Evaluation of Brainstem Auditory Evoked Responses in Patients With Conversion Disorders

Sebahattin Cüreoğlu M.D.[1], Abdurrahman Altındağ M.D.[2], Üstün Osma M.D.[1], Şakir Özen M.D.[2], Faruk Oktay M.D.[1], Faruk Meriç M.D.[1], İsmail Topçu M.D.*[1]

SUMMARY

EVALUATION OF BRAINSTEM AUDITORY EVOKED RESPONSES IN PATIENTS WITH CONVERSION DISORDERS

Objective: The aim of this study was to detect any suboptimal brainstem lesions in patients with conversion disorder.

Methods: This study included 37 patients (25 female, 12 male) with conversion disorder. Control's group included 30 healthy persons (22 female, 8 male). The diagnosis of conversion disorder was based on criteria of DSM IV. BAER was recorded at conventional and higher stimulus rate in these patients. The main BAER measurements analyzed were the I-III, III-V, and I-V interpeak intervals and the wave V amplitude.

Results: There was significant difference for I-III ($p<0,05$), I-V ($p<0,05$) interpeak latencies between patient and controls groups at 10/s click rate. The only I-III interval differed significantly at 50/s click rate. Abnormal BAER result was seen in only one of 37 patients at the clicks of 10/s and 50/s, when the values exceeding 2.5 standard deviations above the means of the normal controls were considered abnormal. No significant correlation was found between diseased period and BAER latencies.

Conclusion: The lower brainstem (cochlear nucleus, superior olivary complex and lateral lemniscus) has been affected in patients with conversion disorder.

Key words: conversion disorders, brainstem, evoked potentials

Bull Clin Psychopharmacol 2000;10:129-132

ÖZET

KONVERSİYONLU HASTALARDA BEYİNSAPI UYARILMIŞ İŞİTME POTANSİYELLERİNİN DEĞERLENDİRİLMESİ

Amaç: Konversiyonlu hastalarda suboptimal beyinsapı lezyonlarını belirlemek. **Yöntem:** Bu çalışma konversiyon bozukluğu tanısı alan 37 hasta (25 kadın, 12 erkek) üzerinde yapıldı. Kontrol grubu yaş ve cins uyumlu 30 sağlıklı bireyden (22 kadın, 8 erkek) oluşturuldu. Konversiyon bozukluğu tanısı, DSM IV kriterlerine göre konuldu. Bu hastalardan beyinsapı uyarılmış işitme potansiyelleri konvansiyonel ve yüksek uyarı hızında kaydedildi. Beyinsapı uyarılmış işitme potansiyellerinin değerlendirilmesi; I-III, III-V ve I-V interpik intervallerini ve V. Dalga amplitüdünün ölçümlerini kapsamaktadır.

Bulgular: Saniyede 10 klik hızında I-III ve I-V interpik intervallerinde fark mevcuttu ($p<0,05$). Saniyede 50 klik hızında ise sadece I-III intervalinde fark gözlendi. Normal kontrol ortalamalarının 2.5 katı standart sapmasını aşan değerler anormal kabul edildiğinde 37 hastanın sadece birinde anormal beyinsapı uyarılmış işitme potansiyeli gözlendi.

Sonuç: Konversiyonlu hastalarda alt beyin sapı (koklear nükleus, superior oliver kompleks ve lateral lemnisküs) etkilenimi vardır.

Anahtar sözcükler: konversiyon bozukluğu, beyinsapı, uyarılmış potansiyeller

Klinik Psikofarmokoloji Bülteni 2000;10:129-132

INTRODUCTION

Conversion disorder is characterized by the presence of one or more neurological or general medical symptoms that cannot be explained by a known neurological or medical disorder (1). Several studies have reported that 5 to 15 percent of psychiatric consultations in a general hospital involve patients with conversion disorder diagnosis (2). This disorder frequently occurs in the context of other psychopathology and also tends to have a significant association with CNS disease. According to some researchers, organic CNS dysfunction is a particularly common correlate of conversion disorder (3). Of these, about half had pathology directly or systematically affecting the brain (3). It was suggested that excessive cortical arousal that sets off negative feedback loops between the cerebral cortex and the brainstem reticular formation cause inhibition of the patient's awareness of bodily sensation (2). The brainstem auditory evoked response (BAER) reflects electrophysiological activity of large numbers of neurons in the brainstem auditory pathway following acoustic stimulation. The various deflections in the response represent neural activity at different levels of the auditory brainstem. Waves I and II are

[1] Dicle University, School of Medicine, Department of Otorhinolaryngology - Diyarbakır, [2] Dicle University, School of Medicine, Department of Psychiatry- Diyarbakır

Yazışma Adresi / Address reprint requests to: Sebahattin CÜREOĞLU M.D., Dicle Üniversitesi Tıp Fak. KBB Anabilim Dalı, 21280, Diyarbakır- TURKEY
Phone :+90 412 2488001 Fax:+ 90 412 2488520 E-Mail: scureoglu@hotmail.com

generated in the extracranial and intracranial portions of eighth nerve, respectively. Subsequent waves are generated from auditory centers at gradually higher levels of auditory pathway in the brainstem. Wave V, the major deflection of the BAER, is generated, most likely, in the lateral lemniscus and, less likely, in the inferior colliculus, located in the rostral brainstem. This response can be noninvasive recorded from the scalp. The method of increasing stimulus rate has been suggested to be a potentially useful "stress test" to improve the sensitivity of the BAER in detecting brainstem injuries (4-6).

This study was designed to assess the outcome of brainstem auditory electrophysiology in patients with Conversion Disorder. In particular, in order to detect any suboptimal brainstem lesion that may not be shown by the BAER with conventional rates, the BAER was also recorded at higher stimulus rate in patients who did not show any obvious abnormalities in the BAER at 10/s clicks.

MATERIALS AND METHODS

This study included 37 patients (25 female, 12 male) with conversion disorder. The diagnosis of conversion disorder was based on criteria of DSM IV (Table 1). Control's group included 30 persons (22 female, 8 male). Patient with a family history of hearing loss, chronic otitis media, ototoxic medication, acoustic trauma and diabetes mellitus were excluded from the study. All patients had otoscopic examination before test to exclude external factors. No pathologic findings were found in neurological examination, CT and EEG tests of these patients. All patients and controls gave their informed consent.

Table 1. Diagnostic criteria for conversion disorders

A. One or more symptoms or deficits affecting voluntary motor or sensory function that suggest a neurological or other general medical condition.
B. Psychological factors are judged to be associated with the symptom or deficit because the initiation or exacerbation of the symptom or deficit is preceded by conflicts or other stressors.
C. The symptom or deficit is not intentionally produced or feigned (as in factitious disorder or malingering).
D. The symptom or deficit cannot, after appropriate investigation, be fully explained by a general medical condition, or by the direct effects of a substance, or as a culturally sanctioned behavior or experience.
E. The symptom or deficit causes clinically significant distress or impairment in social, occupational, or other important areas of functioning or warrants medical evaluation.
F. The symptom or deficit is not limited to pain or sexual dysfunction, does not occur exclusively during the course of somatization disorder, and is not better accounted for by another mental disorder.

Table 2. Symptoms of conversion disorder in patients

symptom	number of patients (n=37)
Pseudoseizures	25
Motor symptoms*	8
Sensory symptoms**	4

*Abnormal movements, gait, disturbance, weakness, paralysis, gross rhythmical
Tremors, chore form movements, tics and jerks
** Anesthesia, paresthesia, deafness

Recording of BAER. We used Medelec Sapphire 2A equipment for BAER recording. Subjects lay supine on a soft bed in a sound-isolated and electrically shielded room. Three silver- silver chloride disk electrodes were placed, respectively, at the forehead in the midline (ground), at the mastoid ipsilateral to the acoustic stimuli (negative), at the vertex (positive). Interelectrode resistance was maintained at 4 kW or less. Rarefaction clicks of 100-microsecond duration were used as acoustic stimuli. The clicks were presented at an intensity of 70 dB HL, delivered monaurally through TDH 39 earphones. The contralateral ear was masked with white noise 40 dB below the ipsilateral click stimuli. All patients were tested at a click rate of 10/s. In the patients who had a normal BAER at 10/s, the presentation rate was then increased from 10/s to 50/s. Brainstem responses to 2048 clicks were recorded for each run. The recording signals were bandpass-filtered between 100 and 2000 Hz, and processed by an averaging computer. An automatic artifact rejection was used to reduce the inclusion of high-amplitude muscular activity in the averaged responses. Sampling was discontinued whenever there were excessive muscle artifacts on the monitoring oscilloscope.

BAER measurements and data analysis. The main BAER measurements analyzed were the I-III, III-V, and I-V interpeak intervals and the wave V amplitude. Normative criteria of various BAER measures for patients were determined as follows. The upper limits for the I-III, III-V, and I-V intervals were 2.2, 2.0, and 4.1 milliseconds (ms) respectively. The normative lower limit for wave V amplitude was 0.25mV, and for V/I amplitude ratio was 0.45.

Table 3. Comparison of BAER interpeak intervals in patients with conversion disorder and controls

	Click Rate	I-III	III-V	I-V
Patients	10	2.16±0.26*	1.84±0.25	3.97±0.27*
	50	2.18±0.24*	1.84±0.25	4.00±0.28
Controls	10	2.05±0.17	1.79±0.19	3.84±0.23
	50	2.12±0.16	1.82±0.18	3.94±0.24

*P<0.05 by *t test* for comparison of difference between patients with Conversion Disorder and controls.

In statistical analysis; *t test* for independent groups were performed. Values exceeding 2.5 standard deviations above the means of the normal controls were considered abnormal.

RESULTS

The mean age of patients was 28.5 ± 10.6 (range 14-47 years) in patient's group, 32.5 ± 8.9 in control group. Symptoms of Conversion Disorder in these patients are shown in Table 2. Mean of patients' diseased period was from 1 month to 10 years. ABR results are given in Table 3. As seen in Table 3, there was significant difference for I-III (p<0,05), I-V (p<0,05) interpeak latencies between patient and control groups. At 50/s click rate, BAER latencies and interpeak intervals were prolonged slightly. But statistical analyses showed that only the I-III interval differed significantly.

Abnormal BAER result was seen in only one of 37 patients at the clicks of 10/s and 50/s, when the values exceeding 2.5 standard deviations above the means of the normal controls were considered abnormal. No significant correlation was found between diseased period and BAER latencies.

In BAER wave-form morphology, no significant changes were found.

DISCUSSION

DSM-IV defines Conversion Disorder as a disorder characterized by the presence of one or more neurological symptoms that cannot be explained by a known neurological or medical disorder. In addition, the diagnosis requires that psychological factors is associated with the initiation or the exacerbation of the symptoms (1). Conversion Disorder should be differentiated from major depressive disorder, anxiety and schizophrenia.

Increasing data implicate biological and neuropsychological factors in the development of conversion disorders. The symptoms may be caused by an excessive cortical arousal that sets off negative feedback loops between the cerebral cortex and the brainstem reticular formation. Elevated levels of corticofugal output, in turn, inhibit the patient's awareness of bodily sensation, which in some conversion disorders patients may explain the observed sensory deficits(2,7).

There is a descendent tract extending from lateral lemniscus to reticular formation. The BAER reflects electrophysiological activity of large numbers of neurons in the brainstem auditory pathway following acoustic stimulation. The various deflections in the response represent neural activity at different levels of the auditory brainstem. Wave V, the major deflection of the BAER, is generated in the inferior colliculus, located in the rostral brainstem. The method of increasing stimulus rate has been suggested to be a potentially useful "stress test" to improve the sensitivity of the BAER in detecting brainstem injuries (4-6). In the evaluation of BAER results, there was significant difference for I-III (p<0,05), I-V (p<0,05) interpeak latencies between patient and control groups. At 50/s click rate, BAER latencies and interpeak intervals were prolonged slightly. But statistical analyses showed that only the I-III interval differed significantly. Abnormal BAER result was seen in only one of 37 patients (%2.7) at the clicks of 10/s and 50/s, when the values exceeding 2.5 standard deviations above the means of the normal controls were considered abnormal.

According to Whitlock, release of the mechanism for conversion disorders can occur not only as the result of functional alterations of corticofugal inhibition, but also from physical damage to the brainstem itself (8). To our knowledge, there is no other study detecting any sub optimal lesion of the brainstem in patients with conversion disorders by using BAER. Our study results indicate that the lower brainstem (cochlear nucleus, superior olivary complex and lateral lemniscus) has been affected in patients with conversion disorders. It may be thought that the lesions of the brainstem structures (medial geniculate body, lateral lemniscus, reticular formation) can be the cause of conversion reaction. For this purpose, brainstem evoked potentials must be performed in a large series of this disorder.

References:

1. Diagnostic and Statistical Manual of Mental Disorders, 4th ed. Washington, Copyright American Psychiatric Association, 1994.

2. Kaplan HI, Sadock BJ, Grebb JA. Somatoform disorders. In: Kaplan HI, Sadock BJ, Grebb JA editors. Kaplan and Sadock's Synopsis of Psychiatry, 4th ed. Baltimore: Williams and Wilkins, 1994; 617-631.

3. Mersky H, Buhrich NA. Hysteria and organic brain disease. B J Med Psychol 1975; 48: 359-366.

4. Pratt H, Ben-David Y, Peled R, Podoshin L, Scharf B. Auditory brainstem evoked potentials: clinical promise of increasing stimulus rate. Electroencephalogr Clin Neurophysiol 1981; 51:80-90

5. Jiang ZD. Binaural interaction and the effects of stimulus intensity and repetition rate in human auditory brainstem. Electroencephalogr Clin Neurophysiol 1996; 100:505-16

6. Jiang ZD, Brosi DM, Wilkinson AR. Immaturity in electrophysiological response of the neonatal auditory brainstem to high repetition rates of click stimulation. Early hum dev 1998; 52:133-43

7. Miller L. Neuropsychological concepts of somatoform disorders. Int J Psychiatry Med,1984; 14(1):31-46

8. Whitlock FA. The etiology of hysteria. Acta Psychiatr Scand 1967; 43:144-162