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Graded Aerobic and Resistance Training for Early Fatigue in Guillain–Barré Syndrome: A Clinical Case Report

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Abstract

Background: Guillain–Barré syndrome (GBS) is an acute, immune-mediated neuropathy often causing weakness, sensory changes, and fatigue. Post-GBS fatigue is common and can persist even after strength recovery, limiting participation in daily activities. Evidence for safe, effective rehabilitation strategies targeting fatigue remains limited.

Case Presentation: We report the case of a 34-year-old male schoolteacher diagnosed with acute inflammatory demyelinating polyneuropathy (AIDP) following an upper-respiratory infection. After receiving intravenous immunoglobulin and initial inpatient care, he presented to outpatient neuro-physiotherapy four weeks post-onset with early fatigue despite improved muscle strength. Baseline assessments showed Fatigue Severity Scale (FSS) score of 6.1, 6-Minute Walk Test (6MWT) distance of 210 m, and mild residual lower-limb weakness.

Intervention: A progressive, closely monitored eight-week program of graded aerobic and resistance training was implemented. Aerobic sessions began at 40–50%

heart-rate reserve, progressing in duration; resistance exercises targeted major limb muscles at 40% of one-repetition maximum, advancing cautiously while monitoring fatigue and overwork symptoms.
Outcomes: By week eight, the patient's FSS improved to 3.8, 6MWT increased to 395 m, grip strength improved bilaterally, and perceived exertion during activity decreased. No adverse effects, overwork weakness, or disease relapse occurred. The patient reported increased energy and resumed part-time teaching.
Conclusion: Early, individualized, graded aerobic and resistance exercise can safely reduce fatigue and improve endurance in patients recovering from GBS. Careful pacing, symptom surveillance, and patient education are essential to optimize outcomes.

Introduction

Guillain-Barré syndrome (GBS) is one of the most common causes of acute and flaccid, neuromuscular paralysis. this syndrome was discovered for the first time more than a century ago.(1) Guillain-Barre syndrome (GBS) is an auto immune group of disorders where the body's own immune system mistakenly attacks its peripheral nerves, leading to sensory, motor, or autonomic nerve damage. GBS IS characterized by progressive weakness both upper and lower limbs(2). autonomic dysfunction and paralysis of respiratory system may also occur in GBS(3). The annual burden of GBS is one to two per 100,000 persons (4). Worldwide GBS affects approximately 100 000 people annually(5). The prevalence of GBS is little higher in male than female(6). The mortality rate of GBS is approximately 3% in both genders(7). About 25% of GBS patients need ventilatory assistance in breathing during acute phase of GBS, Although the majority of GBS survivors recover within six months after the onset of the of symptoms(8). Some of the patients with this condition have prolonged symptoms About 10 to 20% of patients have severe disability, mostly among young adults aged group 30 to 50 years(9).

Several pathogenic microorganisms are suspected to have association with Guillain-Barré syndrome, most notably *Campylobacter jejuni*, Zika virus (10). For diagnosis of GBS, the principal good practice points (GPPs) are GBS is more likely if there is a history of recent diarrhea and/or respiratory infection, Cerebro-Spinal Fluid examination is also valuable in the diagnosis , particularly when the diagnosis is less certain, electrodiagnostic testing is also advised to support the diagnosis(10). Currently, the cure for GBS is yet to be developed, but Therapeutic plasma exchange and injecting immunoglobulins through intravenous (IV) route are beneficial in the treatment of acute phase of GBS(5). Other effective treatments for GBS include corticosteroids, unconventional treatments, and some time non-routine doses of IVIg and PE, Some clinical trials and systematic review and meta-analyses have investigated their positive therapeutic effects on GBS (11). Corticosteroids if administered alone to GBS patients have no considerable outcome (5, 11). IVIG ameliorates the course of GBS, is also used as an option for treatment but its specific action mechanism is still unknown(12). An RCT suggested that IVIG was a more effective treatment option than PE. 53% of the patients that received IVIG had improved in one or more functional grades when compared to the 34% in the PE group(13).

Guillain–Barré syndrome (GBS) presents with a broad group of symptoms affecting the major systems in the body, specifically motor, sensory, autonomic, and respiratory systems, often leading to significant disability and the need for long-term rehabilitation(14). Weakness is the most prominent symptom, ranging from mild paresis of the limbs, including intrinsic muscles of the hands and feet, to complete quadriparesis requiring mechanical ventilation, and is graded using the Hughes

functional score (15). Depending on severity, patients benefit from resistive, active-assisted, or passive exercises, while careful positioning with splints and pillows helps prevent deformities, and frequent turning reduces the risk of pressure sores in severely paralyzed individuals(16). Immobilization increases the risk of deep vein thrombosis (DVT), which can be minimized through passive movements, compression bandaging, and support stockings. Fatigue, reported in up to 75% of patients even after motor recovery, restricts daily activities and social participation, underscoring the importance of incorporating its assessment into rehabilitation plans(1). Pain is another common and sometimes early symptom, affecting all GBS variants and potentially lasting more than a year; it is often treated with carbamazepine or gabapentin, while transcutaneous electrical nerve stimulation (TENS) may be used as an adjunct, although with limited evidence(17).Autonomic dysfunction occurs in approximately half of patients, manifesting as sinus tachycardia, arrhythmias, blood pressure fluctuations, and gastrointestinal dysmotility. Around 40% of hospitalized patients require long-term rehabilitation, with ventilator dependence prolonging hospital stay in nearly 30%; at two weeks, most patients remain dependent for activities of daily living, and about 12% continue to experience disability after two years, particularly if physiotherapy was delayed. Residual fatigue and weakness persist in about 13% of patients and contribute substantially to the overall health burden; while endurance training is recommended(1, 5, 16) it remains under-studied in GBS. Sensory loss, often presenting as glove-and-stocking impairment or with ataxic gait (e.g., in the AMSAN variant), may affect up to half of patients two years post-onset, increasing the risk of injury, ulcers, and infection, which necessitates education on daily skin inspection, proper hygiene, and safe orthosis use. Respiratory dysfunction is a major determinant of prognosis, frequently requiring ventilatory support; chest physiotherapy, postural drainage, and, after weaning, breathing exercises such as diaphragmatic, segmental, and pursed-lip techniques are crucial, along with airway clearance methods and incentive spirometry(13). Bladder and bowel incontinence, due to autonomic involvement, predisposes patients to urinary tract infections, skin breakdown, renal stones, and psychosocial distress; management may include behavioral therapy, pelvic floor muscle training, self-catheterization, and adjuncts like biofeedback or electrical stimulation, though evidence in GBS remains scarce(2) Poor outcomes are associated with older age, ventilator dependence, lack of immunotherapy (IVIG or plasma exchange), rapid symptom onset and progression to quadriplegia, *Campylobacter jejuni* infection, failure to improve within three weeks, dysautonomia, cranial nerve involvement, and other medical complications. Early multidisciplinary rehabilitation targeting motor, sensory, autonomic, and respiratory domains, together with close monitoring for fatigue, skin integrity, and thromboembolic risk, remains central to optimizing functional recovery in GBS(1, 15). Physical therapy exercises are useful in increasing strength, reduce fatigue, and are helpful to promote functional independence in GBS Recommended physical therapy interventions include muscle strengthening, functional trainings, and some endurance exercises(3).Carefully graded physical activity are promising to improve fatigue in people with Guillain-Barré Syndrome. developing a fatigue management program if individualized to a person's context is likely to improve the quality of life in GBS(3). Traditional rehabilitation focused mainly on restoring strength and gait. Recent studies suggest that graded aerobic and resistance exercise can reduce post-GBS fatigue, provided it is delivered at appropriate intensity and with close monitoring to avoid the "overwork weakness."

Methods: This case report was conducted as per CARE guidelines of case report, this case shows assessment of early fatigue in GBS, Design and delivery of a progressive exercise program, Objective outcomes over 8 weeks.

Patient Information: A 34-year-old male having Occupation as School teacher with medical history of Mild seasonal asthma, otherwise the patient was healthy Present illness was Three weeks after an upper-respiratory infection, developed ascending paresthesia and weakness in legs, then arms. Hospitalized and diagnosed as acute inflammatory demyelinating polyneuropathy (AIDP) (the most common type of GBS)(18). Treated with IV immunoglobulin (2 g/kg over 5 days). At 4 weeks post onset, he was discharged for outpatient neuro-physiotherapy with complaints of: "I feel exhausted and very tired after walking even a short distance, although my strength seems better."

Initial Assessment Chart

Domain	Findings
Muscle strength (MRC)	UE 4+/5; LE 4/5 (proximal), 4+/5 (distal)
Reflexes	Hyporeflexia at knees & ankles
Sensation	Mild glove-and-stocking paresthesia
Fatigue	Fatigue Severity Scale (FSS) = 6.1/7
Endurance	6-Minute Walk Test (6MWT) = 210 m
Grip strength	R 22 kg, L 24 kg
Cardiorespiratory	HR & BP within normal limits
Other	No respiratory compromise; independent sit-to-stand

Clinical impression was noted as **early post-GBS fatigue** with mild residual weakness.

Timeline

Time from onset	Event
Week 0	Acute onset of weakness → admitted
Week 1–2	IVIG therapy, stabilization
Week 4	Discharge; referred to neuro-PT
Week 4–12	Outpatient graded exercise
Week 12	Final evaluation & home program

Diagnostic Assessment: Laboratory: CSF showed albumin-cytologic dissociation. Nerve conduction study showed demyelinating features (prolonged distal latency, conduction block). Imaging: normal spinal MRI. Diagnosis was confirmed by physicians as **Guillain–Barré syndrome, AIDP variant.** No alternative causes of fatigue (thyroid, anemia) were identified.

Therapeutic Intervention: Goals were set as, reduce fatigue while avoiding overwork. Improve walking endurance and muscle strength and promote safe return to work and daily activities.

Principles: Begin at low–moderate intensity (40–50% heart-rate maintained). With Increase duration or resistance gradually; avoided increases in both on the same week. HR, BP, Borg RPE, fatigue level 24 h post-session was closely monitored.

Program Design

Step	Details
Warm-up / Cool-down	5 min gentle ROM & breathing
Aerobic	Stationary cycle or treadmill, 40–50% HRR, 5–10 min → 20 min (wk8)
Resistance	Therabands → ankle weights → light dumbbells; quads, hams, deltoids, biceps, grip. Start 40% 1RM (1×10), progress to 60% 1RM (3×12)
Balance & gait	Step-ups, side-stepping, gentle uneven-surface walk
Energy conservation	Task pacing, rest breaks, ergonomic advice
Frequency	3 supervised sessions/week + 2 home stretching days

Precautions: training stopped if pain, marked weakness, or >2-point FSS rise the next day.

Follow-Up and Outcomes

Outcome Measure	Baseline	Week 8
Fatigue Severity Scale	6.1	3.8
6MWT distance	210 m	395 m
Grip strength (R/L)	22 / 24 kg	32 / 34 kg
MRC LE proximal	5-Apr	5-/5
Perceived exertion (Borg) at 6MWT end	15 (“hard”)	11 (“light”)

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Afte the program Patient reported “feeling more energetic and able to return to part-time teaching.” No episodes of overwork weakness or disease recurrence.

Discussion: This clinical case of GBS shows that fatigue in GBS can be addressed safely once strength has stabilized(19) Fatigue is not purely due to weakness; mechanisms include axonal loss, altered central drive, and deconditioning. Early introduction of aerobic training (low HRR) plus progressive resistance improved endurance and reduced perceived fatigue(3). Close surveillance is essential: monitor HR, perceived exertion, and next-day fatigue to avoid overload. Gains exceeded the minimal clinically important difference for FSS (0.45) and 6MWT (~50 m)(20).

Physical therapy Rehabilitation improves functional improvement in GBS patients, with long-term benefits observed. However, lasting symptoms such as fatigue and neuropathic pain may persist despite functional improvement. These findings highlight the importance of incorporating rehabilitation into the management of GBS and addressing residual symptoms to improve patient outcomes(21).

Patient Perspective: "I was cautious about physical therapy and exercise because I'd heard it might make all things worse in GBS. The gradual plan of exercise with regular checking gave me good confidence. Now I can walk to school without stopping. And I am hoping for complete recovery"

Conclusion: A structured, graded aerobic and resistance program can safely alleviate early fatigue and improve endurance in GBS. Individualization, pacing, and attentive monitoring remain crucial.

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