

## The inferior frontal gyrus and cough

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### Abstract

We present a case of a patient with a tumor close to the right inferior frontal gyrus. The only symptom this patient had was a disturbing dry cough. After removal of the tumor the cough disappeared immediately. Review of the literature showed that there is a control center of voluntary cough in the right inferior frontal gyrus. Our case suggests that there might be such a center, which can be affected by a tumor close to it.

### Introduction

There are a number of studies dealing with the cough reflex center and its function. However, only a few studies could identify supramedullary centers, which are involved in the control of voluntary cough. We present an interesting case of a patient with cough, which completely disappeared after removal of a tumor close to the inferior frontal gyrus.

### Case Report

We report the case of a 59-year old female patient, which was diagnosed and operated on a precentral glioblastoma. One month after radiation and chemotherapy she received a control magnetic resonance imaging (MRI). In this MRI a new glioblastoma, which was not in approximation with the first tumor could be seen. The new tumor was localized in the right medial frontal gyrus, with edema extending into the inferior frontal gyrus (Figure 1).

It was interesting that the patient complained about a disturbing persisting dry cough, which started a month before the MRI. The cough appeared all over the day without any provocation (no stimuli). The cough appeared in bouts. No other changes in the breathing of the patient could be observed. Internal medicine evaluation did not identify any pathology explaining the cough. Immediately after surgical removal of the tumor the cough disappeared.

### Discussion

Search of the literature in PubMed about cough control in the central nervous system (CNS) and cough reflex, shows that the cough reflex is controlled by the brain stem, and can be initiated even in anesthetized or comatose individuals.<sup>1</sup> Therefore it seems that neural processing above the brainstem level is not essential.<sup>1</sup> However, in the excellent review of Mazzone *et al.*,<sup>2</sup> the authors discuss the neural circuits of voluntary cough and cough suppression. The authors show in fMRI studies the existence of suprapontine involvement of voluntary cough induction and suppression.<sup>2</sup> It is also known that humans can voluntarily evoke or suppress cough.<sup>3</sup> It is very interesting that suppression of cough is controlled by centers located in the anterior insula, supplementary motor area, motor cingulate cortex and the right inferior frontal gyrus.<sup>3</sup> There is an inhibitory network involving the above-mentioned areas.

Despite of the new studies, which show a supramedullary cough control mechanism in animals, there is little known about the exact mechanism of this control areas in humans.

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Another interesting study of McGovern *et al.*<sup>4</sup> showed that after inoculation of the trachea of rats with a herpes virus, the virus was transported anterogradely to the significant centers of the CNS, which play a role in the perception of airway sensation. Included in this circuit

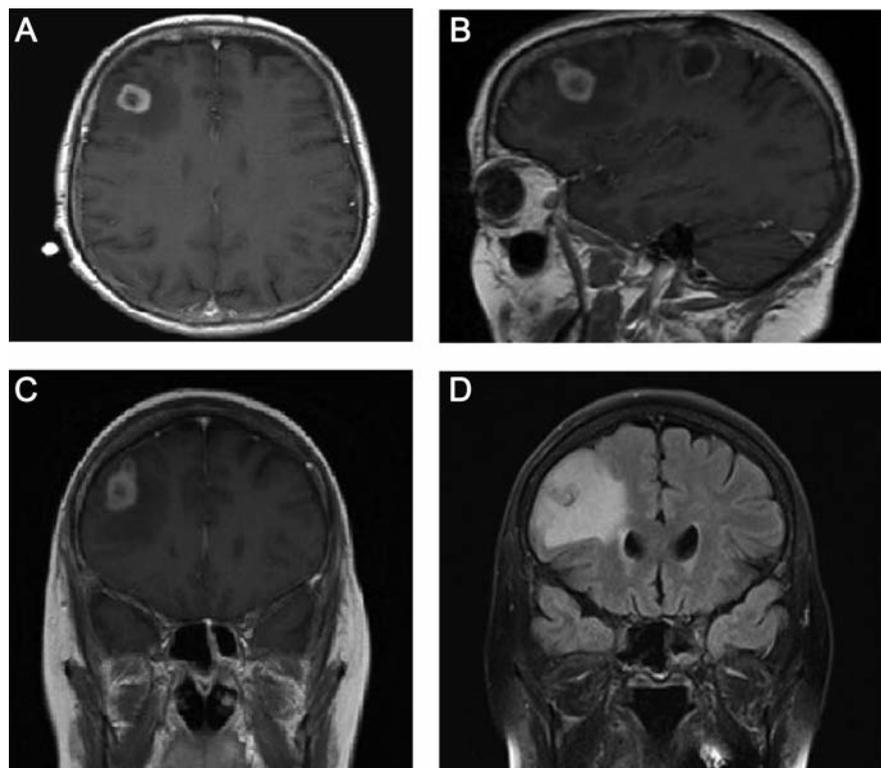


Figure 1. Frontal tumor with compression of the inferior frontal lobe. A) T1 contrast enhanced magnetic resonance imaging (MRI) showing the frontal tumor and the peritumoral brain edema (transverse section); B) T1 contrast enhanced MRI sagittal section; C) Coronal section of the tumor; D) Coronal section T2 weighted image showing the extent of peritumoral edema.

were forebrain regions like the orbital cortex.<sup>4</sup> Also their exact anatomical position as well as their existence in humans has to be proven, in the present letter we show that the inferior frontal cortex, which was clearly compressed by perifocal edema could indeed be involved in the mechanism of cough or cough suppression. Immediately after tumor removal and decompression of the area the patient's cough disappeared. Although we are aware that we provide data based on only one patient and that we could not confirm such a symptom in a series of patients and that the observation of

our case has to be seen critically, the disappearance of the cough was striking.

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