

## Sexual behaviour change in seronegative limbic encephalitis due to the involvement of the left amygdala

Asuman Orhan Varoglu,<sup>1</sup> Hasan Turan Karatepe<sup>2</sup>

### Abstract

Limbic encephalitis (LE), a rare cause of encephalitis, generally presents with neuropsychiatric manifestations, memory deficits, seizures, and movement disorders. The case of a 41-year-old female patient with LE involving the left amygdala is presented. The patient was admitted to the emergency department with complaints of unconsciousness and seizures. Paraneoplastic and limbic markers were negative. This case was diagnosed as seronegative LE. Three to four months after the diagnosis, it was observed that her sexual preference changed to the female sex. No report has been published so far, concerning any case of LE associated with changes in sexual behaviour. The patient was treated with intravenous methylprednisolone (IVP) and triple antiepileptic therapy. After treatment, changes in sexual behaviour returned to the previous state.

**Keywords:** Limbic encephalitis, Sexual behaviour, Autoimmune encephalitis, Paraneoplastic syndrome, Left amygdala, Homosexual.

**DOI:** <https://doi.org/10.47391/JPMA.4480>

### Introduction

Limbic encephalitis (LE) patients present with symptoms attributed to dysfunction of mesial temporal lobe structures. Prominent symptoms include short-term memory loss and behavioural disturbances.<sup>1</sup> The cause of the main neuropsychiatric symptoms of LE is the involvement of the amygdala. This region is a core area of the limbic system that regulates the control of positive and negative effects, modulation of social behaviour, memory, cognition functions, and behavioural adaptation to stress.<sup>2</sup>

There are a few reports presenting psychosis and other psychiatric disturbances with LE.<sup>1</sup> The case presented here is of a female patient with seronegative limbic encephalitis with left amygdala involvement, who changed sexual behaviour by preferring women as sexual partners. There is no report related to changing sexual

.....  
<sup>1</sup>Department of Neurology, <sup>2</sup>Department of Psychiatry, Medical School, Istanbul Medeniyet University, Istanbul, Turkey.

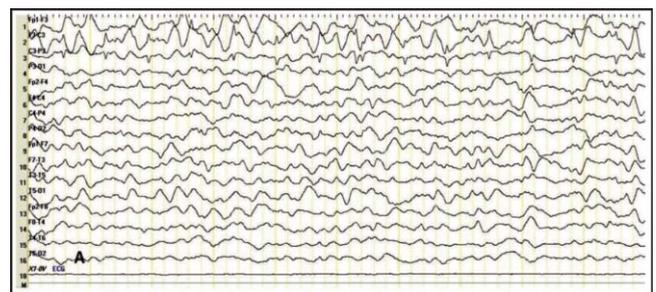
**Correspondence:** Asuman Orhan Varoglu. Email: [asumanorhan69@gmail.com](mailto:asumanorhan69@gmail.com)

behaviour in limbic encephalitis in the literature. It is the first case describing this kind of behavioural change in the published reports.

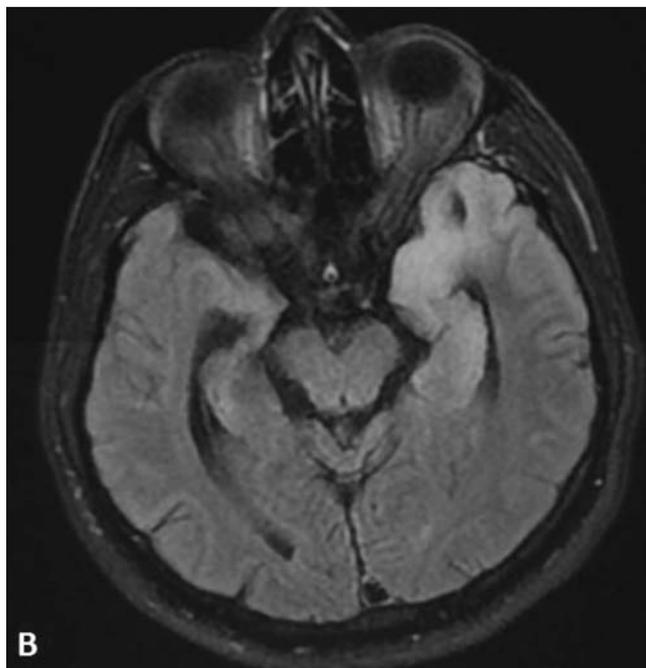
### Case Report

A 41-year-old female patient presented to the emergency service of Istanbul Medeniyet University on 26/06/2014 with complaints of dizziness, nausea, vomiting, and focal seizures lasting for three days. The patient had inappropriate symptoms such as laughing and crying and staring blankly. Besides these gradually developing complaints of the patient, she was shifted to the emergency department due to epileptic seizures. The secondary generalized epileptic seizures were controlled with triple antiepileptic therapy. The medical and psychiatric history of the patient and her family were negative. The patient is married for 15 years with two children.

Neurological examination revealed the presence of confusion. The patient's orientation to place, person, and time was partially impaired, and no pyramidal signs were found. Meningeal irritation signs were not observed. Body temperature was 36°C. Electroencephalogram (EEG) showed the presence of diffuse slow activities at a theta frequency of 4-5 Hz as a background activity and much higher amplitude polymorphic delta paroxysms in the left frontocentrotemporal regions (Figure-A). Magnetic resonance imaging (MRI) showed hyperintense lesions in the left amygdala (Figure-B). The lumbar puncture (LP) evaluation revealed that the opening pressure was 180 mm H<sub>2</sub>O. No cells were seen in the cerebrospinal fluid (CSF). Biochemistry and culture were also normal. PCR



**Figure-A:** An electroencephalogram showed the slow activity appeared as commonly, and sharp and wave paroxysms at the left fronto-centro-temporal regions.



**Figure-B:** Axial FLAIR MRI image shows the lesions are hyperintense involving left amygdala.

investigation for Herpes Simplex Encephalitis was negative. Serum sodium levels were 130 mmol/L (reference range is from 135 to 145 mmol/L).

The collagen tissue disease and ischaemic stroke were excluded. Paraneoplastic markers such as anti-Hu, anti-PNMA2, anti-amphiphysin, anti-Ri, anti-Yo, anti-Ri, GABA B1, AMPA1, AMPA2, CASPR2, LG1, and NMDA were negative both in serum and CSF. Finally, the case was diagnosed as seronegative LE. Intravenous methylprednisolone (IVP) as 1g/day was administered for five days. As a maintenance treatment, 64 mg/day of prednisolone was continued for about one year with a 10mg/day tapering dose. Levetiracetam 3000mg/day, carbamazepine 1200 mg/day, and diphenylhydantoin 300mg/day were given for seizures. The cognitive functional evaluation was performed with Mini-Mental Scale (MMS) which was found to be 26/30. Neurological deficits improved within two to three months.

Three to four months after the diagnosis, the patients' medical history taken from her relatives and husband revealed that the patient's sexual preference changed from males to females. Three of her female neighbours (38, 42, and 51 years old) complained to the patient's family about the patient's inappropriate sexual approach towards them. Her neighbours said that she was trying to seduce them with sexual content and speech, trying to kiss them, and trying to touch their genital organs. The

patient was taken to a psychiatrist for consultation because of her inappropriate behaviour and emotional lability. She was ashamed of her behaviour and did not want to talk about this situation. The patient stated that she did not feel any sexual interest towards women before her illness. After the illness, she was unable to have sexual intercourse with her husband and developed an attraction towards females. She also admitted to noticing a change in her sexual behaviour after the disease. The patient had not suffered from any psychological problem before and has no history of psychotic disorders in her family. She did not complain of any psychological issues and was reluctant to talk about her sexual behaviour. No mood differences were reported. The psychiatric examination did not reveal any judgmental disturbance and psychotic symptoms like delusions and hallucinations.

There was no elevated mood, insomnia, grandiosity, increase in speech, or goal-directed activity in the patient's clinical appearance and history. Her inappropriate behaviours were limited to sexual issues only. The psychiatrist did not diagnose the patient as having a mood disorder or psychotic disorder but suggested haloperidol 5mg/day for these behavioural disturbances and recommended to keep her under observation in the outpatient department for the progress of behavioural changes. She used haloperidol for one month and discontinued it because of side effects (like rigidity in muscles and sedation). The patient continued to receive prednisolone treatment in this period. After 6-7 months, the patient stated that her sexual preference returned to normal. She and her husband were quite happy owing to the disappearance of her strange condition.

The patient was treated and followed up in the neurology outpatient clinic for five years in terms of paraneoplastic syndrome, and no cancer was found. Five years after the diagnosis, antiepileptic treatments were continued by reducing the dose of the medications, MMS was also 23/30.

## Discussion

The case of changing sexual behaviour in a female patient, who was diagnosed with LE in the left amygdala is presented. The presence of clinical symptoms of LE is critical in the diagnosis. It is revealed in the literature that MRI, PET-CT scan, CSF, and EEG may be negative despite the presence of severe clinical symptoms. Moreover, autoantibody may not be found in the blood or CSF.<sup>1</sup> Initially, our patient had inappropriate affection, laughing, and crying, then the sexual preference of the patient

changed. She tried to start a sexual life with women. Changing sexual behaviour in LE patients has not been published so far.

The most important regions of the brain in mate selection are the hypothalamus and amygdala.<sup>3</sup> The sexual differentiation region is the sexually dimorphic nucleus (SDN) located in the hypothalamus.<sup>4</sup> With the participation of the anterior hypothalamus in physiological processes, sexual orientation is regulated.<sup>5</sup> Savic et al.<sup>6</sup> reported that there are two parameters about sex differentiation. The most important parameter is the detection of asymmetry in cerebral and cerebellar hemispheres using MRI volumetry. Heterosexual men and homosexual women had a larger right hemisphere, but there is no asymmetry in heterosexual women and homosexual men. The second important parameter is the functional connection between the right and left amygdala imaging with PET.<sup>6</sup> Another report evaluating the sex-differentiated amygdala lateralization reported that the activation of the right amygdala in men and the left amygdala in women was more pronounced.<sup>7</sup> The connections are mainly in the right amygdala and related to the striatum, pulvinar, and sensorimotor cortex in men. However, the left amygdala is more prominent in women and related to the subgenual cortex and hypothalamus.<sup>8</sup> In another report, Takeuchi et al.<sup>9</sup> reported that the white matter area at the left amygdala-hippocampal complexes is a more important region than the right amygdala-hippocampal complexes for sexual permissiveness. In our patient, involvement of the left frontocentrotemporal regions in EEG and MRI examinations suggested disturbance of left amygdala connectivity. So the right amygdala may be predominant in our case, same as heterosexual men. In heterosexual women, there is no asymmetry between the two hemispheres. In this case, the right hemisphere was probably dominant, like homosexual women. We speculated that changes in sexual behaviour might be related to the involvement of

the left amygdala.

## Conclusion

We described a female patient with left amygdala involvement and seronegative limbic encephalitis who changed her sexual behaviour by favouring women as sexual partners. Physicians should consider that left amygdala involvement may lead to changes in sexual behaviour in women with LE.

**Consent:** The patient gave informed consent

**Disclaimer:** None to declare.

**Conflict of Interest:** None to declare.

**Funding Sources:** None to declare.

## References

1. Saeed Arif , Shaheer Arif. Anti-N-Methyl-D-Aspartate receptor Encephalitis as a potential cause of worsening Herpes Simplex Virus Encephalitis. *J Pak Med Assoc* 2021; 71:569-70.
2. Kao YC, Lin MI, Weng WC, Lee WT. Neuropsychiatric Disorders Due to Limbic Encephalitis: Immunologic Aspect. *Int J Mol Sci.* 2020; 22:E389.
3. Calabrò RS, Cacciola A, Bruschetta D, Milardi D, Quattrini F, Sciarrone F, et al. Neuroanatomy and function of human sexual behavior: A neglected or unknown issue? *Brain Behav.* 2019; 9:e01389.
4. Roselli CE, Stormshak F. Prenatal programming of sexual partner preference: the ram model. *J Neuroendocrinol.* 2009; 21:359-64.
5. Berglund H, Lindström P, Savic I. Brain response to putative pheromones in lesbian women. *Proc Natl Acad Sci U S A.* 2006; 103:8269-74.
6. Savic I, Lindström P. PET and MRI show differences in cerebral asymmetry and functional connectivity between homo- and heterosexual subjects. *Proc Natl Acad Sci U S A.* 2008; 105:9403-8.
7. Canli T, Desmond JE, Zhao Z, Gabrieli JDE. Sex differences in the neural basis of emotional memories. *Proc Natl Acad Sci USA.* 2002; 99:10789-94.
8. Kilpatrick LA, Zald DH, Pardo JV, Cahill LF. Sex-related differences in amygdala functional connectivity during resting conditions. *Neuroimage.* 2006; 30:452-61.
9. Takeuchi H, Taki Y, Nouchi R, Hashizume H, Sekiguchi A, Kotozaki Y, et al. The structure of the amygdala associates with human sexual permissiveness: evidence from voxel-based morphometry. *Hum Brain Mapp.* 2015; 36:440-8.