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 system2. The genetic disorder is characterized by muscular wasting, weakness, and sensory loss, and is most severe in the distal lower extremities3. Common symptoms include foot drop, high-stepped gait with frequent trips and falls, foot deformities such as high arches and hammer toes, and loss of muscle bulk in the distal lower extremities4. 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 adulthood5. There is no pharmaceutical treatment for CMT. Clinical approaches include physical therapy (PT) management, orthotics, and surgical interventions for treatment of foot 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 particular patient population, especially for a patient in this age demographic, 45-65. The purpose of this case report was to provide an overview 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>
<th>Charcot-Marie-Tooth disease</th>
<th>Low back pain (LBP)</th>
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<tr>
<td>Body Functions &amp; Structures</td>
<td>Decreased tandem ROM</td>
<td>Decreased core strength and functional strength</td>
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<td>Participation Restrictions</td>
<td>Difficult bearing weight during gait activities</td>
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<td>Participation &amp; Participation Restrictions</td>
<td>Antalgic gait</td>
<td>Decreased static and dynamic standing balance</td>
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<td>Weak knee joint extensor muscles</td>
<td>Weak knee joint extensor muscles</td>
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The patient met all of his primary 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.

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

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

Findings:
- Hypertonicity of bilateral quadratus lumborum, piriformis, erector spine
- Decreased functional lumbo-pelvic stability
- Pain, weakness and decreased lumbar range of motion that limited activities in sitting, standing, and walking
- Poor static and dynamic balance

Physical Therapy Diagnosis

Summary of diagnosis included: Motor and sensory conduction delays, poor balance, and decreased functional lumbo-pelvic stability.

Short Term and Long Term 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 in 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 is to complete one full week 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.

Interventions

Core Strengthening
- Bird dog in prone
- Planks
- Transverse abdomen exercises
- Lifting and drags in semi-larnder
- Bridge

Gait Training
- Obstacle courses
- Four point gait
- Tandem
- Proprioception
- Hamstrings
- Calves
- Ankle Weights
- Hip flexors
- Gastrocnemius and soleus
- Semi-larnder squats with reaching

Balance
- Rocker board -itin to back and side-to-side
- Balance beam
- Gait training
- Cane walking
- Step up on foot with a random step
- Half knee march
- Electrical stimulation
- Soft tissue mobilization
- HSB
- Mosel heat pack

Patient Education
- Ergonomics in the workplace
- Posture
- Precautions
- Robotic hip
- Shoulder hip
- Instability

Mobility

Lumbopelvical Stability
- Champlain’s in side-lying
- Protraction

Manual
- Hip mobilization
- Joint mobilization
- Manual Tr actions

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.

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 64% disability to a 38%. By discharge, JB reported that he had not experienced sharp pain in two weeks.

References