



Case report

Bitemporal independent 3-Hz spike-and-waves in adult patient with idiopathic generalized epilepsy and Graves disease



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ABSTRACT

Objective: We present a case of idiopathic generalized epilepsy (IGE) with seizures manifesting in the context of Graves disease and unusual interictal EEG pattern of bilateral independent 3 Hz spike and wave activity.

Case report: A 33-year old man with three generalized tonic-clonic seizures (GTCS) in history admitted for overnight video-EEG. At the age of 28, he had his first seizure soon after being diagnosed with Graves' disease. For four years, he received thiamazole and then underwent total thyroidectomy. EEG showed a high number of generalized 3-Hz spike-and-wave discharges (GSWD) but also revealed numerous runs of bitemporal independent lateralized 3-Hz spike-and-wave activity (LSWA). GSWD and LSWA were mostly independent and had slightly different morphology. A diagnosis of IGE with GTCS upon awakening was made. On levetiracetam therapy, the patient demonstrated no seizure recurrence during 2-year follow-up. Repeated overnight EEG showed significant GSWD reduction and complete LSWA suppression.

Discussion: To our knowledge, in patients with IGE, strictly lateralized spike-and-wave activity was never reported. In this case, thyroid dysfunction seemed to increase propensity to generate spontaneous seizures. We speculate that thyroid dysfunction superimposed on IGE thalamocortical network oscillations resulted in uncommon bitemporal independent LSWA.

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1. Introduction

Thyrotoxicosis has a variety of neurological manifestations, including seizures. Thyroid hormones are known to play an important part both in the normal development of the maturing brain and in neuronal interaction and functioning (Tamijani et al., 2015). We present a case of a patient with idiopathic generalized epilepsy (IGE) with seizures manifesting in the context of Graves disease and unusual interictal bitemporal 3 Hz spike and wave activity in the EEG.

2. Case

A 33-year old right-handed man admitted for overnight video-EEG with a history of three generalized tonic-clonic seizures (GTCS) at the age of 28, 32 and 33 years. All seizures occurred early

in the morning upon awakening. At the age of 27 he began to experience irritability, heart palpitation, episodes of increased blood pressure, and hand tremor. Upon investigation serum his thyroid stimulating hormone (TSH) was 0.01 U/l, TSH antibodies were elevated (24.17 U/l) and thyroid gland was enlarged. The patient was diagnosed with Graves disease, and treatment with thiamazole was initiated. Two months later he had his first GTCS. Therapy with thiamazole lasted for four years before total thyroidectomy was performed. Further medication with levothyroxine was prescribed. Two weeks after thyroidectomy the patient had a second GTCS. One year later another GTCS occurred, and upon consultation his doctor requested EEG. Neurological examination was normal, except for hand tremor. There was no history of febrile seizures and head trauma, he never received any antiseizure medications (ASM). Brain MRI was unremarkable.

EEG showed a high number of generalized 3-Hz spike-and-wave discharges (GSWD) lasting up to 12 s (Fig. 1A). During sleep GSWD increased, but became shorter and fragmented, with high proportion of epileptiform K-complexes. In addition to GSWD, EEG recording contained multiple either short or prolonged (up

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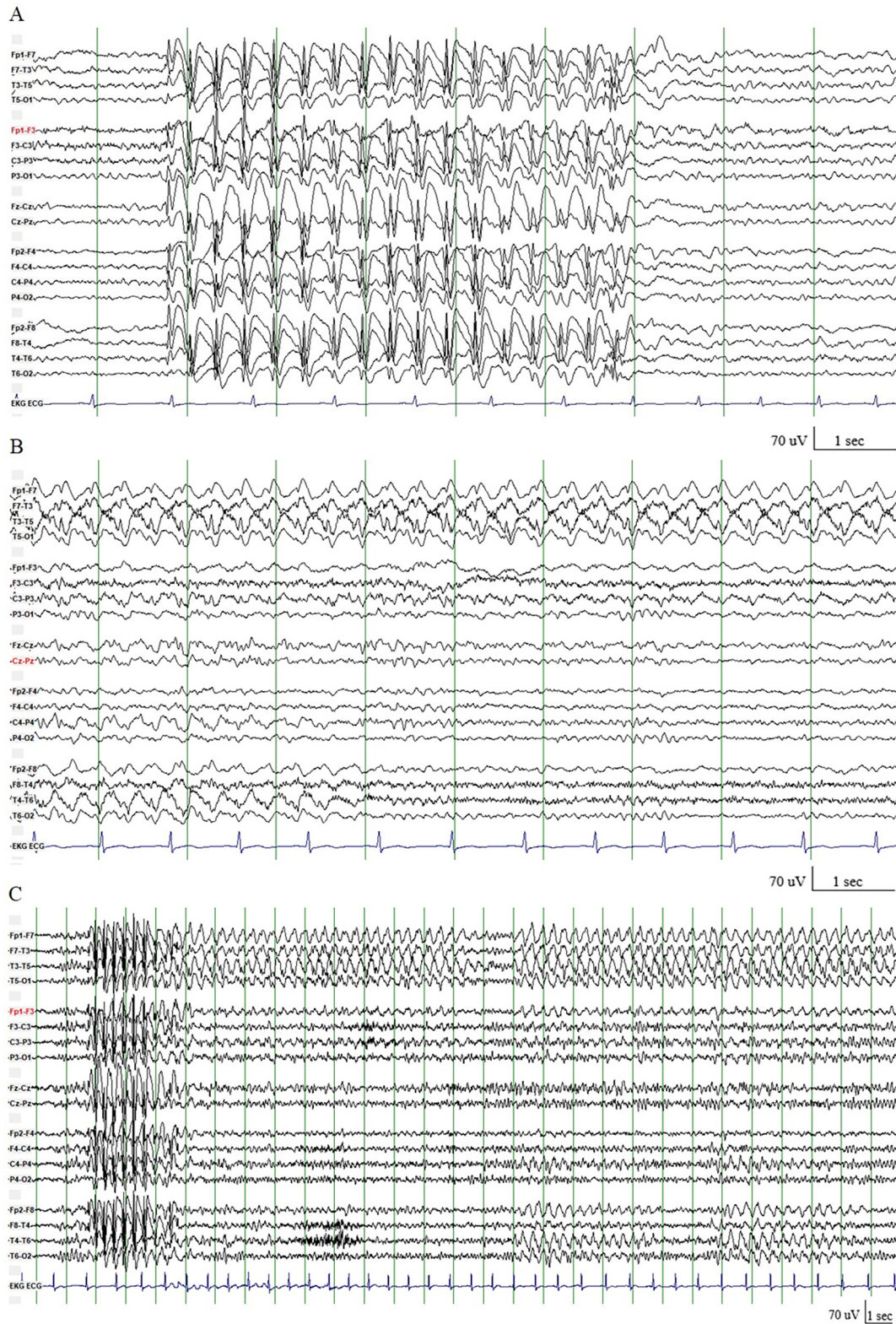


Fig. 1. (A) Generalized 3 Hz spike-wave discharges (GSWD); (B) Bitemporal independent 3 Hz spike-wave activity; (C) GSWD, followed by prolonged runs of bitemporal spike-waves.

to 30–40 s) runs of bitemporal independent lateralized spike-and-wave activity (LSWA), with longer ones prevalent on the left side (Fig. 1B). Frequency of LSWA was also 3 Hz. During sleep the quantity of LSWA decreased significantly, with only few short 1–3 s

runs with frequency of 2–2.5 Hz. There was no increase of either GSWD or LSWA during photic stimulation or hyperventilation. Morphologically LSWA were of smaller amplitude than GSWD, spike component in relation to slow wave was also smaller in

LSWA. Frequency of both GSWD and LSWA was rather stable, decreasing for less than 0.2–0.3 Hz to the end of prolonged runs. In wakefulness more than half (56 out of 78) GSWD were immediately followed by runs of LSWA (Fig. 1C), whereas only five GSWD were preceded by LSWA. Testing performed during prolonged runs of both GSWD and LSWA revealed no discernible impairments of consciousness.

Since there were no indications on myoclonia or absences, the patient was diagnosed as a case of IGE with GTCS upon awakening. Treatment with levetiracetam was initiated at 1000 mg twice daily. There was no seizure recurrence during 2-years follow-up. Overnight EEG was repeated 3 and 12 months after the initiation of therapy. There was a dramatic three-times decrease (from 520 to 170) of GSWD number and complete suppression of LSWA in the second recording. In the third EEG performed one year later, only few epileptiform K-complexes were found with no LSWA. At the time of EEG studies thyroid function was controlled by levothyroxine at 150 mcg daily.

3. Discussion

The first seizure in our patient occurred six weeks after he was diagnosed with Graves disease and started to receive thiamazole. Seizures are a well-known but rare neurological complication of thyrotoxicosis. Song et al. (2010) estimated their prevalence to be as low as 0.2%. Seizures can also be observed in patients with previously hypothyroid state as an iatrogenic complication of thyroxine administration. Antithyroid treatment might prevent recurrence of seizures in such cases. EEG changes reported in patients with hyperthyroidism are various and nonspecific, including diffuse, bilateral or regional slowing, increased frequency of alpha-rhythm, increase of fast activity, altered responsiveness to photic stimulation (Leubuscher et al., 1988). If seizures persist after antithyroid treatment, one should consider coexistence of epilepsy in a patient. There are few case reports on patients with IGE and thyroid dysfunction. Su et al. (1993) presented two cases of Graves disease diagnosed in female teens with seizures and EEG resembling IGE. Seizures control was achieved only by combined ASM and antithyroid treatment. Obeid et al., (1996) et al. reported absence seizures which were exacerbated in a 35-year old woman with previously well controlled JME after administration of thyroxine due to simple goiter. In the clinical case described by Maeda and Izumi (2006), antithyroid treatment alone, without ASM, abolished diffuse spike-wave discharges EEG in a 13-year old patient with Graves disease and GTCS. The authors suggested that susceptibility to develop seizures in IGE was enhanced by his hyperthyroid condition.

GSWD in EEG of our patient are characteristic for IGE. The unusual EEG findings were concurrent prolonged runs of bitemporal independent 3-Hz spike-waves. It is well known that EEG in IGE, especially in juvenile myoclonic epilepsy, may have focal features. Nevertheless, strictly lateralized spike-wave activity confined to temporal regions has never been reported before in patients with IGE. GSWD and LSWA were mostly independent by time of appearance, were differently modulated by sleep and had slightly different morphology. Often GSWD were followed immediately by LSWA, but not vice versa. Given the fact that the lateralized discharges have a frequency like the generalized discharges and disappear under treatment, we can assume that the underlying mechanisms are similar.

It seems that in our patient propensity to generate spontaneous seizures was increased and became overt by thyroid dysfunction. Both EEG patterns responded well to levetiracetam. We speculate that unusual bitemporal independent 3-Hz spike-wave activity in this case might be the result of changes in neuronal excitability caused by thyroid dysfunction superimposed on pathological thalamocortical network oscillations of IGE.

Authors contributions

A.B.: study concept, interpretation of results, manuscript drafting. A.B-B., T.N.: study supervision, data analysis, manuscript drafting, interpretation of results. S.D., A.A., A.L, data analysis, interpretations of results. All authors reviewed and approved the manuscript.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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