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Reversible Cranial Magnetic Resonance Imaging Lesions in Status Epilepticus: A Case Report

Status Epileptikusta Görülen Reversibl Kraniyal Manyetik Rezonans Görüntüleme Bulguları: Olgu Sunumu

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Dear Editor,

Magnetic resonance imaging (MRI) changes during the periictal and postictal period can be monitored in patients with epilepsy diagnosis due to structural causes, as well as the effect of seizure activity. Epileptic conditions can induce transient, variable or reversible MRI abnormalities.

A 25-year-old female patient who had two generalized tonic clonic seizures without regaining consciousness in between them, was evaluated urgently. With the diagnosis of status epilepticus, levetiracetam was loaded intravenously and levetiracetam 1000 mg/day was started for maintenance. She was hospitalized in the intensive care unit. It was learned from her history that she had been followed up with a diagnosis of epilepsy in childhood and she had ceased treatment at the age of 16 years. There was a history of consanguineous marriage and epilepsy in her family history. On the 3rd day of her hospital stay, when the seizures were brought under control, she was transferred to the neurology ward. In her neurologic examination, she was conscious, oriented and cooperative. There were no meningeal irritation signs. Her left nasolabial fold was flattened and she had left hemiparesis. Biochemical tests were normal. In diffusion MRI, wide corticosubcortical diffusion restriction was observed in the right frontoparietotemporal area (Figure 1). Generalized slowing was detected in the right hemisphere in routine electroencephalography (EEG). Focal epileptic activity in the F4 electrode was observed in the sleep EEG. After 2 days, a follow-up MRI showed signal increase in the gyri, flattening of the sulci, and mild cortico-subcortical contrast enhancement (Figure 2). On the 3rd day of her hospitalization, focal seizures with preserved consciousness developed. In a follow-up MRI, the cortex was edematous and thick in T2- and fluid-attenuated inversion recovery (FLAIR)-weighted images. The third ventricle was narrowed, and shift and subfalcine herniation were present in the midline structures. Lumbar puncture was performed

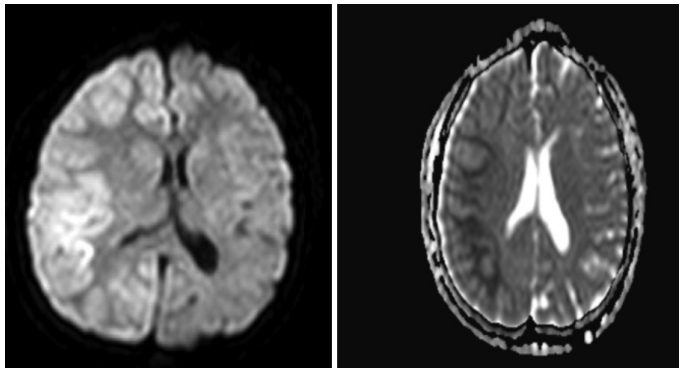

Figure 1. Axial diffusion-weighted MRI (DW, B100): Signal changes that are hyperintense in diffusion-weighted images and hypointense in apparent diffusion coefficient-weighted images are seen located in the posterior frontal, parietal, and temporal lobes of right cerebral hemisphere along the gyral surfaces
MRI: Magnetic resonance imaging, DW: Diffusion-weighted

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for the differential diagnosis of encephalitis, the findings of which were normal. The levetiracetam dose was increased and anti-edema treatment was given. The patient's paresis completely resolved on the 5th day. Diffusion MRI performed 1 month later and MRI performed 2.5 months later were normal (Figure 3, 4).

MRI changes in status epilepticus have been reported in the literature in various case reports and case series for many years (1). Epileptic conditions can induce temporary, variable or reversible MRI abnormalities (2). The cause of peri-ictal MRI changes in patients with epilepsy is vasogenic edema caused by disruption of the blood-brain barrier, high metabolic demand, and seizure-induced hyperperfusion (3). Glucose and oxygen metabolism increases as a result of increased blood flow to the cells due to seizures. If the blood flow is not sufficient, anaerobic metabolism

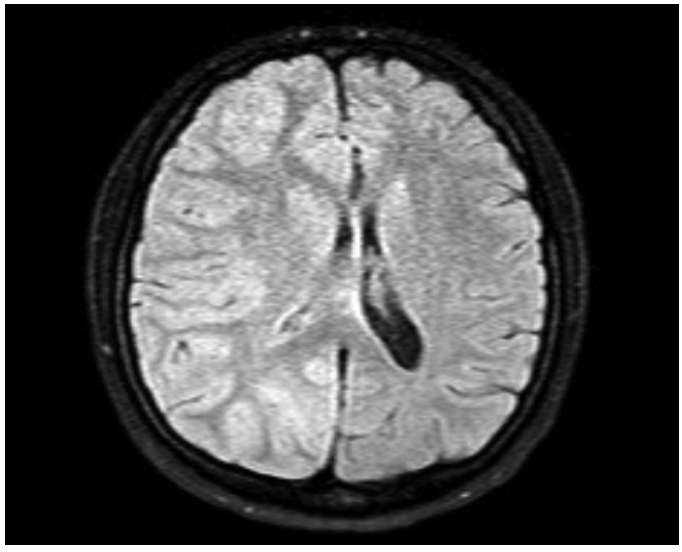

Figure 2. Axial FLAIR-weighted MRI (TR4836, TE100, FA90): In the regions mentioned in Figure 1, mild hyperintense signal changes, increased thickness of the gyri, and mild flattening of the accompanying sulcal structures are observed. Slight flattening of the right lateral ventricular contour and slight shift of the midline structures to the left predominantly in the subfalcine area are observed

MRI: Magnetic resonance imaging, FLAIR: Fluid attenuated inversion recovery

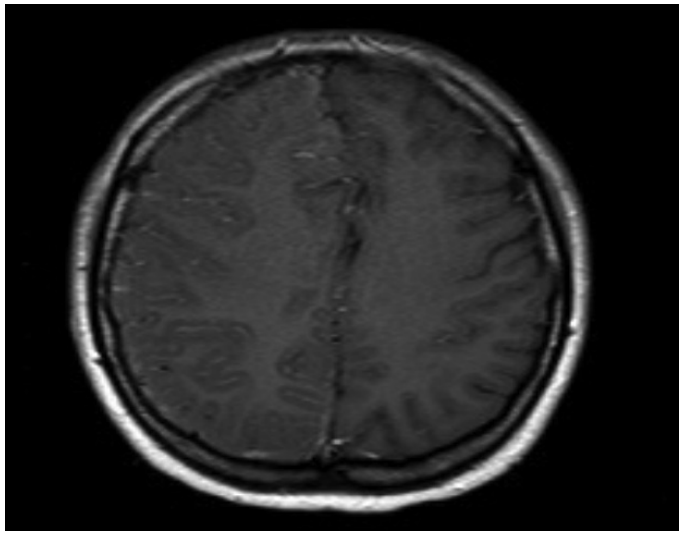

Figure 3. Contrast-enhanced cranial MRI (TR650, TE15): In the T1W-SE-weighted post-contrast images, the increase in calibration in the same-sided vascular structures compatible with the increase in perfusion draws attention

MRI: Magnetic resonance imaging

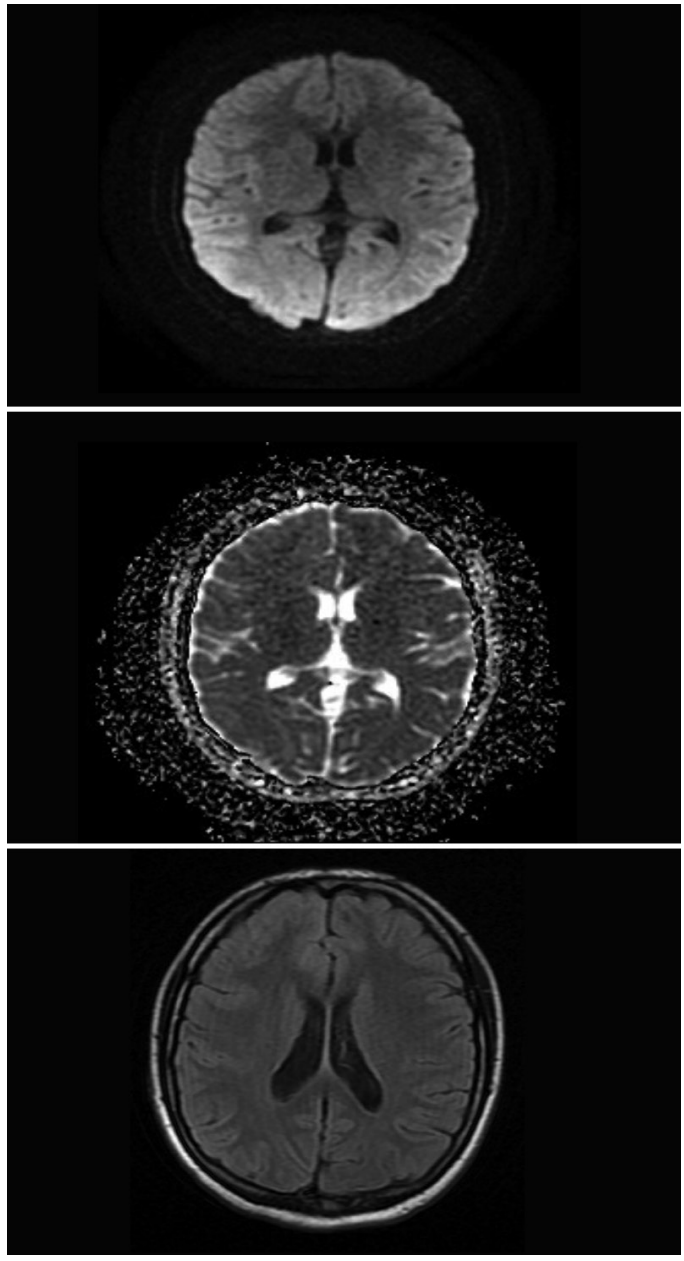

Figure 4. In the control diffusion MRI and cranial MRI examination after 1 month, the diffusion restriction, hyperintense signal changes, increased thickness of the gyri, mild flattening of the accompanying sulcal structures, slight flattening of the right lateral ventricular contour, and slight shift of the midline structures detected in the previous examination show total regression

MRI: Magnetic resonance imaging

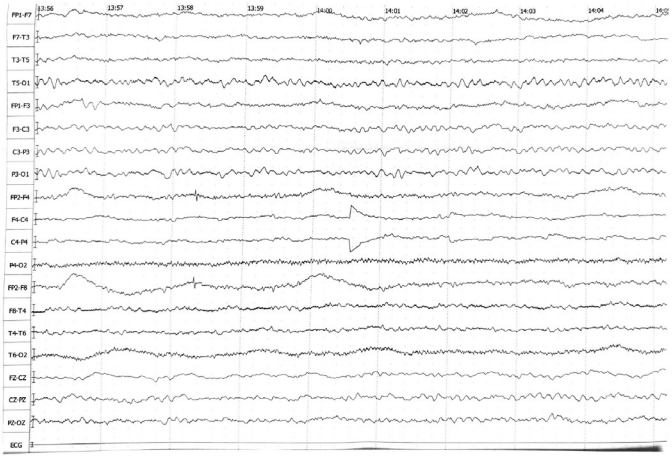

Figure 5. In the routine EEG performed on the 3rd day of hospitalization of the patient, a mild generalized slowing was detected in the right hemisphere

EEG: Electroencephalography

continues. The ion pump is damaged and ion permeability changes. Hyperintensity in apparent diffusion coefficient (ADC)-weighted images is observed due to cytotoxic edema (4). Irreversible lesions can be triggered by concomitant cytotoxic edema.

Changes in MRI can be unilateral or bilateral. Increased or decreased T2 signal changes, leptomeningeal contrast enhancement and hyperintensity in DWI- and FLAIR-weighted images and hypointensity in ADC-weighted images suggesting diffusion restriction have been reported. The most consistent results have been reported in DWI-weighted images (3). The abnormality can be seen in the cortical/subcortical areas, basal ganglia, white matter, corpus callosum, and cerebellum. Our patient's corticosubcortical lesions were observed in T2-, FLAIR-, and diffusion-weighted images.

Some of the MRI changes seen in status epilepticus are completely reversible, whereas others result in residual gliosis or focal atrophy. The time to the normalization of the lesions was given as 15-150 days (average 62 days) (2). MRI findings in our patient completely resolved within 2.5 months.

Peri-ictal MRI changes and lateralized periodic discharges show a strong association (5). Although our patient had generalized background slowing in routine EEG, focal epileptic activity was detected in sleep EEG (Figure 5).

MRI findings triggered by seizure require a broad differential diagnosis. However, awareness about MRI findings may reduce the risk of unnecessary diagnostic tests and interventions.

Ethics

Informed Consent: Informed consent was given by the patient.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: S.Ü.Ö., C.Ö., Concept: S.Ü.Ö., D.C.S., Design: S.Ü.Ö., D.C.S., C.Ö., Data Collection or Processing: C.Ö., K.H., S.Ü.Ö., Analysis or Interpretation: C.Ö., K.H., Literature Search: S.Ü.Ö., C.Ö., D.C.S., Writing: S.Ü.Ö., D.C.S.

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References

1. Kramer RE, Lüders H, Lesser RP, et al. Transient focal abnormalities of neuroimaging studies during focal status epilepticus. Epilepsia 1987;28:528-532.
2. Cianfoni A, Caulo M, Cerase A, et al. Seizure-induced brain lesions: a wide spectrum of variably reversible MRI abnormalities. Eur J Radiol 2013;82:1964-1972.
3. Mendes A, Sampaio L. Brain magnetic resonance in status epilepticus: A focused review. 2016; 38:63-67.
4. İlgen Uslu F, Bebek N, Çoban O, Gökyiğit A. Akut İskemik Serebrovasküler Hastalık Klinik ve Görüntüleme Bulguları Olan Epileptik Olgu. Epilepsi 2014;20:43-48.
5. Giovannini G, Kuchukhidze G, McCoy MR, Meletti S, Trinka E. Neuroimaging alterations related to status epilepticus in an adult population: Definition of MRI findings and clinical-EEG correlation. Epilepsia 2018;59(Suppl 2):120-127.