Physical Therapy Management of the Patient with Post-Polio Syndrome

A Case Report

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This case report documents the treatment of a patient who experienced progressive muscle weakness and a decrease in function over time that did not appear to be related to any secondary neuromuscular disease. We discuss the relationship between age and maximal muscle function in addition to some general guidelines for rehabilitation. This type of patient can represent a challenge for the physical therapist. This case report however, illustrates the degree of muscular and functional recovery that can result with a physical therapy program aimed at reducing levels and intensity of exercise, daily activity, and stress. Such a combination of short-term goals appears to be essential to the successful management of a patient with post-polio syndrome.

Paralytic poliomyelitis, caused by a small ribonucleic acid virus that invades the central nervous system, has ceased to be a common catastrophe in areas where vaccinations are administered routinely. Evidence of the crippling effects of this disease, nevertheless, is widespread. According to data from the Center for Disease Control. Atlanta, GA. an estimated 250.000 survivors of paralytic poliomyelitis are in the United States at present.

Until recently. poliomyelitis typically had been considered a stable. chronic disease. Many poliomyelitis survivors, however, experience new health problems years after contracting the disease. Based on data from a preliminary study by Codd et al at the Mayo Clinic, about 25% of poliomyelitis survivors seek medical assistance 25 to 30 years after the abrupt onset of the disease. A variety of complaints. such as fatigue, increased weakness in either the muscles affected by or presumably unaffected by the poliomyelitis virus, pain, and a change in functional status, appear to represent new symptom developments in patients with a history of poliomyelitis. This group of apparently poliomyelitis-related symptoms has been referred to as the "post-polio syndrome."

The mechanisms for these poliomyelitis-related symptoms are unknown. Possible explanations include reactivation of the poliomyelitis virus, genetic predisposition allowing the previously affected motoneurons to deteriorate further, normal aging of a previously diseased motor unit and reduced ability to compensate for poliomyelitis-weakened muscles, immunopathologic mechanisms, or simply mere coincidence. The purposes of this report are to discuss a case of post-polio syndrome, characterized by a definite. quantifiable increase in muscular weakness over time, and to describe the course of management for this condition.

PATIENT DATA AND TREATMENT

A 42-vear-old white woman contracted poliomyelitis in 1955 at the age of 13 years. The initial paralysis involved the muscles of the lower trunk and the lower extremities. The upper trunk and upper extremities were not involved. The patient underwent physical therapy that, according to the patient. involved "painful" stretching and strengthening exercises conducted three times a week by a physical therapist and on alternating days by a family member. The

patient completed her rehabilitation program two years after the onset of poliomyelitis and was able to ambulate independently without the use of assistive devices. Results of a manual muscle test conducted after the completion of her initial two-year rehabilitation program revealed a muscle strength grade of Normal in the right leg, but Fair plus in the left quadriceps femoris and lower abdominal muscles, Good plus in the left ankle dorsiflexor and hip flexor muscles, and Fair minus in the hip abductor muscles (Table). The patient subsequently reported difficulty ascending and descending stairs and standing from a low seated position.

At the age of 35 years. the patient began to notice increased muscular weakness in the left leg that caused her to drag her leg during the swing phase of gait. She also recalled being awakened during the night with "muscle cramps" in her legs after a day of excessive walking. The muscular weakness and fatigue progressively worsened until she began falling outdoors a year later. Preexercise manual muscle test results revealed a muscle strength grade of Poor minus in the left quadriceps femoris muscles and Fair in the left ankle dorsiflexor, hip flexor, and hip abductor muscles (Table). A progressive resistive exercise strengthening program performed three times a week on alternating days was prescribed by her physician. Three months later at discharge from the program. she was able to ambulate safely with a straight cane. Manual muscle test results after the three months of physical therapy showed improved muscle strength in the left quadriceps femoris to a grade of Fair and in the ankle dorsiflexors to a grade of Fair plus. Hip flexor and hip abductor muscle strength improved to a grade of Good (Table). Despite these improvements in muscle strength. the patient reported that she had not regained her former level of endurance in ambulation. She independently continued the muscle stretching and strengthening exercises with leg weights at home.

TABLE

Preexercise Muscle Strength in the Left Lower Extremity

Muscle Group	Time 1 (age 15 yr.) Postonset	Time 2 (age 35 yr.)	Time3 (age 42 yr.)
Quadriceps Femoris	3+	2-	2-
Hip Flexors	4+	3	3-
Hip Abductors	3-	3	3-
Ankle Dorsiflexors	4+	3	3-

Postexercise Muscle Strength in the Left Extremity

Muscle Group	Time 1 (age 15 yr.) Postonset	Time 2 (age 35 yr.)	Time3 (age 42 yr.)
Quadriceps Femoris		3	3+
Hip Flexors		4	4+
Hip Abductors		4	4
Ankle Dorsiflexors		3	4+

At 40 years of age, the patient was unable to ambulate out of doors the distance to her job even with the aid of a straight cane. A pair of Lofstrand crutches was prescribed by her former physical therapist. No formal gait training in the proper use of the crutches was provided. The patient independently used a three-point gait pattern with the bilateral use of Lofstrand crutches.

At the age of 42 years, the patient reported a feeling of generalized fatigue and muscle

weakness. She began falling indoors and. thus. became fearful of ambulating. She was referred for physical therapy with the diagnosis of post-polio syndrome. The patient participated three times a week in a home physical therapy program that included therapeutic exercise, postural exercises, and gait training. After six to eight weeks of rehabilitation, the patient was to be reevaluated for signs of muscle strengthening. for functional and gait improvements, and for subjective improvement in fatigue and endurance. If no improvement occurred, electromyographic testing to identify a possible electrophysiologic basis of further neurogenic involvement was to be administered.

Preexercise manual muscle test results revealed a muscle strength grade of Good plus in the right leg with the exception of a grade of Fair plus in the muscles surrounding the right hip. In her left leg. she had grades of Poor minus in the quadriceps fernoris muscle, Good plus in the ankle dorsiflexor muscles, and Fair minus in the hip flexor and hip abductor muscles. Her abdominal muscles had a grade of Fair minus. Her passive range of motion in the lower extremities was essentially within normal limits except for limitations in dorsiflexion (0" - 60") and straight leg raising (0" - 60") bilaterally. Passive range of motion in both upper extremities was within normal limits except for shoulder flexion (0" - 60"). shoulder abduction (0" - 60"). and neck rotation to the right (0" - 75"). Her posture showed a kyphoscoliotic thoracic spine. She assumed a hyperextended or forward head position with her neck.

The patient's ambulation was guarded. She attempted to use a three-point gait pattern with the bilateral use of Lofstrand crutches for ambulating outdoors, but her balance was poor. Her gait was characterized by excessive plantar flexion at heel-strike. decreased hip and knee flexion during the swing phase of gait. short steppage and stride length. and a mild gluteus medius limp on the left side. Her pelvis and trunk were held rigid and lacked rotation. Indoors, she preferred to use a cosmetically pleasing, although unstable. straight cane for ambulation. Her gait deviations were more exaggerated with the use of a straight cane. She was able to ambulate about 20 ft. without grasping an item of furniture for additional support. Her newly acquired fear of falling prevented her from independently ambulating outside of her apartment. She preferred to remain inside her apartment and to ambulate as little as possible. Functionally. the patient could not stand from a low or cushioned chair. nor ascend or descend a curb or a flight of stairs.

After the assessment of the patient's passive range of motion, we recorded manual muscle strength, gait, posture, and functional abilities, pertinent details about her life style, her perceived physical discomfort and muscle fatigue, and changes in her functional status. The patient lived alone in a building having an elevator and drove to and from her full-time job three times a week. Her physical complaints included neck and left upper arm pain that had persisted during the previous six months and a feeling of increased muscle weakness and fatigue after excessive energy expenditure (physical or emotional). She feared rapid deterioration and immobility.

An initial treatment goal was to provide the patient with education and counseling about the causes of the post-polio syndrome and the problems associated with it. The most widely accepted causational theory attributes the loss of muscular strength to the slow, progressive loss of anterior horn cells, which superimposes new strength losses on already weakened muscles. A decrease in muscular contraction force occurs with aging and with exercise-induced damage of the motor unit. The patient, thus, was told that her remaining anterior horn cells had been overstressed for years because they had been made to function like a normal group of motor cells. Normal aging causes some of the cells to weaken or die more rapidly. The old principle of "no pain, no gain" that has been promoted by physical therapists in the past no longer is appropriate for poliomyelitis patients with new complaints of

muscle weakness and fatigue. The appropriate treatment for such patients, however, is to prevent exercise-induced muscle weakness by promoting a plan of moderate exercise with frequent rest periods. Instructions for a safe and efficient gait to minimize energy expenditure and plans to decrease strenuous physical and stressful emotional situations also are recommended.

The exercise protocol was as follows:

I. Mobility: Passive muscle stretching was directed primarily to the hamstring and calf muscles. Active assistive exercises were directed to the trunk. upper extremities, and neck.

2. Trunk muscle strengthening: Active isotonic exercises were administered to the back extensor and abdominal muscles. Active resistive exercises were administered 10 the lower trunk rotator muscles.

3. Lower extremity muscle strengthening: Brief (10-second holding) isometric and isotonic exercises were performed by the patient daily. The patient performed 10 repetitions of each exercise, and each exercise was preceded by and ended with a rest period. The group of active exercises took the patient about 20 minutes to complete. She was instructed to cease exercising if she experienced muscle twitching, pain, or fatigue.

4. Resistive exercises: The physical therapist conducted resistive proprioceptive neuromuscular facilitation exercises three times a week. Each exercise was administered 10 times and was followed by a 3- to 5-minute rest period. Initially, a total of 20 minutes of resistive exercise was provided. The patient then would rest for 5 to 10 minutes before proceeding to gait training. The patient was instructed not to use free weights independently (to guard against over-exercise effects).

5 Gait training: The purpose of gait training was to promote comfort and minimal energy expenditure. The patient was taught a four-point gait pattern using Lofstrand crutches. Training began in her apartment hallway to prepare for outdoor training. The four-point gait pattern was chosen to provide the patient with a means of stable outdoor and long-distance ambulation. One Lofstrand crutch instead of the cane was used indoors to improve the patient's balance and quality of gait. 6. Review and follow-up: During each physical therapy session, the theory underlying the program of moderate exercise with rest was reviewed. The patient was questioned about subjective improvement. exercise compliance. and fatigue. The physical therapist provided the patient with feedback after each review.

After eight weeks of this program, the physical therapy evaluation revealed that passive range of motion was within normal limits in all extremities. Manual muscle test results showed muscle strength grades of Good plus in the patient's right lower extremity: the left lower extremity showed grades of Fair plus in the quadriceps femoris muscle, Good plus in the ankle dorsiflexor and hip flexor muscles, and Good in the hip abductor muscles (Table). She ambulated short distances with one Lofstrand crutch both indoors and outdoors with increased hip and knee flexion. increased dorsiflexion at heel-strike, and increased pelvic rotation. Marked improvement in her posture was noted during ambulation. Physical therapy continued three times a week for additional therapeutic exercise and gait and postural training.

Currently. the patient ambulates with a straight cane indoors and with the bilateral use of straight canes (using a four-point gait pattern) outdoors for short distances. For long-distance ambulation or ambulation during the patient's working hours (which requires her to carry a heavily weighted backpack). she independently uses either Lofstrand crutches bilaterally or one Lofstrand crutch and one short cane in a four-point gait pattern.

Subjectively. the patient reports the absence of neck and arm pain. increased stability and confidence during ambulation. and increased muscle strength and endurance. She, nevertheless, reports experiencing fatigue during the late after-noon as a result of a long day's work or excessive ambulation. Generalized fatigue and instability during ambulation appear to result after periods of increased stress or anxiety. Brief rest periods of 30 to 60 minutes help to relieve the physical fatigue. Reorganizing busy work schedules (a suggestion made by the physical therapist) helps to decrease stress and. thus, relieve the generalized fatigue attributed to anxiety.

DISCUSSION

Many of the complaints of patients with post-polio syndrome such as muscle weakness, pain, and fatigue are ailments commonly associated with patients having a long-standing medical history of a musculoskeletal or neuromuscular disease. Therefore, eliminating common medical problems when evaluating the patient with post-polio syndrome presents a dilemma for the physician. Deciding which cases represent a quantifiable increase in gradual muscle weakness over time and providing the diagnosis of post-polio syndrome represents a complicated diagnostic issue.

After the diagnosis of post-polio syndrome is made, the clinical management program then should be adapted specifically to each patient's needs. We have presented the exercise protocol for this particular case. Some general guidelines that may be helpful for physical therapists in the rehabilitation of patients with a similar diagnosis are as follows:

1. Education and counseling are critical components in the management of all progressively disabling diseases. The emotional impact of such disabilities may be especially devastating to the patient with post-polio syndrome, however, because the patient typically is middle-aged, and the onset of progressive weakness often is compounded by psychosocial and vocational problems associated with aging.

2. A combination of moderate exercise with rest should be monitored appropriately. Therapists may encounter resistance from patients to a new approach for an old disease. After years of living with the knowledge that tough and exhaustive exercise originally helped these patients to "conquer" their disease, they now are being asked to change their cognitive style of coping and possibly to change their life style. A method that was helpful in this particular case was the idea of implementing a six- to eight-week trial program of this '-new" treatment approach of moderate exercise, rest, and recovery. In this way. the patient believed that she had control over the program. The patient's immediate family also was informed about the causes of post-polio syndrome and the effects of aging and exercise, and the new approach for rehabilitation was discussed.

3. Multiple options for ambulation should be provided for the patient. Depending on the patient's status, these options may include adaptive equipment. bracing, or transportation. The goal for each patient should be efficient energetics. The patient's level of fatigue and endurance and the functional setting should determine the type or types of assistive devices necessary for safety, efficiency, and comfort. These options provide the patient with a sense of security and not with a sense of failure.

4. Psychological counseling and post-polio syndrome support groups should be made available to the patient. The patient's realization that a change in life style may be necessary to reverse functional losses and to prevent further losses from occurring may be traumatic.

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