Case Report

Speaking Foreign Language With Expressive Aphasia of Native Language During Postictal Period

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Abstract

Postictal signs are often good indicators of seizure localization, of which language is one. Several types of dysfunction are associated with complex partial seizures, especially originated in the temporal lobe. Few similar case studies and their findings have been reported in the literature. In this light, we present two cases for the epilepsy surgery procedure in our video EEG monitoring unite who speak a foreign language in postictal period and whose epileptic focus have been observed in nondominant hemisphere.

Keywords: Epilepsy; postictal; language

Özet

Postiktal bulgular, nöbet lokalizasyonunu açısından sıklıkla kuvvetli belirtecilerdir. Bunlardan biri olan lisan fonksiyonu ve bunlarla ilgili fonksiyon bozuklukları, özellikle temporal lob kaynaklı kompleks parsiyel nöbetlere eşlik edebilmektedir. Benzer bulgulara sahip vakaların literatürde seyrek olması nedeniyle, video EEG monitorizasyon ünitemizde epilepsi cerrahisi sürecinde değerlendirilmiş olduğumuz, epileptik odağın nondominant hemisfer olarak tanımlanmış olup, postiktal dönemde yabancı dilde konuşma bulgusu olan iki vakayı, literatür bilgileri ışığında değerlendirdik.

Anahtar Kelimeler: Epilepsi; postiktal; lisan

INTRODUCTION

Temporary neurological symptoms or signs have usually been encountered following epileptic seizures. Well-known postictal neurological phenomenon are amnesia, Todd’s paralysis, cortical blindness, hemianopsia, language dysfunction, bulimia and pulmonary edema(7,9).

Several types of language dysfunction associated with epilepsy semiology has been defined. Semiological analysis of the findings related to language, which are encountered in complex partial seizures are indicators for localizing and lateralizing of epileptic foci(5).

They have often been seen in temporal lobe seizures, and can be categorized as dysphasia, aphasia, or automatisms. Dysphasia is generally induced within the dominant hemisphere. The speech automatisms are usually associated with the localization of the nondominant
temporal lobe, and may also be induced with the dominant hemisphere\textsuperscript{(25)}. Ictal speech automatisms are seen in temporal lobe epilepsy at the rate of 12-39\%\textsuperscript{(8,18)}. Although the speech automatisms in the ictal period are believed to be induced in the nondominant hemisphere and predominantly in the temporal lobe, speech automatisms in the postictal period are believed to be induced in the left hemisphere\textsuperscript{(8)}. It is thought that aphasia, paraphase, and other language dysfunctions, encountered in the postictal period in temporal lob epilepsy, are thought to usually localize the left hemisphere\textsuperscript{(24)}. In the postictal period, the patient is considered to be aphasic in the native language. However, it is reported that this localization varies when someone learns to speak a foreign language. Factors such as age and proficiency of a second language can effect the representation in the cortex\textsuperscript{(16)}.

**CASE PRESENTATION**

**CASE 1**

The subject is a 31 year-old male, right handed, and speaks native Turkish and learned German when he was 10 years-old. He had meningitis at two years-old, and now suffers also from complex partial seizures and sometimes from secondarily generalized tonic clonic seizures.

In our long term video (electroencephalography) EEG monitoring unit, we recorded him having three seizures in seven days, during which time we observed him. Two seizures were complex partial types and one seizure was a secondary generalized tonic-clonic type. He responded with meaningful answers in German to the questions in Turkish in the postictal period, following one of his complex partial seizures and a secondary generalized seizure.

\begin{quote}
Nurse : Where is it here? (In Turkish) \\
Patient: Krankenhaus (hospital) \\
Dr: What is your name? (In Turkish) \\
Patient: Mein Name ist ... (my name is ...) (right answer) \\
Nurse : Do you remember the password I had given you? (In Turkish) \\
Patient: Nein (no)
\end{quote}
Nurse: What happened to you, what have you felt? (In Turkish)
Patient: Ich bin schmachend (I am languishing).
Nurse: What happened? (In Turkish)
Patient: Ich bin schmachend.

There was no seizure activity during his simultaneous EEG. He began answering in Turkish again, after having answered in Germany for nearly one minute.

There were induced paroxysmal epileptiform discharges from the right temporal region in the ictal EEG, with bilateral hippocampal atrophy in the right hemisphere on a cranial MRI.

Problems with the Wechsler Memory Scale (WMS-R), the Auditory-Verbal Learning Test (AVLT), the facial recognition test, and neuropsychological tests, including line orientation, were consistent with bilateral severe memory impairment.

After amygdala-hippocampectomy surgery, with right temporal lobectomy applied to patient, there was complete seizure control with treatment of 400 mg/day of carbamazepine therapy. Following 13 years, there was no observed seizures; however, we learned during this time that he died due to non-Hodgkin’s lymphoma.

**CASE 2**

The subject is a 23 years-old male, right handed and speaks native Turkish and learned to speak English at 9 years-old. He began suffering from seizures after a head trauma at age 14, secondarily generalized tonic-clonic seizures. In our long-term video EEG monitoring unit during our 6-days follow up, he had tonic-clonic type seizures twice, which secondarily generalized from the upper left extremity and half of his left face. After one of his seizures in the postictal period, he gave meaningful aswers in English to the questions in Turkish.
Nurse: (Pointing at his mother ) Who is she? (In Turkish)
Patient: My mother
Nurse: What is her name? (In Turkish)
Patient: … (Right answer)
Nurse: What is this place? (In Turkish)
Patient: Hospital
Nurse: Can you count from one to ten. (In Turkish)
Patient: One, two…
Nurse: Count in Turkish. (In Turkish)
Patient: ( No answer)
Nurse: ( Pointing at a pen ) What is this? (In Turkish)
Patient: Pen.
Nurse: What colour is its cover? (In Turkish)
Patient: Blue (right answer)

There was no epileptiform discharge in simultaneous EEG. After this situation continued for nearly 1-1.5 minutes, the patient began answering again in Turkish.

In his ictal EEG following the sharp rhythmic theta between 6 and 7 Hz in frontotemporal region and in his right temporal region, secondary generalization was monitored. Dysplasia was seen at the right parahippocampal gyrus in a cranial magnetic resonance imaging (MRI). The positron emission imaging (PET) scan was consistent with hypometabolism at the right hemisphere. His neuropsychological tests were planned, and he was considered to be an epilepsy surgery candidate.

**DISCUSSION**

Patients’ postictal and ictal findings are important in terms of determining of epileptic focus. A careful evaluation of language function in the postictal period can provide valuable information about seizure localization and its spread\textsuperscript{22}. Semiological analysis of language findings in complex partial seizures can be useful in localizing and lateralizing the epileptic focus\textsuperscript{8}. Ictal and postictal language dysfunctions can be identified more accurately with a concurrent introduction of the video EEG monitoring. Thus, more accurate results about language dominance and seizure localization can be obtained this way\textsuperscript{22}.

Dysphasia, which is one language dysfunction encountered in the ictal period,
is usually induced in the dominant hemisphere: it can also be induced by the nondominant speech automatisms in the nondominant temporal lobe as well\(^{(25)}\). The other language dysfunctions encountered in postictal period such as aphasia, paraphase can also usually localize the left hemisphere\(^{(24)}\).

These studies helped to determine the native and second language in the cortical area; the fact that they are different in healthy individuals sheds light on the pathophysiological mechanisms related to language dysfunctions\(^{(5)}\). Ictal and postictal language dysfunctions in the patients speaking only one language is an important indicator for lateralization\(^{(4)}\). The clinical reports related to topographic features of language dominance, in patients speaking one language, have also been obtained from studies involving surgery of the perisylvian area, and carried out through various types of selective language findings\(^{(11)}\).

The cortical representation of the second language depends on language learning age, language fluency, and frequency of language use\(^{(17)}\). It has been reported for the bilingual patients that native language activates a homogeneous area in the left temporal lobe, while a second language activates a variety of neuronal networks in right-left temporal and frontal areas, and sometimes can be limited to the nondominant hemisphere\(^{(6)}\).

We have evaluated two cases with many common points on the basis of ictal foreign language automatism and on native language aphasia that occurs during foreign language speaking in the postictal period.

In both cases when asked if they had remembered the period in which they had spoken a foreign language, both replied ‘I remember’. When questioned why they had not replied in Turkish, they responded ‘I felt saying that’ or ‘I say it without thinking’. Also the second case told us to remember that when he was shown the ball point pen he preferred to say ‘pen’ instead of ‘pensil’.

Although we met rarely after this situation, we saw each other only twice again (given a thousand patients in fifteen years who visit our center). Both of these cases were male and they presented with right temporal onset seizures. In addition, both of them learned second language later in life. This situation is not current for all of their seizures.

A literature search showed that ictal language and automatisms tend to be induced by the language-nondominant hemisphere, specifically the temporal lobe: postictal aphasia or dysphasia seem to be activated by the language-dominant hemisphere\(^{(8)}\). Chauvire analyzed the results of 689 patients, and observed second-language speaking automatisms in two patients, while dominant temporal lobe was reported as the seizure onset\(^{(5)}\). It is reported that native language ictal automatisms and second-language ictal automatisms can rarely be detected in patients suffering from complex partial seizures with temporal lobe origin: it has also been found that through ictal progression from the native language to a second language (in cases with several languages) other problems can occur\(^{(25)}\). It is accepted that ictal language automatisms induced by the nondominant hemisphere arise as a result of related inhibitory effects from the nondominant hemisphere through the dominant hemisphere, or by direct overactivation of the nondominant hemisphere\(^{(19)}\). These hypotheses are based on studies carried out with functional MRI and single-photon emission computerized tomography (SPECT). The foreign language ictal automatisms which occur at less frequency is explained in such a way that the prevalence of network related with foreign language in the brain area is more limited comparing to native language\(^{(20)}\).

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reported for bilingual patients that native language activates a homogeneous area in the left temporal lobe, while a second language activates a variety of neuronal networks in right-left temporal and frontal areas, and are sometimes limited to only the nondominant hemisphere (5). The literature regarding cortical representation of a foreign language is contradictory, and is still controversial. However, experimental studies are based on two hypotheses: age and proficiency level. According to age hypothesis, the lateralization of a second language depends on the age of learning it. Learning a foreign language after age six is the same in terms of lateralization for both a native language and a second language. According to level hypothesis, learning capability of a second language is the primary determinant of language lateralization, based on a meta-analysis comprised of sixty-six behavioral studies (20). It has been reported that left hemispheric dominance has been detected in people with knowledge of one language; however, with bilingual speakers who acquire a second language at older ages, there is a bihemispheric effect on languages learned at earlier ages, regardless of skill (1).

When the spatial relationship between the native and language and second language in the human brain has been examined through functional MRI, it has been found that the areas related to language (Broca) did not differ in terms of native language and second language: this has to do with the person’s second language at earlier ages but has little effect on different frontal cortical area of the person’s second language acquired at older ages. No difference has been detected in temporal lobe areas (Wernicke) in terms of early or late learning. In some cases, while listening to a foreign language, activation occurs in the left hemisphere – especially when the native language has been detected in the right hemisphere temporal areas. The left superior temporal sulcus is distributed in larger areas when listening to a foreign language, compared to the native language in real topography (13).

Albert and Obler has reported that left lateralization for a second language has been observed at a lower rate (6). However, this result is inconsistent with other studies (13).

The mechanism underlying postictal aphasia can be explained through inhibition or postical fatigue at the language function areas with their connections. Although many studies have emphasized that postictal aphasia arises from the dominant hemisphere, data on this subject is scarce. Symptoms such as postictal confusion suppressing language function fatigue occurs frequently, so it is difficult to evaluate this in related processes. This situation becomes more complicated in patients with bihemispheric language presentation or in those whose seizure has spread to the contralateral hemisphere (1).

Ramirez reported in a study involving sixty patients, whose language dysfunction included postictal language delay, paraphasic disorders, and interictal paraphasias, they encountered patients with dominant temporal lobe complex partial seizure more than in others with nondominant localization (2). Privitera examined 105 seizures in twenty-six patients by using deep electrodes and reporting that postictal language delay occurred for longer than 60 seconds (between 67 and 1276 seconds) in all left temporal seizures and less than 60 seconds (between 0 and 106 seconds) in the forty-two of forty-three right temporal seizures (23).

If the language functions of patients include atypical localization, it is reported that these defined postictal language patterns can vary (22). According to a study carried out with the intracarodit amobarbital test (IAT), it has been found that incompatible postictal language patterns have been detected in ten of
eleven patients with bilateral language dominance or in which the right hemisphere is documented with IAT including fifteen of fifty-three patients with left hemisphere dominance. Although postictal language tests in thirty-eight of fifty-three patients with this issue, seventy-two percent lateralized the seizure onset zone correctly, could not lateralize in ten patients (19%) and lateralized incorrectly with five patients (9%)\(^{21,23}\).

Since both our patients are males, reports of the patients with foreign language ictal automatism included two women and eight men; the emotional features have been predominantly in the foreign language in which ictal automatism of male patients occur\(^{3,4,8,14,18,19}\). The right amygdala in men has a specific role in the foreign language automatism, where emotional features have indicated that sexual dimorphism is present in the human amygdala. Indeed, the amygdala area in the brain of men is larger than that of women. In addition, basal blood supply of the right amygdala in men is greater compared to other brain regions\(^{16,12,18}\).

We reevaluated our patients with these data. The presence of seizures induced by the nondominant hemisphere potentially elicits ictal foreign automatism. We have not recorded any simultaneous seizure activity in patients who can remember this process from the last period, making this possibility unlikely. We evaluated this situation in terms of possibility of foreign automatism, where the native language aphasia existed in the postictal period. It seems incompatible with the data since it is induced by the nondominant hemisphere. However, it is thought that the language function of our patients include atypical localization, or that a relative second language dominance creates a delay in return to the native language in the postictal process (including overactivations in other areas of the right hemisphere during a seizure).

Since our records are from scalp, all associated possibilities cannot fully be ruled out. We think that it is possible to distinguish ictal and postictal more clearly by placing deep electrodes and increasing record sensitivity.

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26.