Physical Therapy for a Patient with Poor Balance Secondary to Charcot-Marie Tooth Disease and Chronic Low Back Pain: A Case Report

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Introduction/Background
Charcot-Marie-Tooth disease (CMT) is one of the most common inherited neuromuscular disorders with a prevalence rate of 1 in 2,500 in the United States1. CMT is a form of muscular dystrophy, and is an umbrella term for certain inherited genetic disorders that affect the peripheral nervous system. The genetic disorder is characterized by muscular wasting, weakness, and sensory loss, and is most severe in the distal lower extremities2. Common symptoms include foot drop, high-stepped gait with frequent tripping, falls, foot deformities such as high arches and hammer toes, and loss of muscle bulk in the distal lower extremities2. Neuropathic pain and fatigue upon exertion are also common symptoms that are under-reported. The onset of symptoms is variable depending on the type; however, it is usually prevalent during adolescence or early adulthood3. There is no pharmacological treatment for CMT. Clinical approaches include physical therapy (PT) management, orthotics, and surgical interventions for treatment of foot and ankle deformities.

Purpose
This patient was selected for a case report because there was relatively little research on therapeutic interventions for a patient with chronic low back pain alongside balance deficits in this particular patient population, especially for a patient in this age demographic, 45-45. The purpose of this case report was to provide a broad view of CMT disease and a description of PT management strategies used for a patient with poor balance secondary to CMT disease and chronic low back pain.

Patient History/Systems Review

<table>
<thead>
<tr>
<th>International Classification of Function Model</th>
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<tr>
<td>Charcot-Marie-Tooth disease</td>
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<td>Muscular low back pain</td>
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<td>Locomotor System</td>
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<td>Noncognitive Impairments:</td>
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<td>Motor System</td>
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<td>Physical Performance</td>
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<td>Sensory System</td>
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<td>Environmental Factors</td>
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<td>Personal Factors</td>
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<td>51 year old and diabetic</td>
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<td>Wife and daughter share the same condition</td>
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<td>The patient demonstrated impaired musculoskeletal, neuromuscular, cardiopulmonary, and communication systems at the initial evaluation</td>
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Examination

Tests and Procedures:
- Goniometric measurement of active lumbar range of motion
- Lumbar joint assessment with central posterior-anterior force
- Functional movement assessment – deep squat test
- Palpation

Special Testing:
- Compression/Distraction of lumbar spine
- Straight Leg Raise
- Functional and manual muscle testing of distal lower extremity muscles
- Sensory testing

Findings:
- Hypomobility of bilateral quadratus lumborum, piriformis, erector spinae
- Decreased functional lumbar stability
- Pain, weakness and decreased lumbar range of motion that limit activities in sitting, standing, and walking
- Poor static and dynamic balance

Outcome Measures:
- Pain Analog Scale
- Oswestry Disability Index
- Functional Gait Assessment
- Single Leg Stance

Physical Therapy Diagnosis

Purpose
Physical Therapy for a Patient with Poor Balance Secondary to Charcot-Marie Tooth Disease and Chronic Low Back Pain. The genetic disorder is characterized by muscular wasting, weakness, and sensory loss, and is most severe in the distal lower extremities. Common symptoms include foot drop, high-stepped gait with frequent tripping, falls, foot deformities such as high arches and hammer toes, and loss of muscle bulk in the distal lower extremities. Neuropathic pain and fatigue upon exertion are also common symptoms that are under-reported. The onset of symptoms is variable depending on the type; however, it is usually prevalent during adolescence or early adulthood. There is no pharmacological treatment for CMT. Clinical approaches include physical therapy (PT) management, orthotics, and surgical interventions for treatment of foot and ankle deformities.

Interventions
JB’s PT management of balance and low back pain took place over the course of 14 weeks (23 full treatment sessions, an initial evaluation, and two re-assessments). JB received treatment twice per week for the entire 14 weeks, except for one week he did not schedule therapy due to vacation. Another therapist performed the initial evaluation and provided the first 4 weeks of therapy. The patient consented to work with a student therapist, and his plan of care was altered according to his needs based upon a re-evaluation.

The plan of care and selection of interventions were centered upon the patient’s goals for therapy as well as the impairments that were found during tests and measures. The interventions were chosen from both clinical experience as well as interventions that were deemed to be effective according to previous research. The patient’s primary goal for therapy was to improve his low back pain so that he was able to complete a full week of work without the onset of increased pain. The interventions were progressed per the patient’s tolerance.

Short and Long Term Therapy Goals

- JB will be able to complete functional squat x 5 in order to increase the ease of transfers and ADLs in four weeks
- JB will improve his Oswestry score by five points in four weeks
- JB’s goal to complete one full week work without an increase in pain six weeks
- JB will demonstrate an improved Functional Gait Assessment score of 21/30 in two weeks to decrease risk of falling
- JB will demonstrate improved static balance during SLS to 20 seconds in four weeks
- JB will be able to complete functional squat x 25 in order to increase the functional ease of transfers and ADLs in four weeks
- JB will improve his Oswestry score by ten points in 12 weeks
- JB’s goal to complete one full week work without onset of pain by discharge
- JB will demonstrate an improved Functional Gait Assessment score of 23/30 in six weeks to decrease risk of falling
- JB will demonstrate improved static balance during SLS to 30 seconds in eight weeks

Outcomes
JB was discharged to home after fourteen weeks of physical therapy. No referral was made to other health professionals due to his independence in completing daily activities and tasks at work, and significant improvement in symptoms and impairments. JB’s progress was steady, but fluctuated frequently. Four weeks after JB started therapy, he no longer reported symptoms of referring pain down his bilateral lower extremities. Typically, his symptoms of low back pain would be minimal toward the beginning of the week and exacerbate later in the week. Although the intensity of his pain did not change significantly, JB reported that the frequency of his sharp pain significantly decreased during the time he attended therapy. JB met all of his physical therapy goals, except for the improvement in his overall pain related disability as demonstrated by his minor improvement in his Oswestry Disability Index score from a 44% disability to a 38%. By discharge, JB reported that he had not experienced sharp pain in two weeks.

Physical Therapy Diagnosis

Practice Patterns for the patient included: Pattern 4D: Impaired Joint Mobility, Motor Function, Muscle Performance, and Range of Motion Associated With Connective Tissue Dysfunction, Pattern 5E: Impaired Motor Function and Sensory Integrity Associated With Progressive Disorders of the Central Nervous System

Practice Patterns

- Pattern 4D: Impaired Joint Mobility, Motor Function, Muscle Performance, and Range of Motion Associated With Connective Tissue Dysfunction
- Pattern 5E: Impaired Motor Function and Sensory Integrity Associated With Progressive Disorders of the Central Nervous System

Discussion

Overview and Conclusion:
- Case report describes the PT management of a patient with CMT and chronic low back pain
- The patient made good progress during the 14 weeks of outpatient therapy and achieved all but one goal
- Primary focus on low back pain because JB’s primary goal was to reduce his low back pain
- Balance and decreased dorsiflexor strength were apparent, treatment shifted to include interventions that also improved balance and distal lower extremity strength
- JB showed dramatic improvements in static and dynamic balance, lumbar range of motion, overall functional strength, and frequency of intense onset of pain by the end of the fourteen weeks

Further research:
- Effectiveness of various physical therapy management strategies and interventions would benefit the current literature.
- No communication between the first and second therapist after the second therapist took over treatment
- JB’s feet could have influenced the differential diagnoses that were made and communication with the podiatrist and/or orthopedist
- Steroid shots in spine may have improved his frequency of pain during the time JB participated in physical therapy

References