Balance and Gait Training to Reduce Fall Risk in a Patient with Bilateral Foot and Hand Deformities Secondary to Rheumatoid Arthritis: A Case Report

Kirsten Bombardier, BS, DPT Student
Department of Physical Therapy, University of New England, Portland, Maine

Background
- Each year, one out of three adults over the age of 65 suffers a fall. Although the risk of suffering a fall increases with age, falls are not an unavoidable aspect of the aging process.1
- Fall risk can be heightened in patients with medical comorbidities that impact the physiological senses which help maintain balance.2
- Rheumatoid arthritis (RA) is a chronic inflammatory disorder that affects the lining of the joints and causes painful swelling that can eventually result in bone erosion and joint deformity.3
- The fall incidence rate in individuals with RA is 0.62 falls per person per year as compared to a fall incidence rate of 0.45 falls per person per year in healthy elderly individuals.3

Case Description
- 84 year old female who suffered a fall likely due to structural deformities secondary to RA that impaired her balance and ability to safely ambulate.
- Fall resulted in a right olecranon fracture and subsequent open reduction internal fixation for surgical repair.
- Transferred to a skilled facility for continued care.

Purpose
- To provide an overview of the physical therapy plan of care for a patient at high risk for falls.
- Procedural interventions focused on balance and gait training while accommodating for the patient’s bilateral foot and hand deformities secondary to RA.

Figure A and B: Resting position of the patient’s bilateral foot and hand deformities secondary to rheumatoid arthritis. She presented with grossly 25% of AROM in bilateral feet and hands.

Interventions
- Balance
  - Static and dynamic
  - Sitting and standing
  - Weight shifting laterally, A/P
  - Functional reaching
  - Altering visual and somatosensory input (foam, eyes closed)

- Gait
  - Verbal cuing
  - Repetition
  - Endurance
  - Dynamic gait obstacle course
  - Dual task ambulation

- Functional Training
  - Bed mobility and transfer training
  - Variable practice altering surfaces, surface height, armrestbedrails

- Strength
  - Lower extremity strengthening with ankle weights and resistance bands
  - Recumbent bike

Examination

<table>
<thead>
<tr>
<th>Tests &amp; Measures</th>
<th>Initial Evaluation Results</th>
<th>Discharge Results</th>
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</thead>
<tbody>
<tr>
<td>Bed Mobility</td>
<td>MInA to lift trunk from supine position</td>
<td>Independent</td>
</tr>
<tr>
<td>Supine to Sit</td>
<td>MInA for upper body and trunk</td>
<td>Independent</td>
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<tr>
<td>Transfers</td>
<td></td>
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<tr>
<td>Sit to Stand</td>
<td>MInA with hemi-walker, used L UE to push from surface</td>
<td>SBA with hemi-walker, used L UE to push from surface</td>
</tr>
<tr>
<td>Stand to Sit</td>
<td>MInA for controlled descent, verbal cues to reach back for surface with L UE after feeling the surface on the back of her legs</td>
<td>Modified independent with hemi-walker</td>
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<tr>
<td>Ambulation</td>
<td>1x20ft with hemi-walker and CGA</td>
<td>2x200ft with hemi-walker and distant supervision</td>
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<td>Gait Analysis</td>
<td>Unsteady gait, foot-flat contact, decreased step length, decreased cadence, forward trunk lean, out-toeing laterally</td>
<td>Unsteady gait at times, improved step length, improved cadence, continuous stepping, slight forward trunk lean, out-toeing laterally</td>
</tr>
<tr>
<td>Balance</td>
<td>Sitting</td>
<td>Standing</td>
</tr>
<tr>
<td>Static</td>
<td>Good</td>
<td>Fair*</td>
</tr>
<tr>
<td>Dynamic</td>
<td>Good</td>
<td>Fair</td>
</tr>
<tr>
<td>Activity Tolerance</td>
<td>Minimal limitations, sustained ordinary activities cause fatigue</td>
<td>Age appropriate activities do not cause increased fatigue</td>
</tr>
<tr>
<td>Time Up &amp; Go</td>
<td>78 seconds with hemi-walker and MInA for sit&gt;stand</td>
<td>48 seconds with hemi-walker and SBA for sit&gt;stand</td>
</tr>
<tr>
<td>Tinetti Performance Oriented Mobility Assessment</td>
<td>10/28</td>
<td>18/28</td>
</tr>
<tr>
<td>Falls Efficacy Scale</td>
<td>70/100</td>
<td>27/100</td>
</tr>
</tbody>
</table>

I = left, UE = upper extremity, MInA = minimal assist, sit>stand = to and from sit to stand, SBA = stand-by assist

Outcomes
- After 3 weeks of interventions, the patient achieved higher levels of independence on all mobility tasks.
- The patient ambulated with a hemi-walker on indoor surfaces 2x200ft with distant supervision.
- The patient decreased her fall risk as demonstrated by improved TUG, POMA and FES scores.

Discussion
- The patient demonstrated improved endurance, strength, balance, bed mobility, transfers and gait.
- The positive outcomes of patient-centered balance and gait training reflected upon the patient’s improved TUG, POMA and FES scores.
- Patient-centered PT with a focus on balance and gait training appeared to make significant improvements in this patient’s overall function and decrease her fall risk.
- Future research studies analyzing the efficacy of particular gait training and neuromuscular re-education interventions targeting fall risk in a population of individuals experiencing instability secondary to RA related structural changes are necessary in order to generalize the results to different patients.

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References