BACKGROUND

According to the National Spinal Cord Injury Statistical Center, as many as 300,000 people in the United States are living with spinal cord injury (SCI). Every year, there are approximately 12,000 new cases of SCI in the United States. Less than 1% of those with SCI will experience complete recovery; highlighting the need for effective therapeutic interventions after neurologic damage has occurred. A common theme in literature on neurological recovery is that specific and intensive motor training induces adaptive neurological reorganization, also known as plastic changes. Moreover, persistent responsiveness to sensory and motor input, and the plastic changes that result, can occur after incomplete SCI because the spinal cord remains partially preserved and interconnected with the intact brain 1,2. Thus, neuroplasticity based interventions shown successful in conditions such as stroke may also be effective in incomplete SCI. Current evidence indicates that a non-invasive form of brain stimulation called transcranial direct current stimulation (tDCS) facilitates upper extremity motor recovery after stroke 3. However, no available data indicates the extent to which tDCS may enhance the effects of lower extremity motor training in patients with incomplete SCI. Here, we present a case series evaluating the effectiveness of tDCS delivered before robot-assisted treadmill training to promote functional motor recovery in 4 subjects with incomplete SCI.

METHODS

Four subjects with severe gait deficit following incomplete SCI received anodal tDCS immediately preceding 1 hour of robot-assisted treadmill training (Lokomat, Hocoma, Inc, Zurich, Switzerland) 4, 5, 6, 7. The Lokomat exoskeleton facilitates a bilaterally symmetrical gait pattern as (a) supported gait training on a bodyweight-supported treadmill 8. Moreover, this study is funded by the Christopher and Dana Reeve Foundation (304B107976). We thank the participants and caregivers for their time and effort. We also thank Cheryl Carrico, MS, OT/L for skilful editing.

RESULTS

Marked improvement occurred in all measures. Especially notable was the increase in walking speed measured with the 10-Meter Walk Test. The mean improvement in walking speed was over 5 times greater than the improvement reported in a recent randomized clinical trial of robot-assisted treadmill training alone (no tDCS) for subjects with SCI 9.

CONCLUSION

This case series demonstrates that tDCS coupled with robot-assisted gait training on a body-weight supported treadmill carries great potential for strategies to improve gait recovery in incomplete SCI. This data represents preliminary results of an ongoing study. We plan to enroll additional subjects in order to (a) determine the difference in effects when compared with a control group and (b) establish the impact of this intervention on activities of daily living and quality of life.

REFERENCES