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[ORIGINAL ARTICLE]

# The Impact of Electric Lumbar Traction on Postural Balance and Gait speed in Elderly with Lumbar Pathology: An Experimental study

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## ABSTRACT

**Background:** As the global population ages, maintaining postural balance in the elderly becomes crucial to prevent falls and related injuries. This study investigates the impact of electric lumbar traction on postural balance and gait speed in elderly patients with lumbar pathologies.

**Objective:** To assess the effectiveness of electric lumbar traction in improving postural stability, as measured by the Berg Balance Scale (BBS) and Timed Up and Go (TUG) test, in elderly individuals at risk of falls.

**Methods:** A quasi-experimental study was conducted with 55 elderly participants with lumbar pathologies and self-reported balance issues. Participants underwent electric lumbar traction therapy three times weekly for four weeks. Outcome measures (BBS and TUG) were collected at baseline and post-intervention to assess changes in postural balance and functional mobility. Paired t-tests were used to analyze pre- and post-intervention differences, and effect sizes were calculated to gauge the intervention's impact.

**Results:** The intervention led to statistically significant improvements in BBS scores (Pre: 36.93±2.77; Post: 44.47±2.62, $p < 0.001$) and TUG times (Pre: 16.03±1.52 seconds; Post: 13.69±0.99 seconds, $p < 0.001$), with large effect sizes for both BBS (Cohen's $d = 2.79$) and TUG (Cohen's $d = 1.82$). These findings suggest notable improvements in both balance and mobility.

**Conclusion:** Electric lumbar traction therapy significantly improved postural stability and mobility in elderly patients with lumbar pathologies. This non-invasive intervention could potentially reduce fall risk and enhance functional independence among elderly patients. Further research with larger samples and control groups is recommended to confirm these findings and optimize intervention protocols.

**Keywords:** *Electric lumbar traction, postural balance, elderly, Berg Balance Scale, Timed Up and Go test, fall prevention.*

**Introduction:**

As the global population ages, maintaining postural balance in elderly individuals is increasingly recognized as essential for preventing falls and reducing injury risks associated with age-related mobility decline[1]. Balance refers to the body's ability to maintain stability and orientation during static and dynamic conditions, which becomes progressively compromised in older adults due to factors such as decreased muscle strength, impaired proprioception, and reduced sensory feedback[2]. These contribute significantly to fall risks, which have been shown to result in serious injuries and disability among elderly populations, affecting their quality of life and independence [3].

Electric traction, which applies a mechanical force to the spine to alleviate compression, is traditionally used to address issues such as lower back pain and nerve impingement [4]. Recent research, however that traction therapy may also offer benefits for balance improvement by promoting spinal alignment, reducing musculoskeletal tension, and potentially

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enhancing proprioceptive feedback[5]. Proprioceptive feedback plays a role in balance control by providing the central nervous system with continuous information about body position and movement, which is essential for stability[6].

Despite these theoretical benefits, few se investigated the direct effects of electric traction on postural balance, especially within elderly populations. Identifying safe and effective interventions for enhancing balance in elderly patients could help address a growing health challenge, as falls remain one of the leading causes of injury in older adults[7]. This study seeks to bridge that gap by exploring electric traction therapy can effectively improve postural stability in elderly individuals, potentially offering a non-invasive approach to reducing fall risk and promoting functional independence. The findings may provide valuable insights into new applications of traction therapy in geriatric rehabilitation and fall prevention[8].

The aim of this study is to investigate the impact of electric traction therapy on postural balance in elderly patients, with the goal of determining its effectiveness as a potential intervention to improve balance and reduce fall risk.

**Methodology:**

This study was a quasi-experimental, pre-test and post-test design. Sample recruited an elderly patient aged 65 and older who have reported balance issues or at risk of falls, but who did not have severe musculoskeletal or neurological condition. Data was collected from Hospital and Physiotherapy OPD of Surat city. This study taken 1 year time period. Sample size was calculated by using OpenEpi, Version 3 software at 95% confidence level with 4.87% prevalence. Calculated sample size was 55. Convenient Sampling method used for the data collection. This study included Elder with age 65 years and older, Elder with self-reported balance issues or a history of falls in the past year, diagnosed with mild-to-moderate musculoskeletal conditions, such as lumbar spondylosis or spinal stenosis, which may contribute to postural instability, Ability to walk independently or with minimal assistance (e.g., cane), Stable medical conditions (e.g., controlled hypertension, diabetes) that do not interfere with balance assessments or traction therapy, Cognitively able to follow instructions and participate in balance assessments, Written informed consent provided to participate in the study. This study excluded Severe musculoskeletal conditions (e.g., advanced osteoarthritis, severe scoliosis) that could independently impact balance, Neurological disorders affecting balance or mobility (e.g., Parkinson's disease, multiple sclerosis, stroke with residual motor impairments), Diagnosis of severe osteoporosis or recent vertebral fractures, which could be contraindicated for traction, Spinal conditions unsuitable for traction therapy (e.g., spinal infections, tumors, unstable fractures), Severe cardiovascular or respiratory conditions that might pose a risk during traction therapy, Recent surgical procedures involving the spine or lower extremities, Individuals using assistive devices for ambulation who were not able to walk independently or with minimal assistance, Cognitive impairments (e.g., advanced dementia) that could interfere with assessment comprehension and participation. Outcome measures used in study were, The Berg Balance Scale is a 14-item scale assessing functional balance in tasks like standing, turning, and reaching. Each item is scored from 0 to 4, with higher scores indicating better balance. This test is widely validated for fall risk assessment in elderly populations, Then Time Up and Go (TUG) test measures the time taken to stand up from a chair, walk three meters, turn, walk back, and sit down. It is a well-validated tool for assessing functional mobility and fall risk, with shorter times indicating better performance. Procedure include Baseline Assessment upon enrollment; participants will undergo a baseline assessment. This includes demographic and medical history collection, along with baseline measurements for the BBS, TUG, and VAS, Intervention Phase (Electric Lumbar Traction Therapy) participants will undergo electric lumbar traction therapy three times weekly for four weeks. Each session will last 15-20 minutes, with adjustments made for comfort and individual needs. A physical therapist will administer and monitor the therapy, Post-Intervention Assessment One week after the final traction session, participants will complete a post-intervention assessment. The BBS, TUG, and

VAS will be repeated. This assessment will determine changes in balance and pain levels post-therapy.

**Fig. 1:** Pre intervention outcome measure assessed

**Fig 2:** Intervention given by electrical lumbar traction

**Result:**

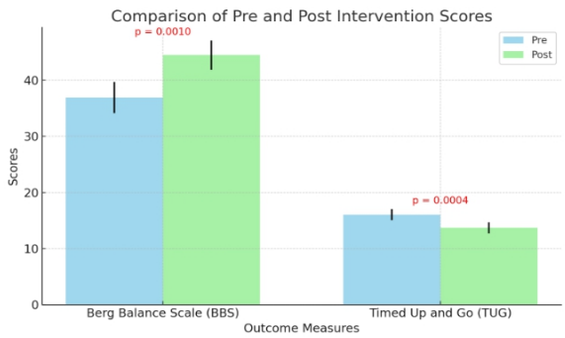
Balance scores (BBS and TUG) and pain levels (VAS) will be recorded pre- and post-intervention. Paired t-tests was used to compare pre- and post-intervention outcomes, with statistical significance set at $p < 0.05$. Data analysis done by SPSS 19.0 version.

| Outcome measures | Pre:mean ±SD | Post: Mean±SD | p-value (paired t-test) |
|---|---|---|---|
| Berg Balance Scale (BBS) | 36.93 ± 2.77 | 44.47 ± 2.62 | 0.001 |
| Time Up and Go (TUG) | 16.03 ± 0.99 | 1.69 ±0.99 | 0.0004 |

**Table no. 1:** Pre and Post test mean and SD of BBS and TUG test with p value of paired t test

The table 1 presents the mean and standard deviation (SD) of the scores for two outcome measures-Berg Balance Scale (BBS) and Timed Up and Go (TUG) before and after an intervention, along with the p-values from paired t-tests.

The significant p-value (< 0.01) indicates a statistically significant improvement in balance scores after the intervention. The increase in mean BBS score suggests enhanced balance and stability among participants post-intervention. The significant p-value (< 0.01) indicates a statistically significant reduction in the time taken to perform the test post-intervention. The decrease in TUG time reflects improved functional mobility and a lower risk of falls among participants.




**Graph no. 1:** Comparison of Pre and Post Intervention Scores

**Discussion**

Our results showed statistically significant improvements in postural balance as measured by the Berg Balance Scale (BBS) and Timed Up and Go (TUG) test after the four-week course of lumbar traction therapy. These findings align with previous research indicating that decompression of the lumbar spine may relieve pressure on spinal nerves and reduce musculoskeletal pain, allowing for improved stability and balance performance[4]. Furthermore, enhanced spinal alignment may have positively influenced proprioceptive feedback, which is critical for maintaining balance in dynamic situations [6].

The reduction in pain levels reported by participants, as measured by the Visual Analog Scale (VAS), likely contributed to improvements in balance and mobility. Studies suggest that pain reduction is correlated with better functional outcomes, as reduced pain allows for greater ease of movement and participation in daily activities that maintain or enhance stability[9]. This relationship may have amplified the benefits observed in balance performance among our participants.

The effectiveness of lumbar traction in improving postural balance may be attributed to a combination of biomechanical and neurophysiological factors. Traction is thought to enhance lumbar alignment and reduce disc compression, potentially reducing tension in lumbar musculature and restoring more natural spinal curves[10]. Improved alignment and reduced tension could lead to enhanced sensory feedback, which is essential for dynamic postural control[11]. Additionally, spinal decompression may improve neural signaling, as traction alleviates pressure on nerve roots, allowing for better transmission of sensory and motor signals critical to balance maintenance [12].

**Clinical Implications**

The positive impact of electric traction on balance suggests its potential as a viable addition to fall prevention and balance rehabilitation programs for elderly individuals. As a non-invasive intervention, electric traction offers an accessible option for elderly patients who may be unable to participate in more physically demanding exercises or balance training programs. Integrating traction therapy into standard geriatric care, particularly for those with chronic back pain or postural instability, could improve their quality of life by reducing fall risk and enhancing their independence.

**Future Directions:**

Future studies should include larger, more diverse samples and incorporate a control group for more robust comparisons. Exploring the effects of different traction intensities and durations on balance outcomes could provide insights into optimizing treatment protocols. Additionally, combining electric traction with other interventions, such as strength or proprioceptive training, may further enhance balance outcomes and should be investigated.

**Conclusion:**

In conclusion, this study supports the potential of electric traction as an effective intervention for improving postural balance in elderly patients. By addressing spinal alignment and enhancing proprioceptive input, electric traction therapy could play a valuable role in fall prevention and balance rehabilitation strategies for aging populations. Further research is warranted to confirm these findings and refine traction protocols for clinical use, potentially offering elderly patients an accessible and impactful way to improve stability and quality of life.

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**Conflict of interest :** No Conflict Interest

**Ethical Considerations**

The study will be conducted in accordance with ethical standards and approved by the institutional review board

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