Comprehensive care of epilepsy: Involvement of psychological assessment and wada test

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Epilepsy is a diagnosis applied to a variety of neurological disorders characterized by recurrent seizures. According to a World Health Organization (WHO) survey, epilepsy accounts for 1% of the global burden of disease. There are many non-medical problems on the people with epilepsy including cognitive alteration, psychiatric disturbances and difficulty coping in social, scholastic and vocational spheres. Regarding these complicated problems, A comprehensive epilepsy treatment program is a key concept in management of epilepsy including neuropsychological assessment in order to improve the patient’s quality of life. Several tools are available for assessing psychological disturbance resulted from epilepsy which consist of five board areas of neuropsychological functioning such as intelligence, cognition, sensory or motor function, affect and coping or adaptation and language. This review will be discussed about the equipment of psychological assessment which may have benefit in order to assess cognitive function among epilepsy patients including wada test.

Keyword: Epilepsy, Comprehensive Care, Seizures, Neuropsychology, Wada Test, Memory, Intelligence, cognition.

INTRODUCTION

Epilepsy is a neurological disorders that characterized by recurrent seizures. Some of these disorders are genetic. In other cases, epilepsy is secondary to cerebral lesion resulting from a number of causes including trauma, infection, stroke, metabolic results and neoplasms (Engel and Pedley, 2008; Tellez-Zenteno and Wiebe, 2008).

According to a World Health Organization (WHO) survey, epilepsy accounts for 1% of the global burden of disease. In developed country, around 50 people per 100,000 develop epilepsy each year. The incidence is higher in developing countries, perhaps almost double at 100 per 100,000 (Tellez-Zenteno and Wiebe, 2008; Birbeck, 2010).

There are many non-medical problems on the people with epilepsy including cognitive alteration, psychiatric disturbances and difficulty coping in social, scholastic and vocational spheres. Up to 50-60% of patients with chronic epilepsy have various mood disorders, cognitive and memory impairment influencing their quality of life (Krishnamoorthy, 2002). Regarding these complicated problems. A comprehensive epilepsy treatment program is a key concept in management of epilepsy (Krishnamoorthy, 2002; Barr, 2007; Hills, 2007; Tellez-Zenteno and Wiebe, 2008).

The field of neuropsychology has provided important contribution to the study of epilepsy for more than 70 years. Neuropsychologists, recognized by other professionals as playing a unique and important role in evaluating psychological aspects are considered key personal for epilepsy centers (Seino, 2001).

First, neuropsychology helps to identify the behavioral outcome of standardized resections. By comparing postoperative scores with preoperative baseline performance, neuropsychology has demonstrated that in addition to control seizures, epilepsy surgery can impact cognition. It has been recognized for 50 years that memory, in particular, is at risk following anterior temporal lobe (ATL) surgery. In addition to memory, in a significant number of patients, select language skills, such as visual confrontation naming, are at risk for decline following the left-dominant ATL surgery (Helmstaedter, Hermann et al., 2011).
Second, neuropsychology also help to predict cognitive change in the individual epilepsy surgery patient. One of role of the neuropsychologist as member of an epilepsy surgery team is to provide information regarding the prognosis of postoperative cognitive decline in the individual patient. The results of psychological assessment may affect surgical decisions and can provide potential patients with information to make informed medical choices. Factors found to have prognostic value relate to brain organization, compensation, and plasticity, including functionality of the tissue to be removed and the functionality of the tissue not to be removed (Johnstone, Coppel et al., 1997; Barr, 2007).

Third benefit of neuropsychology in the preoperative evaluation of epilepsy surgery patient is to aid in identifying the epileptiform area. The results of neuropsychological assessment cannot independently diagnose an epileptiform area, but has been reported to be helpful when combined with other diagnostic information (Barr, 2007). The neuropsychological information may suggest the extent of more diffuse brain involvement, hemispheric lateralization associated with the greater cognitive involvement and in some cases infrahemispheric localization of dysfunction. The diagnostic significance of the neuropsychological findings is considered in light of other evidence, including medical, electrophysiological and imaging data that implicate an epileptiform area (Johnstone, Coppel et al., 1997).

In addition, neuropsychology helps to aid in distinguishing seizures versus non-epileptic seizure and in planning rehabilitation and intervention. By identifying cognitive and social/personality weaknesses existing preoperatively and postoperatively, this information could be used in the planning with suggestions as to potential helpful interventions for the postoperative status (Johnstone, Coppel et al., 1997; Rausch, 2006).

Psychological assessment as part of comprehensive care

Regarding neuropsychological assessment on epilepsy patients, the center of epilepsy should perform some psychological tests that classified into three groups, first is intelligence test, second memory test and the last is frontal test. All of these tests are done as presurgical assessment as well two years post surgery, as a part of comprehensive assessment in order to improve patient’s quality of life (Groth-Marnat, 2003; Helmstaedter, Hermann et al., 2011).

Some references demonstrated that psychological assessment among epilepsy patients divided into 5 domains including intelligence or academic achievement, cognition, sensory and motoric function, affect and copying or adaptation ability and language (Rausch, 2006).

Another consideration before assessing patient, we should remember that these are some of the best tools for these assessment.

1. Intelligence Quotient (IQ) Test

To assess disturbance of intelligence resulted from epilepsy, The Wechsler Adult Intelligence Scale (WAIS) intelligence quotient (IQ) tests are very often used in this Center (Groth-Marnat, 2003).

The Wechsler Adult Intelligence Scale (WAIS) intelligence quotient (IQ) tests are the primary clinical batteries used to measure adult and adolescent intelligence (16–90 years old). For individuals under aged 6-16 years, the Wechsler Intelligence Scale for Children (WISC) are used, and the Wechsler Preschool and Primary Scale of Intelligence (WPPSI) are used for individuals aged 2½–7 years, and 3 months (Helmstaedter, Hermann et al., 2011).

2. Memory test

a. The Wechsler Memory Scale (WMS)

The Wechsler Memory Scale (WMS) is a neuropsychological test designed to measure different memory functions in a person. It can be used with people from age 16 through 90. The current version is the fourth edition (WMS-IV) which was published in 2009 and which was designed to be used with the WAIS-IV. WMS-IV is made up of seven subtests: Spatial Addition, Symbol Span, Design Memory, General Cognitive Screener, Logical Memory, Verbal Paired Associates, and Visual Reproduction. A person’s performance is reported as five Index Scores: Auditory Memory, Visual Memory, Visual Working Memory, Immediate Memory, and Delayed Memory (Groth-Marnat, 2003; Barr, 2007; Hills, 2007).

b. The Rey-Osterrieth Complex Figure Test (ROCF)

The Rey-Osterrieth Complex Figure Test (ROCF) is assessed by asking examinee to reproduce a complicated line drawing, first of all examinee is asked to copy that complicated line and then asked to draw them from their memory. Many different cognitive abilities are needed for a correct performance, and the test therefore permits the evaluation of different functions, such as visuospatial abilities, memory, attention, planning, and working memory (executive functions) (Goldstein, 1997).

c. Benton visual retention test

The Benton Visual Retention Test (or simply Benton
Test) is an individually administered test for ages 8-adult that measures visual perception and visual memory. It can also be used to help identify possible learning disabilities. The child is shown 10 designs, one at a time, and asked to reproduce each one as exactly as possible on plain paper from memory. The test is untimed, and the results are professionally scored by form, shape, pattern, and arrangement on the paper (Goldstein, 1997).

3. Frontal test

a. Wisconsin card sorting Test (WCST)

The Wisconsin Card Sorting Test (WCST) is a neuropsychological test of "set-shifting", i.e. the ability to display flexibility in the face of changing schedules of reinforcement by presenting a number of different shape, color, quantity, and design cards to the patients (Groth-Marnat, 2003). Clinically, the test is widely used by neuropsychologists, clinical psychologists, neurologists and psychiatrists in patients with acquired brain injury, neurodegenerative disease, or mental illness such as schizophrenia. It has been considered a measure of executive function because of its reported sensitivity to frontal lobe dysfunction. As such, the WCST allows the clinician to assess the following "frontal" lobe functions: strategic planning, organized searching, utilizing environmental feedback to shift cognitive sets, directing behavior toward achieving a goal, and modulating impulsive responding. The test can be administered to those 6.5 years to 89 years of age (Helmstaedter, Hermann et al., 2011).

b. Verbal Fluency Test

Verbal fluency tests are a kind of psychological test in which participants have to say as many words as possible from a category in a given time (usually 60 seconds). This category can be semantic, such as animals or fruits, or phonemic, such as words that begin with letter p (Helmstaedter, Hermann et al., 2011). The semantic fluency test is sometimes described as the category fluency test or simply as 'freelisting'. The COWAT (Controlled oral word association test) is the most employed phonetic variant. Although the most common performance measure is the total number of words, other analyses such as number of repetitions, number and length of clusters of words from the same semantic or phonetic subcategory, or number of switches to other categories can be carried out (Groth-Marnat 2003).

c. Trail Making Test

The Trail-making test is a neuropsychological test of visual attention and task switching. The task requires a subject to 'connect-the-dots' of 25 consecutive targets on a sheet of paper or computer screen. Two versions are available: A, in which the targets are all numbers (1,2,3, etc.), and B, in which the subject alternates between numbers and letters (1, A, 2, B, etc.). The goal of the subject is to finish the test as quickly as possible, and the time taken to complete the test is used as the primary performance metric (Groth-Marnat, 2003).

d. Stroop Test

The Stroop task has been employed to study frontal function and attention in brain imaging studies. This test is considered to measure selective attention, cognitive flexibility and processing speed, and it is used as a tool in the evaluation of executive functions. An increased interference effect is found in disorders such as brain damage, dementias and other neurodegenerative diseases, attention-deficit hyperactivity disorder, or a variety of mental disorders such as schizophrenia, addictions, and depression (Groth-Marnat, 2003).

4. Wada test

The Wada test, known as the "intracarotid sodium amobarbital procedure" (ISAP), is used to establish cerebral language and memory representation of each hemisphere. This test is conducted with the patient awake. Essentially, a barbiturate (which is usually sodium amobarbital) is introduced into one of the internal carotid arteries via a cannula or intra-arterial catheter from the femoral artery. The drug is injected into one hemisphere at a time. The effect is to shut down any language and/or memory function in that hemisphere in order to evaluate the other hemisphere ("half of the brain"). Then the patient is engaged in a series of language and memory related tests. The memory is evaluated by showing a series of items or pictures to the patient so that within a few minutes as soon as the effect of the medication is dissipated, the ability to recall can be tested (Seino, 2001; Rausch, 2006).

Interpretation and conclusion of Wada Test will be drawn after all of test is performed. Dominant side for language is decided by looking for response of speaking after injection, and dominant side for memory is interpreted from percentage of correct answer. We could say that the hemisphere is functionally good if patient can
answer 67% of question correctly, and to see the lateralization of memory function, we can measure it from difference between right and left injection, if the difference is more than 20%, we can conclude that there is lateralization (Helmstaedter, Hermann et al., 2011).

**Future Prospects and Suggestion**

To sum up, neuropsychologist has importance role as well as other team members in epilepsy center in order to manage epilepsy comprehensively, especially for epilepsy surgery, because of their contribution to help other team member to identify behavioral outcome of surgery, to predict the epileptiform area, and to suggest the rehabilitation plans after surgery. Due to its importance, psychological assessment among epilepsy patient is needed especially for preoperative study.

In order to assess psychological impact due to epilepsy there are several tools available even there is no uniformity to use these tools for each center, this is a challenges for clinicians to investigate further regarding impact of epilepsy on cognitive function.

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