

# PREDICTION OF RECOVERY IN BELL'S PALSY FROM ELECTROPHYSIOLOGICAL FINDINGS

DR. NITYANANDA KAR<sup>\*</sup>, DR. S.K. BANERJEE<sup>\*\*</sup>

Sixty cases of Bell's Palsy between 8 to 72 years of age, 31 males and 29 females, were subjected to electrodiagnostic study to find out a method in prediction of recovery in Bell's Palsy. Nerve Excitability of facial nerve, Strength-Duration curve of facial muscles and electromyography in facial muscles after 2 weeks of onset of Bell's Palsy are found to be broadly related to the prognosis of recovery. Un-impaired or slightly impaired nerve excitability, normal or slight denervation type of strength-duration curve and complete interference or reduced interference pattern in electromyography indicate complete recovery in almost all cases. Complete loss of nerve excitability, complete denervation type of Strength-Duration curve and single voluntary motor unit potential or discrete activity pattern in Electromyography indicate incomplete recovery in most cases, while absence of voluntary motor unit potential in E.M.G. predicts that complete recovery is not possible. Hence all the three tests are to be done to predict the outcome correctly.

Early prediction of recovery of Bell's Palsy is of paramount importance to alley patient's mental distress, to spare patients with good prognosis, the hazard of unnecessary treatment and also to find out the patients with poor prognosis who may require surgical intervention. Literature also reveals that early clinical findings of Bell's Palsy give limited prognostic information. Moreover, complicated expensive equipments like electrogustometry, electroneurography, Acaoustic impedance audiometer etc. used for prognostication are not readily available in all centres. Hence our aim is to find out a method of prediction of recovery of Bell's Palsy from electrophysiological findings like Nerve

excitability test, strength-duration curve and electromyography, Campbell et al<sup>1</sup> (1962) found diminished excitability of facial nerve, indicating degeneration usually resulted within first 2-3 days of onset of palsy. Adler and Chace<sup>2</sup> found evidence of denervation in strength-duration curve as early as 5th day after onset of facial paralysis. Campbell et al<sup>1</sup>(1962) stated fibrillation potential in E.M.G. indicating denervated muscle fibres were rarely detected before 10 days after onset of palsy. As nerve excitability, strength-duration curve and electromyography are helpful to detect denervation at different stages during the course of Bell's Palsy, it is hoped that prediction will be more accurate.

\* M.B.B.S., D.B.M.S., M.D. (Phys. Med. & Rehab.) Lecturer, Physical Medicine, Burdwan Medical College & Hospital, Burdwan 713 104, W.B. (India).

\*\* M.B.(Cal.), D. Phys. Med; (Eng.). Professor of Physical Medicine, Institute of Child Health, Calcutta, W.B. (India).

## MATERIAL AND METHOD

The study comprises sixty (60) patients of Bell's Palsy attending School of Physical Medicine, I.P.G.M.E. & R, Calcutta. Degree of facial palsy is graded as : Complete Palsy-No detectable facial movement; Moderate Palsy-Noticeable movement with asymmetry at rest and on movement; Mild Palsy-Symmetry at rest and asymmetry on movement. Electrodiagnostic tests like Nerve Excitability, Strength-Duration Curve and Electromyography were performed in every case first after 2 weeks of onset of palsy and repeated after one month. Nerve Excitability Test is carried out by stimulating the facial nerve trunk anterior to tragus with square wave pulses of 0.1 m.sec duration at an interval of 1 sec. The minimum voltage required to produce minimal visible contraction of facial muscles both in normal and affected sides are measured and classified as : (a) Unimpaired - No significant difference between healthy and diseased side; (b) mild impaired - considerable decrease in response to 0.1 m.sec. stimulus; (c) Moderately impaired - No excitability with 0.1 m.sec. stimulus but excitability with 1.0 m.sec. stimulus; (d) Severely impaired - No excitability with either 0.1 m.sec. or 1.0 m.sec. stimulus.

Strength-duration curve is plotted at motor points of facial muscles and classified as : (a) Normal exponential or No denervation type - Gradually increasing intensity of stimulus needed at pulse duration less than 1 m.sec; (b) mild denervation type - Complete curve with a kink and without shift to right; (c) Moderate denervation type - Curve with a kink and partial shift to right; (d) Complete denervation type - Curve is grossly shifted to the right with steep rise before 1 m.sec. and the threshold of stimulation is considerably higher than that of normal. For nerve excitability test and strength-duration curve constant current

electronic stimulator (PLASS-7 Model) machine is used.

Electromyography of facial muscles is performed by Medelec E.M.G. Unit MS 4 Model machine and according to the number of voluntary motor unit potentials in E.M.G., the material is divided into five groups. Those with (1) No voluntary motor unit potential; (2) Single voluntary motor unit potential; (3) Discrete activity pattern; (4) Reduced interference pattern; (5) Complete interference pattern. The recovery is assessed as : (1) Complete recovery - complete restoration of voluntary movement with no asymmetry at rest or on movement and without any associated movement or contracture; (2) Good recovery - incomplete recovery with no paresis but with associated movement; (3) Fair recovery - incomplete recovery with mild paresis and with associated movement; (4) Poor recovery - incomplete recovery with moderate paresis with associated movement and contracture.

## RESULTS

In present study youngest patient is 8 years old and oldest 72 years of age. 31 patients are male and 29 females. Out of 60 patients of Bell's Palsy 15 have mild, 21 have moderate and 24 have complete palsy. The electrodiagnostic findings of these cases at first examination and after one month shown in Table-I.

There are good correlation between clinical evaluation of facial strength and electrodiagnostic tests performed at first examination, shown in Table-II.

Prognosis of these cases according to electrodiagnostic findings at first examination are shown in Table-III.

## DISCUSSION

In our study of 60 patients of Bell's Palsy, 12 cases had unimpaired nerve excitability test of which all (100%) showed complete recovery as in study of Wynnperry and King<sup>3</sup>. 11 cases had slightly impaired nerve excitability of which 10 (90%) had complete and 1 (10%) had fair recovery. Some workers<sup>4,5,6</sup> noted complete recovery in 85 - 90% cases with un-impaired nerve excitability, while May<sup>7</sup> reported complete recovery in 74% cases with unimpaired nerve excitability. In our study 13 cases showed moderately nerve excitability of which 5 (38%) had complete, 2 (15%) cases good and 6 (46%) cases had fair recovery. Some workers<sup>4,5,8</sup> noted complete loss of nerve excitability indicates denervation and full recovery is impossible. Whereas Wynnperry and King<sup>3</sup> concluded full recovery was possible after denervation. Our 24 cases showed complete loss of nerve excitability of which 6 (25%) had complete, 4 (17%) good, 8 (33%) fair and 6 (25%) had no recovery. Hence moderate to complete loss of nerve excitability indicates mostly incomplete recovery though complete recovery is also possible.

Our study revealed 12 cases with normal strength-duration curve and all of them recovered completely. 11 cases revealed slight denervation, 10(91%) of which recovered completely and 1 (9%) had fair recovery. 13 cases revealed moderate denervation of which 5 (38%) complete, 2 (15%) good and 6 (46%) had fair recovery. Remaining 24 cases showed complete denervation of which 6 (25%) complete, 4 (17%) good, 8 (33%) fair and 6 (25%) had no recovery. This shows no or slight denervation indicates almost complete recovery and moderate to complete denervation indicates incomplete recovery barring a few complete recovery. Nearly similar observations were found by Wynnperry and King<sup>3</sup>.

In electromyography, number of voluntary motor unit potentials during maximal effort is broadly related to the final degree of recovery. Complete interference pattern indicated 100% complete recovery. Reduced interference pattern indicated complete recovery in 91% cases and fair recovery in 9% cases. Discrete activity indicated complete recovery in 38.5% cases. Good recovery in 15.5% and fair in 46% cases. Single voluntary motor unit potential in E.M.G. indicated complete recovery in 37.5% cases, good recovery in 19% cases, fair in 31% and poor in 12.5% cases. And no V.M.U.P. in E.M.G. indicated complete recovery in none, good in 12.5% fair in 37.5% and poor in 50% cases. Similar observations were found by other workers.<sup>9,10</sup> Absence of motor unit potential and presence of fibrillation potentials after onset of palsy have been interpreted to indicate incomplete recovery by workers.<sup>11,12,13,14</sup> Conversely, fibrillation potentials were observed in patients who ultimately recovered completely. In our study unimpaired or slightly impaired facial nerve excitability, normal or slight denervation type of strength-duration curve in facial muscles and complete interference or slightly reduced interference pattern in electromyography of facial muscles after 2 weeks of onset of Bell's Palsy indicate complete recovery in most of the cases, while severely impaired nerve excitability, complete denervation type of strength-duration curve and single voluntary motor unit or discrete activity pattern in E.M.G. indicate mostly incomplete recovery and complete recovery in very few cases. No voluntary motor unit potential in E.M.G. of facial muscles predicts no possibility of complete recovery but mostly poor recovery. Hence all three tests, nerve excitability, strength-duration curve and E.M.G., should be done particularly in severe palsy to predict the outcome correctly.

**TABLE-I: Showing results of electrodiagnostic study at first examination compared with findings one month later.**

Electrodiagnostic study		Time of Examination	
		First Examination	One month later
Nerve	Unimpaired	12 (20%)	24 (40%)
	Excitability	Slightly impaired	11 (18%)
Test	Moderately impaired	13 (22%)	6 (10%)
	Severely impaired	24 (40%)	10 (17%)
Strength-	Normal Type	12 (20%)	24 (40%)
	Duration	Slight Denervation	11 (18%)
Curve	Moderate Denervation	13 (22%)	6 (10%)
	Severe Denervation	24 (40%)	10 (17%)
Electro- myography	No V.M.U.P.	8 (13%)	4 (7%)
	Single V.M.U.P.	16 (27%)	6 (10%)
	Discrete Activity	13 (22%)	6 (10%)
	Reduced interference	11 (18%)	20 (33%)
	Complete interference	12 (20%)	24 (40%)

V.M.U.P. = Voluntary Motor Unit Potential.

**TABLE-II: Showing comparison between degree of paresis and electrodiagnostic study at first visit**

Electrodiagnosis at first visit		Degree of paresis at first visit visit		
		Mild Number-15	Moderate Number-21	Complete Number - 24
Nerve Excitability- Test	Unimpaired	12 (80%)	0	0
	Slightly impaired	3 (20%)	8 (38%)	0
	Moderately impaired	0	13 (62%)	0
	Severely impaired	0	0	24 (100%)
Strength- Duration Curve	Normal Type	12 (80%)	0	0
	Slight Denervation	3 (20%)	8 (38%)	0
	Moderate Denervation	0	13 (62%)	0
	Severe Denervation	0	0	24 (100%)
Electro- myography	No V.M.U.P.	0	0	8 (33%)
	Single V.M.U.P.	0	0	16 (67%)
	Discrete Activity	0	13 (62%)	0
	Reduced interference	3 (20%)	8 (38%)	0
	Complete interference	12 (80%)	0	0

V.M.U.P. = Voluntary Motor Unit Potential.

**TABLE - III: Showing prognosis of Bell's Palsy according to electrodiagnostic study at first examination.**

Electrodiagnostic Study		No. of cases	Degree of Recovery			
			Complete	Good	Fair	Poor
Nerve Excitability Test	Unimpaired	12	12 (100%)	0	0	0
	Slightly impaired	11	10 (91%)	0	1 (9%)	0
	Moderately impaired	13	5(38.5%)	2(15.5%)	6(46%)	0
	Severely impaired	24	6(25%)	4(17%)	8(33%)	6(25%)
Strength-Duration Curve	Normal Type	12	12(100%)	0	0	0
	Slight Denervation	11	10(91%)	0	1(9%)	0
	Moderate Denervation	13	5(38.5%)	2(15.5%)	6(46%)	0
	Severe Denervation	24	6 (25%)	4(17%)	8(33%)	6(25%)
Electromyography.	No V.M.U.P.	8	0	1(12.5%)	3(37.5%)	4(50%)
	Single V.M.U.P.	16	6(37.5%)	3(19%)	5(31%)	2(12.5%)
	Discrete Activity	13	5(38.5%)	2(15.5%)	6(46%)	0
	Reduced Interference pattern	11	10 (91%)	0	1(9%)	0
	Complete Interference pattern	12	12 (100%)	0	0	0

V.M.U.P. = Voluntary Motor Unit Potential.

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