Neurological soft signs and EEG findings in children and adolescents with Gilles de la Tourette syndrome

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Gilles de la Tourette syndrome (GTS) is a childhood-onset neuropsychiatric disorder, characterized by multiple motor and vocal tics. The presence of EEG abnormalities and neurological soft signs are reported in patients with GTS. In this study, conducted on 40 children and adolescents, non-specific EEG abnormalities and neurological soft signs were detected in 12 and 57.5 percent of cases, respectively. These findings are analyzed in comparison with other neuropsychological test results. A statistically significant association between EEG abnormalities, neurological soft signs and low-performance IQ results was detected.

Key words: EEG, neurological soft signs, Gilles de la Tourette syndrome.

Gilles de la Tourette syndrome (GTS) is a childhood-onset neuropsychiatric disorder, characterized by multiple motor and vocal tics. Its symptoms can show variations during the disease course. Motor tics vary from simple abrupt movements, such as eye blinking and head jerks, to more complex behaviors such as facial expressions or gestures of the face or hands. Vocal tics range from simple throat clearing to fragments of speech including isolated words. Onset age of Tourette's syndrome is around seven years old. GTS improves during late adolescence and early adulthood[1,2].

The etiology of GTS is not entirely known today, although some hypotheses exist in the literature[3]. The results of neuroanatomical, neuropathological and neuroradiological studies demonstrate a posible role of basal ganglia and the structures which are connected to basal ganglia, such as the thalamic and cortical regions, in the pathogenesis of GTS.

Electroencephalogram (EEG) abnormalities were oserved in 12-37 percent of GTS cases. However, they were not specific for GTS, and no correlation was shown between tics and paroxysmal activities[2]. These findings support the hypothesis that the tics originate from the subcortical structures, such as basal ganglia, rather than from cortical structures[4].

In some studies, it was demonstrated that patients with GTS have neurological soft signs, the most common being minor motor asymmetry, coordination problems, nystagmus and reflex asymmetry[5]. The "neurological soft sign" has been used to describe various abnormalities on the neurological examination that are not believed to be part of a well-defined neurological syndrome[6]. The validity of soft signs would be supported if they predicted motor abnormalities across development. Soft signs were predicted at age seven and over[6].

The aim of this study was to evaluate neurological soft signs and EEG findings in children with GTS, and to look for a correlation of these parameters with other neuropsychiatric tests.

Material and Methods

Forty children and adolescents, who were diagnosed as GTS according to DSM-IV[7] criteria, were enrolled in the study. Eleven (27.5%) of the subjects were female and 29 (72.5%) were male. Their ages ranged between 7-15 years (mean ± sd = 109 ± 2.4).

All patients were examined by the Pediatric Neurology Department for the presence of additional neurological findings. Neurological soft signs were determined in 33 children by a child and adolescent psychiatrist. Neurological soft signs included the ability to differentiate right and left, both according to themselves and the observer; hand-eye coordination; simultaneous double stimuli; coordinated movement; and finger following.

Electroencephalogram, WISC-R inteligence test and Bender-Visual-Motor Perceptions test[8] were performed. The severity was assessed by the Yale Global Tic Severity Scale[9] (YGTSS). Information about the sociodemographical status of the patients was collected via a questionnaire prepared by the researcher. Statistical analysis was performed with a computer package program (Statistical Package for Social Sciences, For Windows Release 5.0.1, SPSS Inc., 1992). Chi-square test was used with non-parametric data and two tailed t-test with parametric data. Fisher's exact test was applied when necessary.

Results

Electroencephalogram (EEG) analysis was done on all 40 patients enrolled in the study. Thirty-five had normal EEG findings, whereas in five patients a dysrhythmia in basal activity was observed. There was no statistically significant difference between males and females (X^2: 0.1572 DF:1 P = 0.6918).

When EEG findings were compared with WISC-R test results, an association between EEG abnormalities and low performance scores on the WISC-R test was observed (P = 0.049). There was no statistically significant association between the results of the Bender tests and EEG findings (P = 0.66).

The right-left preferences of the 33 children and adolescents in using their hands, feet and eyes are shown in Table I. The distribution of neurological soft signs according to subgroups is shown in Table II. Twenty-three (57.5%) of the children and adolescents had a problem in one of the subgroups of straight and cross right-left differentiation, simultaneous double stimuli, hand-eye coordination, balance and coordinated movements and finger following. Ten (25%) of the subjects had no problem.

Table I. Preferences of Children and Adolescents with GTS in Using Their Hands, Feet, and Eyes (According to Gender)

	Right			Left		
	F	M	Total	F	M	Total
Hand	10	22	32	0	1	1
Foot	7	19	26	3	4	7
Eye	7	16	23	3	7	10

Table II. Distribution of Neurological Soft Signs (According to Subgroups)

	EEG	
Neurological soft signs	Normal	Abnormal
Right-left differentiate	20	13
Cross right-left differentiate	16	17
Simultaneous double stimuli	26	7
Hand-eye coordination	29	4
Coordinated movement	25	8
Finger following	33	0

During the analysis of the presence of a relationship between neurological soft signs and other variables, a statistically significant Verbal IQ > Performance IQ difference was found in the WISC-R test (U = 19.0, P = 0.038). No statistically significant association was observed between nerological soft signs and EEG findings (Table III).

Table III. Comparison of Neurological Soft Signs with EEG

	EEG	
Neurological soft signs	Normal	Abnormal
Negative	9	1
Positive	20	3
Missing	6	1

X^2: 0.0763, DF: 1, P = 0.7824 (ad).

Discussion

Few studies in the literature have investigated the presence of neurological soft signs in Tourette's syndrome. Neurological soft signs might be significant in the detection of lateralization, which is thought to play a role in the pathogenesis o GTS[10]. In our study, 32 (96.9%) of the patients enrolled in the study were right-handed and some neurological soft signs, particularly right-left differentiation, were observed in 57.5 percent of the patients. Neurological soft signs have been associated with hyperactivity, conduct, and emotional and cognitive disorders[6]. Performance IQ scores were lower than verbal IQ scores based on WISC-R test results (Verbal IQ = 92.5 ± 18.8, Performance IQ = 88 ± 19.3). This phenomenon is observed in either right-sided or bilateral cerebral hemispheric disorders[11-13]. GTS patients in this study showed a pattern of lower amplitude and impaired visual-motor perceptions and complex motor processing as observed in cross right-left differentiation, simultaneous double stimuli and hand-eye coordination. These deficits have been associated with various anterior-cortical-subcortical systems[14].

Non-specific EEG abnormalities were reported within the rates ranging from 12 to 95 percent[15]. The frequency of EEG abnormalities, all of them non-specific, was five percent in our study group. Trimble[15] reported the presence of EEG abnormalities in 13 percent cases and a low frequency of neurological soft signs in a clinical series consisting of 53 patients. On the other hand, Neufeld et al.[16] did not detect any significant difference in the frequency of EEG abnormalities between patient and control groups. Drake et al.[17], using a computer-aided EEG analysis, found their patients to be free of EEG abnormalities with conventional EEG methods, and observed abnormal recordings in four of 30 patients. Non-specific EEG abnormalities do not appear to be an important parameter in the diagnosis and follow-up of GTS patients when the prevalance of these abnormalities in the general population is taken into account.

These results suggest that neurological soft signs and neuropsychiatric (WISC-R, Bender-Gestalt) test might be important in the evaluation of the pathogenesis and clinical follow-up of GTS patients.

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