabetics. Pure tone audiometry has clearly demonstrated that there was significant loss of intensity of sound perceived at higher frequency (4000 and 8000 Hz in patients with diabetic neuropathy. Nevertheless, the audiogram was similar in the two groups of patients with and without diabetic neuropathy. The most interesting observation was that both conductive and perceptive deafness in diabetic subjects were dependent on duration of diabetes mellitus. A significant correlation was also established between hyperglycemia and hearing impairment. The hearing abnormality was more

obvious at higher frequencies when tested by audiometry. It was similar to the earlier reports (Nagoshi et al., 1970, Podoshin and Fradis, 1975).

A distinct correlation between stria changes and late diabetic complication like neuropathy has been suggested in earlier study (Jorgensen, 1961)). A relationship between diabetes and sensorineural hearing loss was first reported by Jurdo in 1857. Taylor and Irwin (1978) reported that the diabetics have hearing impairment at the lower frequency only. Our observation was different in this respect as the loss of hearing intensity was more obvious at 4-8 KHz of frequency.

Friedman and Schuiman (1975) studied 20 diabetic patients with peripheral neuropathy, 55% had a symmetrical hearing loss of the sensorineural type involving at least one frequency, although none gave a history of hearing loss of ear disease. They reported that the hearing impairment was similar at lower and higher frequencies. Where as seegar (1983) found no statistically significant differences in auditory function between insulin dependent diabetes and normal controls, between the diabetics in good or poor control, or between diabetics with or without neurological or vascular complications. Brainstem responses also showed no difference between the two groups. However, Piras (1985) have reported a series of 30 diabetics of whom 27 were insulin dependent. Eight of the total group showed vascular lesion inherent to diabetics. They carried out auditory and vestibular studies both on diabetic group and a similar number of normal controls and found that the influence of the disease was almost non-existent and the cochleovestibular response was similar in both groups. Gibbin and Davis (1981) investigated 50 diabetic subjects, 22 of whom were insulin dependent, the remainder being managed by other regimens and 50 control subjects. No significant difference were found between the groups on pure tone audiometry.

However, our observations are different from these authors. This study could establish that both conductive and sensorineural deafness were commonly associated in diabetics especially of longer duration. There was a significant impairment of hearing in diabetics with neuropathy. Interestingly, majority of these patients were not aware of the hearing defect.

It could be due to a minor subtle change occurring in the organ of hearing. However, this underlies the importance of conducting research in diabetic subjects for more objective evidence of early nervous system involvement in diabetics. It may help in evaluation of the role of tight control of hyperglycemia and intervention trials.

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Congratulation !

Prof. PILLO, P. HAKIM was invited by Royal national Ear Nose & Throat Hospital, Grays Inn Road, U. K. to deliver lectures and operate upon few interesting cases in March '98 may

We pray for her good health and prosperity.