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Effectiveness of Electrical Stimulation and Rood's Facilitatory Techniques on Muscle Strength in Gbs: A Case Series

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Abstract:
Guillain-Barre Syndrome (GBS) is an acute, immune mediated disorder of the peripheral nervous system that can lead to a rapid onset of muscle weakness, sensory deficits, and functional disability. Physiotherapy plays a crucial role in improving recovery and reducing long term complications, but evidence on its impact in acute phases remains limited. This case series describes the clinical presentation of three GBS patients and to evaluate the effects of physiotherapy interventions like Electrical stimulation and Rood's facilitatory techniques on muscle strength and there by improving the fatigue and quality of life. Standardized outcome measures, including Manual muscle testing (MMT), Fatigue severity scale (FSS), Tendon reflex grading, Northwick park index of independence (NPI) are used in this case series. Physiotherapy interventions are individualized in terms of bronchial hygiene techniques, sensory re-education (Rood's facilitatory techniques), cryotherapy, electrical stimulation, progressive strengthening, coordination training, ADL training and emotional support. Outcomes were reassessed after completion of the physiotherapy program. Sensations were diminished prior to treatment and showed marked improvement following intervention. Muscle tone was hypotonic prior to treatment and returned to normal following the physiotherapy intervention Muscle strength increased by 20% in case 1 and case 3, increased by 40% in case 2. Reflexes were improved to 100% in case 1 and case 2 and 50% in case 3 making all the cases have normal reflexes. Fatigue severity scale [FSS] improved by 46% in case 1, 42% in case 2, 41% in case 3.Northwick park index of independence scale improved by 67% in case 1, 64% in case 2 and 88% in case 3.

Keywords: Guillain-Barre syndrome, Physiotherapy, Rehabilitation, Electrical stimulation, Rood's facilitatory techniques, fatigue, functional recovery.

INTRODUCTION:

The Guillain-Barre Syndrome (GBS) is an immune mediated disorder of peripheral nervous system of acute and sub-acute onset. It is most commonly characterized by combination of generalized weakness paresthesia's of limbs, and areflexias.[1]One third of the patients require admission to the intensive care unit (ICU), associated with significant risk of morbidity, mortality, and incomplete recovery.[2]

It primarily affects the peripheral nervous system, although recent research has shown that in a few of the patients, the central nervous system is also involved. The acute phase often requires intensive care services. There is a growing recognition that the recovery is not as smooth and free of symptoms as previously thought. Following the recovery some people endure long - term residual symptoms, such as fatigue, weakness and pain.[3]

The reported incidence of GBS is 1 to 2 per 100,000 population and the lifetime likelihood of any individual acquiring GBS is 1:1000 with a slightly higher incidence in male than in female. It can occur at any age but the most common age is 30-50 years.[4]

The most common infections reported to be preceding GBS, about 10-14 days are upper respiratory infections. Other identified infections include campylobacter jejuni, cytomegalovirus, mycoplasma pneumonia, Epstein-Barr virus, and influenza virus.[5] The diagnosis is confirmed by nerve conduction velocity testing and cerebrovascular fluid examination both of which may be normal in the early phase of GBS.

The progression of the disease depends upon its severity at onset. It suddenly progresses to severely disabling paralysis of the limbs within few days of onset and the disease severity reaches it peak in two to three weeks in about 50% and 80% of cases respectively.[6] The disease starts its recovery after two to four weeks leaving almost 20% of the patients disabled even after the treatment especially in ambulation.[7]

Case presentation :

Case – 1

Patient information

This was a case of 43 year old female patient, a housewife residing in Anantapur. The information was provided by the patient herself. She had a recent history of hypertension presented with complaints of tingling and burning paraesthesia's. The symptoms initially began in the left upper limb 4 days ago and subsequently progressed to involve both lower limbs, starting in the feet and ascending to the proximal thighs within a day and the right upper limb involved later. She developed both proximal and distal weakness, evidenced by episodes of buckling and slippage of footwear, beginning 3 days ago. Initially, she was able to walk with the support of two people, but by the following day, she became bedbound and was unable to stand even with assistance. Additionally, she complained of backpain, which was worsened in severity over the last two days. There is no history of fever, fall or band like sensation. Her family took her to local hospital as weakness progressed there the doctors refered to SVIMS.

Picture 1 : Case 1 with impaired functional mobility

Case – 2

Patient Information:

This was a case of 14 year old male patient, a student residing in Kurnool. The information is provided by the mother of the child. The child with no comorbidities came with complaints of tingling paraesthesia's from 3 days in both feet which ascended to the level of knees and from 2 days he developed buckling of knee and slippage of chappal with knowledge which progressed to such a state that he is not able to stand at all in a duration of 24 hours. He also reported both proximal and distal upper limb weakness in the form of difficulty in lifting his hand and gripping the hands [left>right]. There are no bladder and bowel symptoms. He has history of similar symptoms at the age of 5 and on evaluation found to have Acute Inflammatory Demyelinating Polyneuropathy [AIDP] for which he was treated conservatively. He came to SVIMS with onset of symptoms as he was treated for the same in this hospital.

Picture 2 : Case 2 with impaired functional mobility

Case 3

Patient Information:

This was a case of 48 year old male a daily wager residing in puttur. The information was provided by himself. He had a background history of CKD on medical management came with complaints of tingling and burning paraesthesia's which started in his feet, 20 days back and later ascended upto the level of proximal thigh in one week. He also has similar symptoms in his upper limbs which stated in his fingers, one week back and ascended to the shoulder in a duration of 4 days. He complains of paraesthesia's of whole body from 2 days and noticed sudden weakness in all four limbs and was unable to move his limbs even against gravity. He was taken to SVIMS immediately for the management.

Picture 3 : Case 3 with impaired functional mobility

Clinical findings

	Case 1	**Case 2**	**Case 3**
Age	43 years	14 years	48 years
Gender	Female	Male	Male
Built	Mesomorphic	Ectomorphic	Mesomorphic
Dysphagia	Absent	Present	Present
Skin changes	Absent	Absent	Absent
Sensory Involvement	Pain, Touch and temperature	No involvement	No involvement
Tone	Hypotone	Hypotone	Normal
MMT	Reduced	Reduced	Reduced
Cranial nerve Examination	All are intact	All are intact	All are intact
Reflexes	Areflexia	Areflexia	Dimnished
ENMG	Predominant axonal pattern	Predominant axonal pattern	Predominant axonal pattern

Bowel and Bladder	Involved	Not involved	Not involved
Fatigue	Present	Present	Present

Table 1 : summary of clinical findings in three cases

Physiotherapy Intervention :

The treatment of GBS aims to accelerate recovery, reduce complications in acute phase of illness and reduce the occurrence of long term neurological residual disability.[8]In GBS the concept of multidisciplinary care refers to the management of the patients with inclusion of at least two disciplines [medicine, physiotherapy, occupational therapy, dietetics and other health professionals].[9]The fact that the disease results in disability inspite of all therapeutic measures is the reason to explore the role of rehabilitation through physiotherapy management of GBS.[10]

In this case series we tried to see the effects of physiotherapy interventions in management of GBS. Since the symptoms of GBS vary according to the stage, it is difficult to come up with a single intervention for GBS cases. In this case series we mainly concentrate on Bronchial hygiene, Sensory, Tone, Motor, Balance and ADL problems.

Component affected	Goal	Physiotherapy treatment
Respiration	For improving respiratory function	Vibrations – with mechanical vibrator 3 times/day,5min for each lobe. Deep breathing exercises – 5 to 10 repetitions with a sequence of peforming deep breathing slowly, holding the breath for 2 to 3 seconds and then exhaling slowly. Incentive spirometry.
Sensory impairments	To improve sensations	Sensory re-education using Rood's facilitatory techniques
Hypotonicity	To normalise tone	Cryotherapy
Motor impairments	To improve muscle strength. To improve hand function.	Electrical stimulations-surged faradic. Passive, Active assisted, Active and resisted range of

		motion exercises 15repititions/3 sets/day Gripping activities with sponge ball
Fatigue	To improve activity	Relaxation techniques
Coordination	To improve or maintain the coordination	Coordination exercises 15 repititions/exercise,3 sets/day
ADL's	To improve ADL's	Bed mobility, Transfer from bed to chair, Reaching for objects while maintaining seated balance. Writing and dressing using ADL board while maintaining seated balance Standing ,walking,bathing, dressing,Toilet use
Emotional well being	Support emotional heath and coping strategies	Counselling , support groups, mindfulness techniques, Jacobson relaxation exercises

Table 2: components affected, goals and physiotherapy treatment

Follow up and outcome measures:

A thorough neurological examination was conducted to identify the affected components in all the three cases. Based on the findings, physiotherapy interventions were individually selected. The primary impairments were assessed both before and after treatment using standardized outcome measures. **Cutaneous sensory Examination** for sensory examination, **Manual muscle testing [MMT]** for muscle strength, **Tendon reflex grading scale** for reflex responses. **Fatigue severity scale** for fatigue, **Northwick Park Index of Independence scale** for functional independence.

Components	Case 1	Case 1	Case 2	Case 2	Case 3	Case 3
	Pre treatment	**Post treatment**	**Pre treatment**	**Post treatment**	**Pre treatment**	**Post treatment**

Sensory						
Right side	Diminished	Elicited	Diminished	Elicited	Diminished	Elicited
Left side	Diminished	Elicited	Diminished	Elicited	Diminished	Elicited
Tone						
Upper limb	Normal	Normal	Hypotone	Normal	Normal	Normal
Lower limb	Hypotone	Normal	Hypotone	Normal	Hypotone	Normal
MMT						
Right upper limb	3/5	4/5	1/5	3/5	3/5	4/5
Right lower limb	2/5	3/5	1/5	3/5	3/5	4/5
Left upper limb	3/5	4/5	1/5	3/5	3/5	4/5
Left lower limb	2/5	3/5	1/5	3/5	3/5	4/5
Reflexes						
Biceps jerk	o	2+	0	2+	1+	2+
Triceps jerk	0	2+	0	2+	1+	2+
Knee jerk	0	2+	0	2+	1+	2+
Ankle jerk	0	2+	0	2+	1+	2+
Plantar response	mute	flexion	mute	flexion	flexion	flexion
Fatigue severity scale	54/63	25/63	53/63	27/63	44/63	18/63
Northwick park Index of Independence scale	0/34 Total dependance	23/34	0/34 Total dependance	22/34	0/34 Total dependance	30/34

Table 3 :Neurological Examination before and after treatment

Results:

Post – treatment results demonstrated significant improvements when compared to pre treatment assessments.

- Sensations were diminished prior to treatment and showed marked improvement following intervention.
- Muscle tone was hypotonic prior to treatment and returned to normal following the physiotherapy intervention
- Muscle strength increased by 20% in case 1 and case 3,increased by 40% in case 2.
- Reflexes were improved to 100% in case 1 and case 2 and 50% in case 3 making all the cases have normal reflexes.
- Fatigue severity scale [FSS] improved by 46% in case 1, 42% in case 2, 41% in case 3.
- Northwick park index of independence scale improved by 67% in case 1, 64% in case 2 and 88% in case 3.

These improvements are due to application of particular physiotherapy treatment protocol based on the deficits in each case. Since the symptoms vary patient to patient and according to the stage, it is difficult to come up with a single intervention for GBS cases. In this case series all the three cases presented with weakness, reduced tone and ADL impairments, so we focused on these symptoms. Therapeutic strategies are routinely modified according to the patient's response and progress. Adjustments in the therapeutic dosages or timing are made to enhance the effectiveness of the treatment.

Discussion:

Acute inflammatory demyelinating polyradiculopathy (Guillain-Barré Syndrome - GBS) is an autoimmune disease characterized by a sudden onset and progressive involvement of the nerve roots and peripheral nerves of the extremities. The first symptoms are sensory disturbances, and the leading symptom is the progressive symmetrical muscle weakness. It ranges from mild weakness to severe palsy of the four limbs, including the facial, respiratory, and swallowing muscles. The progression of the disease varies between one and four weeks, and in half of the patients, reversal was observed within two weeks. Approximately 10% - 20% of the patients develop respiratory failure. The mortality and disease chronification are about 2% - 5%. The acute phase is followed by a period of gradual recovery, usually over periods ranging from several months to two years. Diagnosis of the disease is based on a clinical, electromyographic, and laboratory criteria. Other diseases were excluded such as acute and subacute polyneuropathies, botulism and porphyria, basilar artery thrombosis, myelitis, spinal cord compression, AIDS infection, and others.

It is crucial to apply physiotherapeutic procedures as early as possible at a clinical stage, in order to prevent the following complications: deep vein thrombosis, dysautonomic disorders such as orthostatic hypotension due to prolonged immobilization, respiratory disturbances, respiratory muscle weakness, pain and fatigue.[11]

Deep breathing exercises use the diaphragm to draw air into the lungs instead of relying on accessory respiratory muscles. This method can help reopen collapsed lung areas (atelectasis), enhance oxygen intake, increase lung volume, improve air exchange, and support mucus clearance. Incentive spirometry (IS) is often applied to reduce the risk of lung complications and to support respiratory function in patients who are less mobile. Any mucus that is loosened during the session is typically cleared by coughing at the end. [12]

Depending on the extent of weakness passive range of motion, active assisted range of motion, active range of motion and resisted range of motion exercises will be prescribed to the patients.[13]

Electrical stimulation was found to be an effective approach in GBS. This helps in retaining the muscle properties and also promotes muscle strength. A case report emphasized the successful application og Rood's facilitatory techniques and Electrical stimulations in enhancing tone and muscle strength in patient with GBS[14]

Conclusion:

The findings of the study demonstrate that physiotherapy intervention had a significant positive impact on patient's with GBS across multiple functional domains. Improvements were observed in tone,strength,fatigue and activities of daily life in individuals with GBS. These results support the hypothesis that physiotherapy plays a crucial role in enhancing neuromuscular function, improving fatigue and quality of life. Given the varied symptoms of the GBS areas like dysphagia, respiratory failure, bladder and bowel function can also be addressed. In this study, the short intervention period was due to the patient's limited inpatient stay. As GBS requires a quality period of rehabilitation and recently follows a relapsing – remitting course, future research should explore the long term and more efficient ways of physiotherapy.

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