

MODULATION OF MOTOR AND CEREBELLAR FUNCTION USING TMS AND TSMS IN SPINOCEREBELLAR ATAXIA TYPE 3: A CASE-BASED INSIGHT

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Background

Spinocerebellar ataxia type 3 (SCA3) is the most common autosomal dominant ataxia worldwide, with a known cluster in the Azores islands. It is caused by a CAG repeat expansion in the ATXN3 gene, leading to progressive neurodegeneration involving both cerebellar and extracerebellar regions. This disrupts cerebellar-cerebral and striatal-cortical pathways, ultimately causing motor and functional impairments. Patients develop progressive gait ataxia, dysarthria, and impaired coordination. As the condition advances, individuals increasingly rely on assistance for mobility, experience substantial functional decline, and face reduced life expectancy. Currently, there is no disease-modifying treatment available for SCA3. Repetitive transcranial magnetic stimulation (rTMS) is a non-invasive brain stimulation technique that has been shown to improve symptoms in patients with neurodegenerative cerebellar ataxias. A recent study suggested that transspinal magnetic stimulation (TsMS) applied to the thoracic region between vertebrae T3-T4 improved gait speed in SCA3 patients.

Case report

A 50-year-old female diagnosed with SCA3, originally from São Miguel Island (Azores), underwent 1 hour and 15 minutes of 10 Hz rTMS (50 pulses × 40 trains applied to the M1 leg area; 50 pulses × 60 trains to the cerebellum) and 5 Hz TsMS theta burst (20 pulses, 20 bursts) for five consecutive days. Between each pulse train, lasting 25 seconds, the patient performed physiotherapy exercises targeting improvements in posture, gait and dysmetria, under a physiatrist-guided rehabilitation plan. The Scale for the Assessment and Rating of Ataxia (SARA), the International Cooperative Ataxia Rating Scale (ICARS), and the Timed Up and Go Test (TUG 3M) were assessed before and after treatment, showing significant clinical improvement.

Conclusion

Our results with high-frequency rTMS and TsMS therapy showed improvement in SARA, ICARS, and TUG 3M scores, suggesting that this therapy could be promising for enhancing posture, gait, and limb kinetic function. However, larger randomized controlled trials are needed to confirm these findings.

Keywords: SCA, 3;, rTMS;, TsMS;, ataxia