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RASMUSSEN'S ENCEPHALITIS

The relevance of neuropsychological assessment in patient's treatment and follow up

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ABSTRACT - Rasmussen's encephalitis is characterized by refractory epilepsy, neurological deterioration and progressive atrophy of one cerebral hemisphere. The objective of this study is to describe the importance of neuropsychological evaluation in the treatment decision and follow-up of patients with Rasmussen´s encephalitis. Neuropsychological assessment was performed in two steps. Firstly, the clinical history was obtained and the Vineland adaptative behavior scale (VABS) was applied. After this first step, the patients with social maturity level equal or higher than the inferior limit underwent a battery of neuropsychological assessment. We evaluated three patients before any specific treatment was started, and six months after the intervention (surgery or plasmapheresis). Patient 1 underwent left hemispherectomy and had global improvement on second neuropsychological assessment. This suggests that the decision of performing surgery was adequate. Patients 2 and 3 underwent plasmapheresis. They did not present cognitive decline between both evaluations which suggest that our decision of postponing surgery was adequate as well. We conclude that neuropsychological assessment is important when evaluating patients with Rasmussen´s encephalitis. That is especially true for patients in whom disease progression is slow, and surgery timing has to be carefully planned.

KEY WORDS: Rasmussen's encephalitis, neuropsychological assessment, epilepsy, childhood.

Encefalite de Rasmussen: importância da avaliação neuropsicológica no tratamento e acompanhamento do paciente

RESUMO - Encefalite de Rasmussen é caracterizada por epilepsia refratária, deterioração neurológica e atrofia progressiva de um hemisfério cerebral. O objetivo desse estudo foi descrever a importância da avaliação neuropsicológica no tratamento e acompanhamento de pacientes com encefalite de Rasmussen. A avaliação neuropsicológica foi realizada em duas etapas. Primeiramente, foi obtida a história clínica e foi aplicada a escala Vineland de comportamento adaptativo. Depois dessa primeira etapa, os pacientes com nível de maturidade social igual ou superior à faixa limítrofe foram submetidos a uma bateria de avaliação neuropsicológica. Nós avaliamos três pacientes antes e 6 meses após a intervenção (cirurgia ou plasmaférese). O Paciente 1 foi submetido à hemisferectomia e obteve melhora neuropsicológica global na segunda avaliação. Isto sugere que a decisão da realização da cirurgia foi adequada. As Pacientes 2 e 3 foram submetidas à plasmaférese. Elas não apresentaram declínio cognitivo entre as duas avaliações, o que sugere que nossa decisão de postergar a cirurgia também foi adequada. Nós concluímos que a avaliação neuropsicológica é importante quando são avaliados pacientes com síndrome de Rasmussen. Isto é especialmente verdadeiro para os pacientes nos quais a progressão da doença é lenta e a decisão do tempo cirúrgico deve ser planejada com cautela.

PALAVRAS-CHAVE: encefalite de Rasmussen, avaliação neuropsicológica, epilepsia, infância.

Rasmussen's encephalitis is characterized by refractory epilepsy, neurological deterioration and progressive atrophy of one cerebral hemisphere. Its etiology has not been identified yet. Seizure characteristics are variable, they may be continuous configuring epilepsia partialis continua, and their onset is usually between 1 and 14 years of age[1-3].Diagnosis is based upon brain biopsy and clinical characteris-

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tics. However, in children the diagnosis can be established based on clinical characteristics associated to neuroimaging especially magnetic resonance imaging (MRI), which shows progressive hemispheric atrophy, affecting initially the perirolandic, perisylvian and fronto-opercular regions[4].

Although there are some experimental treatments, such as steroids and plasmapheresis, so far, no clinical treatment was proven to be successful, and surgery (hemispherectomy) is the only option available[5-7]. Nonetheless, since surgery leads to severe and irreversible motor deficit, sometimes it is very difficult to establish the best surgical timing. Previous motor, language and cognitive disabilities should be carefully evaluated when one is considering to perform a hemispherectomy. That is when the neuropsychological assessment is an important tool in the evaluation of patients with Rasmussen´s encephalitis[8].

The objective of this study is to describe the importance of neuropsychological evaluation in the treatment and follow-up of patients with Rasmussen´s encephalitis.

METHOD

We evaluated three patients with diagnosis of Rasmussen´s encephalitis, seen at the epilepsy clinic of our university hospital. Diagnosis was based on clinical characteristics (refractory partial epilepsy and progressive neurological deficit) and MRI findings (progressive atrophy of one cerebral hemisphere).

Neuropsychological assessment was performed in two steps. Firstly, the clinical history was obtained and the Vineland Adaptative Behavior Scale (VABS) was applied. The objective was to evaluate the social maturity level and global neuropsychomotor development as well as four specific areas: communication (receptive and expressive language), daily living skills, socialization, and motor skills (gross and fine).

After this first step, the patients with social maturity level equal or higher than the inferior limit underwent a battery of neuropsychological assessment regarding handedness, attention, visual perception, auditory perception, executive function, constructive praxis, immediate auditory memory, visual memory and language (receptive and expressive). The tools used were: Wechsler intelligence scale for children (WISC III), hand preference test, cancellation test, color trail test, form perception, color perception, figure perception, object perception, Rey complex figure test (Copy and Visual Memory), Bead Memory (Subtest of Stanford Binet intelligence scale – 4th edition), auditory discrimination test, Peabody picture vocabulary test, phonological evaluation protocol (Yavas), Rey auditory verbal learning test (RAVLT) and memory for sentences (Subtest of Stanford Binet intelligence scale – 4th edition).

All patients were evaluated before any specific treatment was started, and six months after the intervention (surgery or plasmapheresis).

RESULTS

Patient 1. A 6 year-old right-handed boy had a normal neuropsychomotor development until age 5. Nine months prior to our evaluation he started presenting daily complex partial seizures characterized by staring and droolling, focal myoclonic seizures, simple partial seizures (clonic movements of right side of the body), and epilepsia partialis continua (EPC) in the right side of the face. He also lost some previously acquired milestones, such as language, memory skills, and the use of the right hand. Neurological examination showed a right hemiparesis. Seizures were refractory to antiepileptic drugs (AED) treatment, and MRI showed atrophy of the left cerebral hemisphere. When he was admitted and underwent neuropsychological assessment he was taking clonazepam, topiramate and gabapentin. Before surgery, the patient received phenytoin and the other AED were tapered off. A left hemispherectomy was performed. Seizures disappeared after surgery except for frequent brief left blinking. Table 1 shows the results of the neuropsychological evaluation.

Before surgery, only the first step of the neuropsychological evaluation was performed because his social maturity level was lower than the inferior limit, showing severe cognitive and motor deficits. He had right manual preference before surgery and progressively shifted his manual preference to the left side two months before surgery. After this procedure, the patient was able to perform some of the tests of the second step, and showed marked motor and language improvement. His global performance improved but still was impaired because he could only use his left hand. He currently utters long sentences, walks without assistance and the neurologic examination reveals moderate right hemiparesis.

Patient 2. A 14 year-old right-handed girl had a normal neuropsychomotor development until age 10, when she first presented a generalized tonic-clonic seizure. A few weeks after her first seizure she developed continuous jerks in the left leg characterizing EPC. Seizures were refractory to AED treatment. She also presented generalized tonic-clonic and complex partial seizures, almost weekly. Neurological examination showed mild left hemiparesis and motor deficit in the left foot due to traumatic peripheral nerve lesion. There was no complaint of cognitive deficit. MRI showed atrophy of the right cerebral hemisphere. Plasmapheresis was performed

Table 1. Results of the neuropsychological evaluation.

Tests	1st assessment			2nd assessment		
	Pt 1	Pt 2	Pt 3	Pt 1	Pt 2	Pt 3
1 - VABS SQ	MD	M	IM	Li	M	IM
Language receptive - Com.	L	A	A	ML	A	A
Language expressive - Com.	L	A	ML	ML	A	ML
DLS	L	A	A	ML	A	A
Socialization	L	A	ML	ML	A	ML
Motor Skill - F	L	A	A	L	A	A
Motor Skill- G	L	L	A	L	L	A
2 - Manual preference test	Le*	R	R	Le	R	R
3 - WISC IQ verbal		90 (M)	72 (Li)	81 (IM)	90 (M)	74 (Li)
IQ performance		99 (M)	76 (Li)	74 (Li)	103 (M)	79 (Li)
IQ global		93 (M)	72 (Li)	75 (Li)	95 (M)	74 (Li)
4 - Cancellation test		+	+		+	+
5 - Color Trail test		+	+		+	+
6 - Form perception (SBIS)		+	+	+	+	+
7 - Color perception (SBIS)		+	+	+	+	+
8 - Figure perception (SBIS)		+	+	+	+	+
9 - Object perception (SBIS)		+	+	+	+	+
10 - RCFT copy		M	IM		M	IM
Visual memory		M	IM		M	IM
11 - Bead memory (SBIS)		+	+	+ -	+	+
12 - Cubes (WISC)		M	Li	Li	M	Li
13 - ADT		+	+	+	+	+
14 - PPVT		M	Li	IM	M	Li
15 - PEP		+	+ -	+ -	+	+ -
16 - RAVLT		IM	MD	Li	IM	MD
17 - Memory for sentences (SBIS)		+	+ -	+ -	+	+ -

* Left handed recently; before he was right handed.

Pt, patient; VABS, Vineland adaptative behavior scale; SQ, social quotient; COM, communication; DLS, daily living skills; G, global; F, fine; WISC, Wechsler intelligence scale for children; IQ, intelligence quotient; RCFT, Rey complex figure test; SBIS, Stanford Binet intelligence scale; ADT, auditory discrimination test; PPVT, Peabody picture vocabulary test; PEP, phonological evaluation protocol; RAVLT, Rey auditory verbal learning test; M, mean; IM, inferior median; Li, limitrophe; MD, mental deficiency; A, adequate; ML, moderately low; L, Low; +, good performance; + -, intermediate performance; -, bad performance; R, right; Le, left.

and after this treatment there was slight improvement of the EPC and seizure control. Neuropsychological assessments, when she was taking valproate, phenobarbital and clobazam, showed no cognitive deterioration. The results of neuropsychological evaluations are shown in Table 1.

Patient 3. A 13 year-old girl presented clonic movements of the lower face and tongue configuring EPC and generalized tonic clonic seizures since 8 years old. Neurological examination showed mild slowing of movements in the right hand. MRI showed atrophy of the left cerebral hemisphere. Plasmapheresis was performed, however with no clinical improvement. Neuropsychological evaluation showed diffuse dysfunction, however, there was no evidence of further cognitive deterioration since the first evaluation. She was taking valproate and carbamazepine on both neuropsychological assessments, whose results are shown in Table 1.

DISCUSSION

According to Taylor[8], the neuropsychological assessment of patients with Rasmussens´s encephalitis is important in understanding language lateralization, and disease evolution follow-up. It can also be a valuable aid for determining when to perform surgery. Serial neuropsychological evaluation of cognitive, sensory and motor functions can establish the disease progress more clearly. Moreover, it can be used to evaluate the brain plasticity.

In this study we used the neuropsychological evaluation for disease follow-up. Since the disease has shown a very slow progress in Patients 2 and 3, the neuropsychological assessment was important

as an additional tool to establish the best surgical timing. Regarding language lateralization, none of our three patients needed specific tests, since they were all right-handed, and this suggests a left hemisphere lateralization for language.

Although Patient 1 shifted his manual preference (from right to left, due to his right-sided motor deficit) before the surgery, his receptive and expressive speech were extremely compromised and did not improve before surgery, showing severe dominant hemisphere impairment. The post-surgery improvement showed that the language was probably transferred to the right hemisphere only after the resection of the left hemisphere. The patient's age and the early intervention allowed cortical reorganization, as well as language and cognitive improvement, despite still having seizures. These findings are in keeping with the ones from the Montreal Neurological Institure (MNI) that show significant IQ improvement after surgery in patients with evident disease progression. In many patients the disease started before six years of age, allowing language transfer to the right (non-dominant) hemisphere after left hemisphere resection[8]. According to Milner[9], these patients will show early improvement in IQ after surgery, and this improvement will continue for a longer period probably reaching normal ranges [8,9]. That is probably what happened in patient 1, since six months after surgery he could perform fine motor activities with his left hand, and could go to the second step of neuropsychological assessment. These data suggest that the resection of the impaired hemisphere enabled a more sophisticated cerebral reorganization. After surgery, the right hemisphere could not only function appropriately, but also perform some extra activities formerly performed by the left side.

Patient 2 did not have global or specific cognitive deficit in the first evaluation, which was considered as a factor against surgical treatment. The decision was taken based on the fact that the hemispherectomy is a radical procedure with irreversible motor deficit. This patient had a left fibular nerve lesion and EPC in the left foot, so she had a mild limp. This created a negative influence in her global motor evaluation. However, her fine motor movements in the hand were normal. Cognitive and motor skills are the most important parameters when considering surgical treatment[10]. Since surgery was not an option, plasmapheresis was performed. After the procedure there was a mild improvement in seizure control including the EPC.

Patient 3 had a normal global cognitive evaluation, however, it was in the limits of normality. This could suggest that previous cognitive decline had occurred. However, we could not confirm that because we did not have the evaluation of the patient's cognitive baseline before the beginning of illness. Since she was stable and there was no impairment of hand movements, surgical treatment was postponed. In this patient, the fact that the lesion was in the left hemisphere (probably dominant for language) and she was 13 years-old, the decision to perform surgery was even more difficult, since the procedure probably would produce not only motor, but also a language deficit.

According to Taylor[8], the mean age of surgery in MNI series was later when the lesion was in the left hemisphere. That was probably linked to the fact that surgery would produce language deficit in patients.

Reevaluation of the patient showed no further neuropsychological or motor deficits. Therefore, this assessment was important as an additional parameter to adjourn surgery, since she still has adequate hand movements and no cognitive decline.

We conclude that neuropsychological assessment is important when evaluating patients with Rasmussen´s encephalitis. That is especially true for patients in whom disease progression is slow, and surgery timing has to be carefully planned.

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