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Original article

Study of electrophysiological findings in Guillain-Barre Syndrome

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Abstract:

Background: Guillain-Barre Syndrome **(**GBS) is an auto-immune mediated disease of peripheral nerves i.e. acute inflammatory demyelinating polyneuropathy (AIDP). [1] Electrophysiological findings help in early detection, diagnosis, classification of different subtypes of the disease and confirmation that disease is a peripheral neuropathy. Our aim was to analyze the electrophysiological abnormalities in GBS patients referred for nerve conduction velocity & electromyography (NCV & EMG) studies in last 7 years retrospectively.

Methodology: NCV study carried out earlier, we analyzed findings. Number of patients & % of total was calculated. Mean age of patients was 24 years. Maximum number of patients were below 30 years (67.01%). Male to female ratio was 1.93:1.

Results: F-wave was absent/prolonged in upper limb nerves of 82.41% patients & absent/prolonged in lower limb nerves of 93.4 patients. Motor conduction velocity was reduced in 58.24% patients of upper limb nerves & in 50.54% patients of lower limb nerves. These findings suggest more of AIDP type of neuropathy which is commonest type as noted by various earlier studies. Analysis of sensory nerve conduction showed that out of 91 patients, 41.75% having abnormal Sensory Nerve Action Potential (SNAP) amplitude in upper limb nerves & 58.24% with normal SNAP. 31.86% had abnormal SNAP amplitude in lower limb nerves & 71.42% with normal SNAP.

Conclusion: Early diagnosis and timely done intervention are important factors in outcome of GBS, the NCV study can help in reducing the morbidity and mortality after the illness.

Key words: Guillain-Baree syndrome Electro diagnostic study Earlier NCV findings

Introduction:

Guillain-Barre Syndrome **(**GBS) is an auto-immune mediated disease of peripheral nerves, in which there is demyelination of nerves also described as acute inflammatory demyelinating polyneuropathy (AIDP). [1] Its incidence is about 1-2 cases per 100,000 population.[2] Prevalence may vary in different regions. [3] Though clinical and laboratory findings are important in diagnosis, electrophysiological findings help in early detection, diagnosis, classification of different subtypes of the disease and confirmation that disease is a peripheral

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neuropathy.[4,5,6] It presents as progressive, symmetrical ascending muscle weakness of more than two limbs, absence of reflexes with or without sensory, autonomic, brainstem abnormalities. Leg muscles are affected more commonly than arms. Fever is generally absent at onset of neural symptoms. Cranial nerves may be affected with additional symptoms related to airway, facial & eye movements and swallowing.[7] Early NCV findings include abnormal or absent F waves, low CMAP amplitude, slowing of conduction.[4,8,9] As early diagnosis results in good outcome after treatment, we planned to analyze retrospectively the NCV findings in GBS patients referred to Physiology department for NCV & EMG studies in last 7 years. This might help clinicians for timely intervention for betterment of patients.

Material & Methods:

All the patients clinically diagnosed of GBS and referred from tertiary care hospital in Western Maharashtra and outside hospitals in the town were included in present study. Their NCV findings were analysed retrospectively. Those with history of diabetes mellitus, endocrine disorder, and any other neurological disorder were excluded. Total 91 patients were included who were referred for NCV study during last seven years (2013-2019). The NCV study was carried by using Clarity make machine & software named Octopus (Bio Medical Systems, Pune, India). The standard procedure for recording NCV studies was followed as described in book by Misra & Kalita. [10] Approval from Institutional Ethical Committee (IEC) was taken prior to beginning of study. Detail history regarding present illness was recorded. In 11 patients preceding illness like fever, diarrhea was present before neurological symptoms appeared. Cranial nerve involvement was there in three patients. The NCV findings studied were motor and sensory conduction velocities (MCV & SCV), distal motor latencies (DML), distal sensory latencies (DSL), amplitudes of compound muscle action potential (CMAP) and sensory nerve action potential (SNAP), F-wave studies. Each finding was co-related to duration of onset of neural symptoms.

Results:

We analysed 91 patients referred for NCV/EMG to physiology department during last seven years. Age wise distribution is depicted in Table 1. Out of 91 patients 29 were below 10 years(31.86 %), 16 were between 11-20 years(17.58 %), 16 were between 21-30 years(17.58%),10 were between 31-40(10.98 %), 15 were between 41-50(16.48%), 1 was between 51-60(1.09%) & 4 were above 60 years(4.39 %). Male patients were 60 (65.93%) and females were 31(34.06%).

Table 2 shows the period between onset of symptoms and referral for NCV studies. The duration between onset of symptoms & NCV study was 1-4 days in 56 patients (61.53%), 5-6 days in 15 patients (16.48%), 7-9 days in 9 patients (9.89%), 10-14 days in 4 patients (4.39), 15-20 days in 4 patients (4.30%) and > 20 days in 3 patients (3.29%). So maximum patients, 71 out of total 91(78.02%) were referred for NCV studies in first week of illness.

Electrophysiological findings about F-wave are shown in Table 3**.** F-wave was absent/prolonged in upper limb nerves (Median & Ulnar) of 75 patients (82.41%) & absent/prolonged in lower limb nerves (Peroneal & Tibial) of 85 patients (93.4%). F- Wave was normal in upper limb nerves of 16 patients (17.59%) & in lower limb nerves of 6 patients (6.6%).

Table 4 depicts the findings of motor nerve conduction. Motor conduction velocity was reduced

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in 53 patients (58.24%) of upper limb nerves & in 46 patients (50.54%) of lower limb nerves. Amplitude of CMAP was reduced in 17 patients (18.68%) of upper limb nerves & in 21 patients (23.07%) of lower limb nerves. In 14 patients (15.38%) amplitude of CMAP & motor conduction velocity both were reduced of upper limb nerves & in 13 patients(14.28%) of lower limb nerves. Motor conduction was normal in 7 patients (7.69%) of upper limb nerves & in 11 patients (12.08%) of lower limb nerves.

From table 5 it is observed that comparatively sensory conduction study was normal in majority of patients; 53 in upper limb nerves (58.24%) & 62 in lower limb nerves (68.13%). And abnormal SNAP amplitude (absent/reduction) was comparatively less 38 patients in upper limb nerves (41.75%) & 29 patients in lower limb nerves (31.86%).

Distal motor latency was prolonged in 33 patients (36.26%) of upper limb nerves and in 53 patients (58.24%) of lower limb nerves. Distal sensory latency was prolonged in 14 patients (15.38%) of upper limb nerves and in 32 patients (35.16%) of lower limb nerves.

Table1: Age of patients of GBS referred for NCV

Age(years)	Male (60)	Female (31)	Number of patients (91)	% of total
< 10	18	11	29	31.86
11-20	12	04	16	17.58
21-30	11	05	16	17.58
31-40	08	02	10	10.98
41- 50	07	08	15	16.48
51-60	Nil	01	01	1.09
>60	04	Nil	04	4.39

GBS: Guillain -Baree syndrome; NCV: Nerve conduction velocity

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Table 2 : Duration between onset of symptoms & NCV study

Duration(days)	No. of patients	% of total
1-4	56	61.53
5-6	15	16.48
7-9	09	09.89
10-14	04	04.39
15-20	04	04.39
>20	03	03.29

NCV: Nerve conduction velocity

Table 3: F-wave findings in GBS patients

F-wave	Upper limb	% of total	Lower limb	% of total
Absent/ Prolonged	75	82.41	85	93.40
Normal	16	17.59	06	6.60

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Table 4 : Motor nerve conduction findings in GBS patients

NCV Finding	Upper limb		Lower limb	
	Number of patients	%	Number of patients	%
↓ Motor conduction Velocity	53	58.24	46	50.54
↓ CMAP amplitude	17	18.68	21	23.07
↓ Motor conduction Velocity& ↓ CMAP amplitude	14	15.38	13	14.28
Normal motor conduction	07	7.69	11	12.08

CMAP: Compound muscle action potential

Table 5: Sensory nerve conduction findings in GBS patients

Limb	Amplitude of SNAP			Sensory conduction velocity		
		Number of patients	% of total		Number of patients	% of total
Upper limb	Absent/ Reduced	38	41.75	Absent/ Reduced	26	28.57
	Normal	53	58.24	Normal	65	71.42
Lower limb	Absent/ Reduced	29	31.86	Absent/ Reduced	18	19.78
	Normal	62	68.13	Normal	73	80.21

SNAP: Sensory nerves action potential

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Discussion:

As noted by various earlier studies,[11-17] GBS can occur at any age. In the present study age of patients varied from 1 year to 65 years. Mean age of patients with GBS was 24 years which was similar to study of Kalita J et al.(25 years) in Lucknow, India. [18] Maximum number of patients (61) were below 30 years (67.01%). Though GBS can affect any gender males are predominantly affected. [16,19] In our study also we found that males were more affected than females. Out of total 91 patients 60(65.93%) were males & 31 were females(34.06%).Male to female ratio was 1.93:1. In a study from Italy this was 1.88:1,[20] and in a study from India this was 1.5:1, [21] 2.4:1 in another study. [22] Out of 91 GBS patients 61(67%) cases were reported between August to February & remaining 30 cases (33%) from March to July. The reason for seasonal variation in incidence of GBS needs to be answered. In a retrospective study by Rajendra Singh Jain et al. [23] seasonal preponderance in winter and summer was found. In another study maximum cases of GBS were notified from February to July. [22]

We analyzed the findings of NCV study of GBS patients. The presenting symptom was weakness in lower limbs in 88 cases(96.7%). Out of these 74 patients(81.31%) developed ascending paralysis with involvement of upper limbs also. Only 3 patients (3.29 %) presented with weakness in Upper limbs alone. One of the Indian study also had found ascending paralysis in 97.5% patients. [20] Electrophysiological examination (NCV study) was done from 4 to 32 days of illness in some of the previous studies. [10,19,23] To carry out electro diagnostic study right from the first day of disease is helpful diagnosis of the disease. [24] Delanoe and others also have expressed similar view in their study. [19] In the present study 80 out of 91 patients (87.91%) underwent electro diagnostic study in the first 10 days of illness.

GBS can be divided in three subtypes which can be differentiated by NCV findings; [25] acute inflammatory demyelinating polyneuropathy (AIDP), acute motor axonal neuropathy (AMAN), & acute motor sensory axonal neuropathy (AMSAN). AIDP is the most common form of GBS in developed countries. Demyelinating type of GBS incidence varies considerably in different countries, [19] which may be due to different genetic background and environmental exposure. [24] The commonest finding in AIDP is absent or prolonged F waves. [26,27] In present study the earliest finding was an abnormal of F-wave(prolonged latency/absent) in upper limb of 75 patients(82.41%) and in lower limb of 85 patients(93.4%). Gorden PH also found an abnormal F-wave in 25 out of 31 patients(84%). [27] From Table 4, it was observed that in the present study 53 patients(58.24%) had reduced motor conduction velocity in upper limb, 46 patients(50.54%) had decreased motor conduction velocity in lower limb,17 patients (18.68%) had decreased amplitude of CMAP in upper limb, 21 patients (23.07 %) had decreased amplitude of CMAP in lower limb, 14 patients(15.38%) had both decreased CMAP amplitude & decreased motor conduction velocity in upper limb & 13 patients(14.28%) in lower limb, 7 patients(7.69 %) had normal motor nerve conduction in upper limb & 11 patients(12.08%) had normal motor nerve conduction in lower limb. These findings suggest more of AIDP type of neuropathy which is commonest type as noted by various earlier studies . [11,12,19,28]

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After analysing sensory nerve conduction out of 91 patients(Table5), it was found that 38(41.75%) had abnormal SNAP amplitude(absent response or decreased amplitude) in upper limb nerves & 53(58.24%) with normal SNAP. 29 patients(31.86%) had abnormal SNAP amplitude in lower limb nerves & 65 (71.42%) with normal SNAP. 26 patients(28.57%) had reduced conduction velocity in upper limb & 65(71.42%) with normal velocity.18(19.78%) had reduced conduction velocity in lower limb with 73(80.21%) having normal velocity. These findings suggest that there is comparatively more affection of upper limb nerves(median & ulnar) than that of lower limb(sural) nerves in GBS which correlates with findings of other study. [29]

Conclusion:

The worldwide incidence of Guillain -Barre syndrome has been reported to be 1-2 cases /100,000 population. It is one of the major demyelinating polyneuropathy. AIDP is the predominant type in INDIA as per various studies carried out. If diagnosed early has better prognosis following timely given treatment. NCV studies help in early diagnosis and characterization of the type of inflammatory demyelinating polyradiculopathy during the first week of illness. The earliest findings in NCV of GBS patients are F-wave abnormalities & reduced motor conduction velocity and /or reduced amplitude of CMAP. Thus NCV study can help in reducing the morbidity and mortality after the illness. As early diagnosis and timely done intervention are important factors in outcome of GBS.

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