

# Recurrent refrains in a patient on Natalizumab for multiple sclerosis: Earworms or musical hallucinations?

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## Introduction

Pathological repetitive musical perception in which the experience is either involuntary or perceived as beyond the control of the individual has been associated with multiple etiologies and is a much more significant symptom. This is not infrequently present in the general population and some would argue a vital component to successful marketing.

Musical hallucinations due to neurological disease include focal brain lesions, epilepsy, hearing impairment and intoxication<sup>3</sup>. Hallucinations may occur in 10% of multiple sclerosis [MS] patients as neuropsychiatric manifestations of the disorder<sup>4</sup> or as a consequence of medications<sup>5</sup>. However, the occurrence of primarily musical hallucinations in MS is a rare event but still remains an important cause for significant distress.

## Objective

Spontaneously perceived, repetitive music without an external stimulus is a common phenomenon and has been reported by several investigators<sup>1</sup>. The music usually consists of short pieces of “catchy” tunes that replay in the mind (earworms). Musical and auditory hallucinations are well-described in certain neurological and psychiatric diseases<sup>2</sup>.

Here we describe a case of a 54 year old woman presenting with a long history of Multiple Sclerosis (MS). A year after starting a new medication (natalizumab) due to her progressive MS, she experienced hearing repetitive strange words and melodies in her mind. This continued even when she interrupted her treatment with natalizumab.

## Case Report

The patient is a right handed woman who has a history of long standing MS. Due to continued relapses and progressive disease the patient was started on natalizumab in 2010. A year later she started hearing repetitive strange words and melodies in her mind. She does not have a history of hearing loss, epilepsy, or psychiatric disease. Neither does she have a history of obsessive compulsive disorder [OCD]. She has not responded to any treatment. Since interruption of treatment with natalizumab made no difference, the patient remains on this medication.

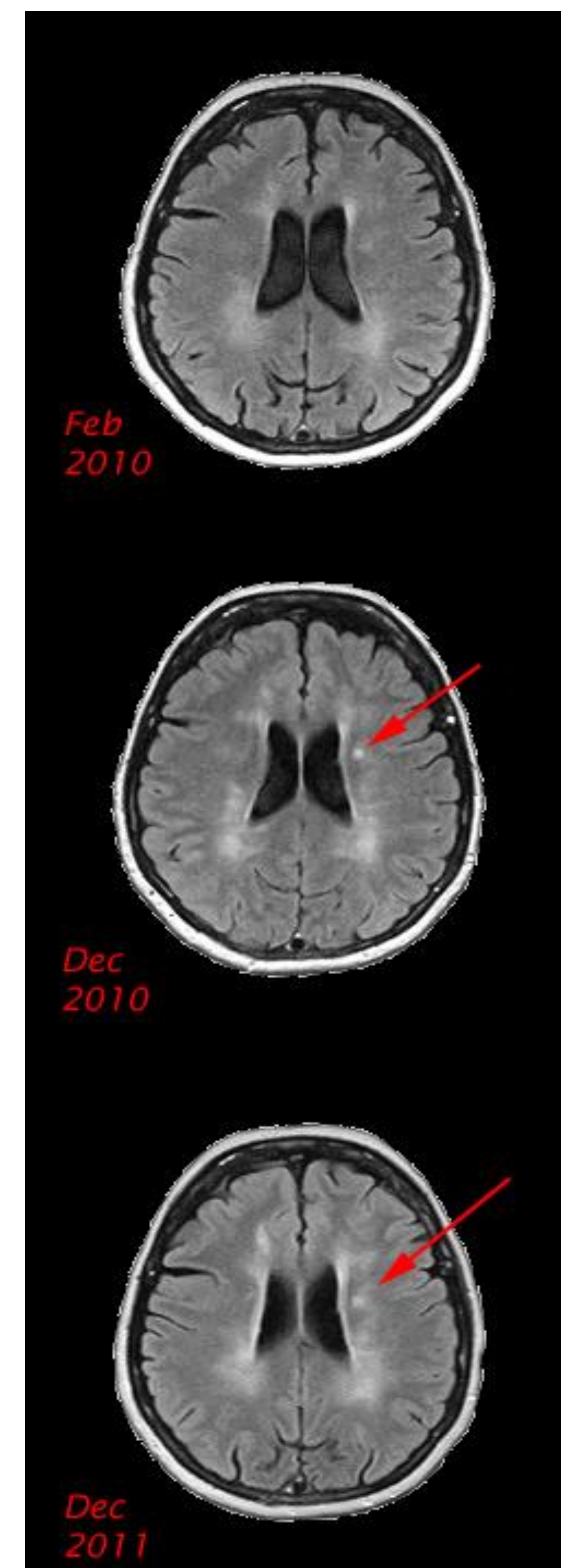
She hears words like “jabberwocky” and “killer alert” several times in a day. In addition, the repetitive refrains heard in her mind are phrases from the first and last lines of verses of familiar country western songs that are accompanied by music. The incessant replay of lyrics is distressing and prevents her from falling asleep. The songs persist during normal conversation and the only way she is able to dampen them is by putting on headphones and listening to an external source of music.

Pertinent findings on examination reveal normal mental status and hearing. Serial MRIs of the brain since 2010 have shown a new, non-enhancing 5mm focus in the left frontal deep white matter, chronic periventricular white matter changes, and an increase in the white matter foci in the right centrum semiovale. She is JC virus antibody positive. Lumbar puncture shows protein level of 52 mg/dL, glucose of 54 mg/dL, 2 WBCs, 2 oligoclonal bands, negative bacterial cultures, and negative PCR for JC virus. EEG is normal.

## Discussion

This case brings up the question whether her symptoms are “earworms” or true musical hallucinations. The replay of familiar lyrics, without an external source, is reminiscent of intrusive thoughts. However, our patient is demonstrating more complex features with unremitting symptoms for two years. She also hears a band accompanying the songs, and they could be musical hallucinations instead. Since her experiences are not mood aversive or congruent it is very possible that they may have a neurologic basis rather than a psychiatric origin.

Figure 1. Sequential MRI of subject



## Discussion Continued

Review of the literature shows that the areas of the brain activated in musical hallucinations are similar to those involved in normal perception of music<sup>6</sup>. The results from functional imaging have led to theories that propose an imbalance of excitatory and inhibitory influences on the auditory pathways as a cause for musical hallucinations<sup>7</sup>. Our case with demonstrable white matter lesions on MRI may be an example of an auditory form of ‘Charles Bonnet Syndrome’. The musical hallucinations could be due to “deafferentation” in pathways involved with music perception. Further work is needed to understand the pathophysiology of musical phenomenon in neurological diseases like multiple sclerosis.

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## Disclosure

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