



Deep Transcranial Magnetic Stimulation with the H4 Coil for Smoking Cessation: A Three-Patient Case Series

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Abstract: Background: Deep repetitive transcranial magnetic stimulation (DrTMS) using the H4 coil is a non-invasive neuromodulation intervention cleared by the U.S. Food and Drug Administration as an aid for short-term smoking cessation in adults. This case series describes short-term clinical changes in three smokers treated with the H4-coil protocol. **Case presentation:** Two men and one woman, mean age 44.3 years, completed 10 daily sessions of H4-coil DrTMS. The protocol used 10 Hz stimulation, 3-second trains, 15-second inter-train intervals, and 60 trains per session, giving 1,800 pulses per session. **Results:** Mean Fagerström Nicotine Dependence Scale (FNDS) score decreased from 7.0 to 3.0 and mean exhaled carbon monoxide from 14.7 ppm to 9.3 ppm. Mean FEV1/FVC increased from 78.7% to 82.0%, PEFR from 5.30 to 6.87 L/s, and FEF 25–75 from 2.61 to 3.40 L/s. **Conclusion:** In this three-patient case series, 10 sessions of H4-coil DrTMS were followed by reduced nicotine-dependence scores, lower exhaled carbon monoxide values, and improved spirometry-related indices. These observations are descriptive and hypothesis-generating; because the sample was small, uncontrolled, and short term, treatment efficacy and causality cannot be established.

Keywords: deep transcranial magnetic stimulation; H4 coil; smoking cessation; nicotine dependence; case series; Fagerström Nicotine Dependence Scale; pulmonary function

INTRODUCTION

Nicotine dependence is difficult to treat, especially in people with long smoking histories and comorbid clinical conditions. DrTMS can modulate cortical and deeper neural networks involved in craving and addictive behaviour. The BrainsWay H4 coil targets addiction-related circuits, including the bilateral insula and prefrontal cortex, and is cleared by the U.S. FDA as an aid for short-term smoking cessation in

adults. We report clinical and spirometry-related changes in three patients who received a short H4-coil DrTMS course for smoking cessation.

The series included three adults: a 49-year-old woman, a 37-year-old man, and a 47-year-old man. All had active smoking and alcohol use recorded; smoking history ranged from 23 to 25 years. One patient had hypertension and one had diabetes

mellitus. Baseline and post-treatment outcomes were recorded using FNDS, exhaled carbon monoxide, FEV1/FVC, PEFR, and FEF 25–75.

MATERIALS AND METHODS

All three patients received the US FDA-cleared BrainsWay H4-coil DrTMS smoking-cessation protocol. Stimulation was delivered at 10 Hz with 3-

second trains, 15-second inter-train intervals, and 60 trains per session, yielding 1,800 pulses per session. Each patient received one session daily for 10 consecutive days. Patients were monitored clinically for treatment-emergent adverse effects, including scalp discomfort, headache, dizziness, tinnitus, sleep disturbance, anxiety, and the rare risk of seizure.

RESULT

Table 1 summarises the cohort characteristics.

Table 1. Patient-level changes after 10 sessions of H4-coil DrTMS.					
Patient	FNDS	Exhaled CO, ppm	FEV1/FVC	PEFR, L/s	FEF 25–75, L/s
Case 1	7 → 4	18 → 11	75% → 80%	3.26 → 5.37	2.33 → 3.26
Case 2	6 → 2	15 → 8	82% → 85%	6.88 → 8.82	2.35 → 3.17
Case 3	8 → 3	11 → 9	79% → 81%	5.76 → 6.41	3.15 → 3.76
Mean change	–4.0	–5.4 ppm	+3.3 %	+1.57 L/s	+0.79 L/s

Nicotine-dependence and carbon-monoxide outcomes:

Dependence and smoke-exposure measures improved in all patients. Mean FNDS decreased from 7.0 to 3.0 and mean exhaled carbon monoxide decreased from 14.7 ppm to 9.3 ppm.

Pulmonary-function outcomes:

Although a small change, pulmonary-function measures also changed in a favourable direction. Mean FEV1/FVC increased from 78.7% to 82.0%, PEFR from 5.30 to 6.87 L/s, and FEF 25–75 from 2.61 to 3.40 L/s.

DISCUSSION

This case series describes short-term outcomes after 10 sessions of H4-coil DrTMS for smoking cessation. The main finding was consistent improvement in both a dependence measure and an objective smoke-exposure marker. The parallel reduction in FNDS and exhaled carbon monoxide suggests a clinically meaningful early response, although the uncontrolled design prevents causal inference.

The findings are consistent with the rationale of the H4-coil smoking protocol, which targets addiction-related insula–prefrontal circuits involved in craving, salience, and inhibitory control. In practice, DrTMS may be considered an adjunct to counselling, relapse-prevention strategies, and biochemical monitoring rather than a stand-alone cessation treatment.

The respiratory findings are supportive but exploratory. Improved FEV1/FVC, PEFR, and FEF 25–75 may reflect reduced smoke exposure, better airway mechanics, repeat-test effort, or normal variability. These measures may help patient counselling but should not be interpreted as proof that DrTMS directly improves lung function.

CONCLUSION

In this three-patient case series, H4-coil DrTMS was

followed by favourable short-term changes in nicotine dependence, exhaled carbon monoxide, and pulmonary-function indices. The findings support further controlled evaluation of H4-coil DrTMS as an adjunctive smoking-cessation intervention.

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