Case report

Physiotherapy for complete motor recovery in 4-year-old child with Guillain Barre syndrome- A case study

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ABSTRACT

This study was conducted in 4-year-old male child in sub-acute stage of Guillain Barre Syndrome (GBS) for 12 weeks in a local clinical setup after discharge from the hospital completing IVIG dose. Physiotherapy was given for 12 weeks, 5 days in a week of 1 and half hour session per day with rest periods between the session. Physiotherapy intervention includes passive – active exercise, resisted exercise, weight bearing exercise, mat activities, breathing exercises, task-oriented exercise, balance and coordination exercise, abdominal strengthening, gait training, and play activities. Outcomes used before and after the intervention were Manual Muscle Test (MMT), Five Times Sit to Stand Test (FTSST), Functional independent Measure (FIM), Time Up and Go test (TUG) and Hand dynamometer to analyse the effects of physiotherapy intervention. This study concluded that there was a significant improvement in patient's motor functions and independence in daily activities after an effective physiotherapy treatment. There was a complete motor recovery after 12 weeks of physiotherapy.

Keywords: Guillain Barre Syndrome; motor recovery; functional independent measure; physiotherapy.

INTRODUCTION

Guillain-Barre syndrome (GBS) is clinically defined as an acute peripheral neuropathy causing limb weakness that progresses over a time period of days or, at the most, up to 4 weeks (1). GBS can develop within 1-3 weeks after infection with several commonly found pathogens, including viruses and bacteria. These include *Campylobacter jejuni*, involved in approximately 30% of GBS cases (2) and common cause is bacterial gastroenteritis, *Mycoplasma pneumoniae, hepatitis E virus, cytomegalovirus, Epstein-Barr virus* (EBV) and *Zika virus* (ZIKV).

Guillain-Barré syndrome is the most common cause of acute paralytic illness in children and adults. GBS is known to occur at all ages, though it is rare in infancy. The incidence remains almost uniform below the age of 40, ranging from 1·3 to 1·9 per 100000 annually (3). Although the syndrome could occur in all age groups, it predominantly affects adult population. GBS is more frequent in children aged 1-5 yr. The syndrome is more prevalent among males than females (4). The incidence of the disease has been estimated to range from 0.5 to 1.5 in 100,000 in individuals less than 18 years of age (5). Recovery period in this disorder is shorter in children than adults and the mortality rate in children is about 3-5% (6).

GBS has been categorized into acute inflammatory demyelinating polyradiculoneuropathy (AIDP), acute motor axonal neuropathy (AMAN), acute motor sensory axonal neuropathy (AMSAN), Miller Fisher syndrome (MFS), and pure sensory and pandy autonomic types. High frequency of AMAN has been reported in Japan, Pakistan, India, China, and Mexico ranging from 28% to 67% (7). Initial symptoms typically include weakness, numbness, tingling, and pain in the limbs. The extent of progression and the severity of symptoms vary greatly among individual patients (8).

The commonest manifestation is limb weakness found more proximally than distal. Facial palsy is the commonest type of cranial nerve involvement (53%), followed by bulbar weakness, ophthalmoplegia, and tongue weakness. In about half the cases the illness is heralded by sensory symptoms. Altogether about 80% have sensory symptoms. Pain is a very common symptom, experienced by around 90% and is often severe. Autonomic dysfunction is seen in about two thirds of the cases, manifesting as either excess or reduced activity of the sympathetic or parasympathetic nervous system. Pulse and blood pressure changes are the commonest manifestations of dysautonomia (9).

GBS has remained a descriptive diagnosis of a disorder for which there are no specific diagnostic tests. The combination of rapidly progressive symmetrical weakness in the arms and legs with or without sensory disturbances, hyporeflexia or areflexia, in the absence of CSF, cellular reaction remains the hallmark for the clinical diagnosis of GBS (10).

Confirmation of diagnosis of GBS depends on nerve conduction studies (NCS) along with electromyography (EMG) are used in the diagnosis. Increased cerebrospinal fluid (CSF) protein

concentration is non-specific and is present in more than two-thirds of patients, the protein content tends to remain normal in early stages of GBS (11).

Intravenous immunoglobulin (IVIG) therapy and plasma exchange hasten early recovery, but even in cases when these treatments are used approximately 20% of the patients are left with severe disability, such as requiring support to walk (12).

Physiotherapy is a mainstay in management of GBS patients and 58% of the patients will receive complete responses following physiotherapy. Satisfaction with physiotherapy is about 87% (1). Physiotherapy rehabilitation has been proved to be effective in the management of acute neurological conditions to increase the speed of recovery and early return to patient's lifestyle (13).

Patient information and clinical findings

Patient is 4-year-old male child who attained all the milestones appropriate for the age and got immunized up to one and a half years, had a history of trauma due to fall from bicycle followed by intermittent fever for 2 days after the trauma. He had difficulty in walking, standing with support, had difficulty in getting from sitting position and also had a history of frequent falls. He was admitted in the Institute of child health and hospital for children, Chennai, India. He was assessed completely and found to have a reduced muscle tone of 4 in upper extremity except finger group which had muscle power of 2 and 3 in lower extremity. There was reduced reflex of lower limb and lower abdomen. Sensation was absent during initial assessment which was found normal in the second assessment. His CSF showed albumin cytological dissociation and NCS showed demyelinating sensory/motor radiculopathy. Patient had acute flaccid paralysis and diagnosed as GBS. He was in the hospital for 10 days and was given an IVIG 400mg/kg for 5 days. Physiotherapy was given in the hospital and discharged with an instruction to continue physiotherapy regularly. Patient came to the clinic with the history mentioned above and was reassessed for further rehabilitation.

He was able to sit without support, but unable to stand without support, unable to walk, had difficulty to sit from lying, had difficulty in holding objects and clap hands. Both sitting and standing balance were absent. Coordination problems were also observed. He had excess anterior pelvic tilt, foot drop and muscle power of 4 in upper extremity and 2 in finger group and his lower extremity showed power of 3. There was overall decrease in activities of daily living.

MATERIALS AND METHODS

Manual muscle testing was used to assess muscle power before and after the intervention. Five times sit to stand to assess balance and lower extremity strength. Functional independence measure is used to measure his activities of daily living. Time up and go test used to assess balance and walking speed. Hand dynamometer was used to assess his hand grip strength. All the outcome measures were assessed before and after 12 weeks of intervention.

As the patient was in the hospital, physiotherapy was given in the hospital during acute stage, after discharged from hospital, continued physiotherapy in our local clinical set up. Physiotherapy was given for 5 days a week for about 1 and half hour with rest periods between sessions. Child was uncooperative sometimes; hence rest was given during these times. Physiotherapy exercise include starting from passive exercise progressing to active assisted, active and resisted exercise. Weight bearing exercises, mat activities, breathing exercises, task-oriented exercise, balance and coordination exercise, abdominal strengthening, gait training and play activities.

Problem list and intervention

Muscle weakness (flaccidity)/ to improve muscle strength - initially started with passive exercise then progressed to active assisted exercise then to active exercise (rhythmic initiation). After he started doing active exercise. We started resisted exercise with 0.5 kg (dumbbell, weight cuff) for both upper and lower limb, finger exerciser for fingers and hand was used. Every exercise was started in elimination of gravity progressed to against gravity weight bearing for both upper limb and lower limb, weight bearing for upper limb was done by side sitting with hand over hard surface and elbow stabilized, weight bearing for lower limb was given by squatting, standing done with wall support and hand support from therapist for 10 repetition 3 sets, progression depends on level of fatigue.

To improve lung capacity - diaphragmatic breathing exercises, spirometry for 3 minutes. Difficulty in sitting from lying, transition, kneeling, standing, sit to stand/to improve transition and function -Mat activities started from pelvic bridging, rolling, prone on elbows, prone on hands, quadruped, Rhythmic movement in quadruped position for relaxation, kneeling, half kneeling, sitting, sit to stand, standing, core strengthening which includes supported crunch alternate arm and leg rise progressed to supported crunch using Swiss ball for 15 min.

Gait training to improve walking was given in parallel bar with supervision, progressed to unilateral support and then progressed to walking without support with supervision, once walking was achieved tandem walking, obstacle walking, hopping was trained for 10 min.

Impaired balance and coordination to improve balance and coordination included perturbations in sitting, shifting weight in sitting and reaching activities which was progressed to unstable surface using Swiss ball and

coordination exercise for upper limb with verbal and visual cues were given.

After sitting was achieved treatment progressed to standing balance like standing with reduced base of support, external perturbation given in standing, bending and reaching activities, single limb stance with support progressed to without support. Tandem walking, walking with narrow base of support trained after walking was achieved for 10 min.

Difficulty in daily activities to improve ADL included task oriented training – PNF pattern D1 flexion (combing hair on same side), D2 flexion (combing hair on opposite side), bilateral flexion (throwing ball), reaching and holding objects which enhance spinal rotation and grip, progressed by using Swiss ball. For lower extremity standing and reaching objects, lifting heels and lifting toes, place foot in stool and bring down for 10 min.

Play activities was included to improve upper and lower extremity function and to promote interest i.e clay activity, throwing of ball, clapping, alternate high-five with therapist for upper extremity. Ball kick, stepping leg over foot prints, tapping foot for music. During walking training at the 11th week, walking over obstacles and picking up the obstacles was trained for 10 min.

RESULTS

The data obtained in the study in the initial assessment and after the physiotherapy management post test data were obtained and are listed in Table 1.

Table 1: Pre-test, Post-test values and Pre and Post difference of FTSTS, FIM, TUG and Hand dynamometer

Test	Pre	Post	Pre-Post difference
FTSTS (sec)	-	10.5	10.5
FIM (score)	71	122	51
TUG (sec)	-	8.16	8.16
Hand dynamometer (kg)	0.2	2.4	2.2

Pre -initial assessment; Post- final assessment; FTSTS – five time sit to stand test; FIM – functional independence measure; TUG – time up and go test.

The FTSTS showed a good difference in time in comparison with pre and post-test assessment. His initial assessment showed a failure of test as he was unable to do the test without assistance and his final assessment showed 10.5 seconds. When coming to FIM score it was 71 during the initial assessment and 122 during the final assessment. In TUG test he failed as he was unable to stand without support at the end of 12th week he took 8.16 seconds to complete the test. Hand held dynamometer showed a 0.2 kg during initial assessment at end of 12 week it improved to 2.4 kg. His MMT (Manual muscle test) during initial assessment was 4 for upper limb and 2 for finger group and 3 for lower limb and during final assessment it was 5 for both upper and lower limb and finger group showed power of 4.

DISCUSSION

This study was conducted to find improvement in functional motor recovery following GBS. GBS is characterized by progressive muscle weakness, sensory disturbances, reduced or absent reflex, sometimes showing autonomic dysfunction. A previous study by Kumar *et al.,* with regards to physiotherapy for GBS, concluded that high intensity compared with low intensity rehabilitation programmes reduces the disability and enhancing motor function in chronic phase of GBS patients (14). Fearnhead *et al.,* reported that chest physiotherapy (postural drainage, vibrations and sterile tracheobronchial suctioning) and frequent position all changes are very important care factors in GBS (15). Torok *et al.,* reported that individually tailored physical therapy interventions are necessary for successful outcomes when treating patients with GBS. Interventions must be evaluated daily due to the frequently changing symptoms and condition of the patient (16).

Nicholas *et al.,* reported that a 12-week bicycle intervention with severely fatigued patients with GBS and CIDP showed a significant increase in physical and isokinetic muscle strength and reduced fatigue scores (17). Ian et al., physiotherapeutic interventions have indicated positive outcomes in terms of strength, endurance, gait quality and function, and fatigue (18).

Dimitrova *et al.,* concluded that after the applied physiotherapy, our patient experienced a functional improvement of the paretic extremities, which was associated with gradual muscular strengthening and improved balance and gait which was determined by reducing the number of steps and increasing the movement speed (19). Sava *et al.,* concluded that physiotherapists assist to correct functional movement, avoiding harmful compensations that might have a negative effect in the long run (20). Shaha *et al.,* concluded that supervised, individualised exercise reduced fatigue and improved strength and quality of life more than unsupervised home exercise in people with chronic GBS (21).

Sulli *et al.,* reported that Guillain-Barrè syndrome is a rare autoimmune disease that involves peripheral nerves and is potentially life-threatening. Some of the patients who survive the acute phase pre-sent motor and sensitive sequelae, deficits in ambulation, weakness and pain, which negatively impact daily life activities. Therefore, a long-term rehabilitation program is needed to manage the patient's complications (22). Khan *et al.,* concluded that Higher intensity rehabilitation compared with less intense

intervention reduces disability in GBS in later stages of recovery (23).

Loveness *et al.*, reported that about 85% of patients with GBS achieve a full recovery within several months to a year. Fatigue is the most common and persistent symptom after treatment. Other less common residual difficulties include weakness of the lower leg muscles, numbness of the feet and toes, and mild bifacial weakness usually managed by Physiotherapists (24).

In our study there was a good motor recovery seen in 4-year-old child with effective physiotherapy treatment which concentrated on every aspect of his inabilities, his gait improved with good walking speed and his hand grip improved to a great extent. He gained a good muscle power of 5 at the end of the intervention.

CONCLUSION

Results from this study shows that there is a good functional motor recovery following physiotherapy intervention. Exercise intervention is recommended according to the stage of disease. There was improvement in muscle strength in all extremity and improvement in balance and gait which showed increase in walking speed. The patient become confident and started going to school after the recovery.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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