

The Importance of Neuropsychological Tests for the Cognitive Evaluation of Hydrocephalus

Importância dos testes neuropsicológicos na avaliação cognitiva da hidrocefalia

Aurilene Guerra¹, Ana C.Melo ², Arlindo Morais³, Marcelo Moraes Valença⁴.

Received and accepted during the second semester of 2005

ABSTRACT

Hydrocephalus is characterized by the accumulation of cerebrospinal fluid in the cerebral ventricles, and can be developed from a congenital malformation like in the congenital hydrocephalus (CH), or as an idiopathic form or even secondary to other factors, like in the normal pressure hydrocephalus (NPH). Our objective was to assess children through neuropsychological tests who had developed CH and used the peritoneal ventricle derivation (PVD). We also analyzed adults that had developed the NPH, in three stages, before PVD surgery, seven days after and thirty days later. We observed the importance of neuropsychological tests for the cognitive evaluation of these patients. The results showed that patients suffering from CH present important deficit in all cognitive spheres. Patients with NPH showed cognitive improvement after the PVD surgery. We concluded that: through neuropsychological tests we can track the cognitive recovery of patients with NPH, and identify the most damaged cognitive spheres in children with CH.

KEY WORDS: congenital hydrocephalus, normal pressure hydrocephalus, neuropsychology, cognition, neurosurgery.

RESUMO

A hidrocefalia é caracterizada por acúmulo do líquido cefalorraquidiano nos ventrículos cerebrais, pode ser desenvolvida a partir de uma mal formação congênita no caso da hidrocefalia congênita (HC), e de forma idiopática ou secundária no caso da hidrocefalia de pressão normal (HPN). Nosso objetivo foi avaliar através de testes neuropsicológicos, crianças que desenvolveram a HC e que fazem uso da derivação ventrículo peritoneal (DVP). E adultos que desenvolveram a HPN, em três etapas, antes da cirurgia de DVP, sete dias após cirurgia, e trinta dias após cirurgia, e observar a importância dos testes neuropsicológicos na avaliação cognitiva destes pacientes. Resultado - Os pacientes com HC apresentam déficit importante em todas as esferas cognitivas. Na HPN, os pacientes apresentam melhora cognitiva após a cirurgia de DVP. Conclusões - Através dos testes neuropsicológicos podem acompanhar a recuperação cognitiva nos pacientes de HPN, e identificar as esferas cognitivas mais prejudicadas nas crianças com HC.

Palavras chave: hidrocefalia congênita, hidrocefalia de pressão normal, Neuropsicologia, cognição, neurocirurgia.

1-Neuropsychologic a master Department of Neuropsiquiatric of the Federal University of Pernambuco; 2-Graduation student of medicine of the Federal University of Pernambuco; 3-Graduation student of medicine of the Federal University of Pernambuco; 4-eacher, Neurocirurgião of Department of Neuropsiquiatric of the Federal University of Pernambuco.

Correspondence: Aurilene de Siqueira Guerra – Rua brejo da madre de deus, nº 180.bloco A-16, Apt 302, Janga Paulista. Pernambuco, Brasil -CEP: 53.437 040. Email: aurilene-guerra@uol.com.br . Fone: 81 34 34 53 41.

INTRODUCTION

The incidence of congenital hydrocephalus (CH) in children born alive is 1:1000. It is a great medical and social problem, and if not treated the patient develops an increased head size due to accumulation of cerebrospinal fluid (CSF) in the cerebral ventricle, presenting mental retardation, being under death risk because of the intracranial pressure.

In fifty percent of the cases patients may survive up to 10 years according to studies made by time-measuring the derivation implementation, number of revisions (check-ups), and scholarship (education). A weak mental and linguistic development was found in children that were submitted to surgery a month after the diagnosis was made².

The recognizing of the normal pressure hydrocephalus (NPH) as a potentially treatable cause has received increasing attention. This syndrome was first recognized by Hakim and Adams in the sixties, it is characterized by a gradual development of alterations in the march, associated to varied degrees of intellectual decrease, which clearly progresses to more advanced levels of dementia and urinary incontinence.

In the normal pressure hydrocephalus (NPH), a pressure in the cerebrospinal fluid occurs, and the patients also present enlarged ventricles, usually happening between the sixth and seventh decade of life. The cognitive deficits are among the subcortical subtypes, characterized by psychomotor difficulties and are present in the executive function¹.

After the derivation valve placement surgery, the patients present improvements in their cognitive state, gait and urinary incontinence⁴.

The neuropsychological tests for cognitive evaluation in this disease shows their importance from the application since they are well accepted by the patients, take little time to apply, and the results are efficient, avoiding stress for both the patients and professionals who apply the test.

METHOD

In order to assess children with hydrocephalus we used the Rey complex figure test. In order to evaluate the visual memory, this test contains a geometric figure, where we asked the child to copy the figure, using a model. Then,

after three minutes we asked the child to reproduce the figure according to its resemblance, without the model figure. The Rey test is easy to apply and well accepted by the patients, the correction is made according to the number of lines presented by the subject⁶.

The other test used to assess children with CH is the Wechsler Intelligence Scales of Weschler (WISC-III). These series of tests are constituted by thirteen sub-tests, where we assess the mental processing indices, such as the verbal comprehension, through the subtests the comprehension, vocabulary, and block design. The Perceptual Organization, which is part of the executive functions, is investigated through the assemble objects subtests which uses cubes and figure arrangements. The Resistance Towards Distraction is assessed through the arithmetic and digits subtests and Processing Speed through the subtests which look for symbols and codes.

And also the intellectual quotient (IQ) the verbal are all tests that are part of the verbal function, and the executive IQ all the tests that are part of the executive functions, the total IQ is the average between verbal IQ and executive IQ⁷.

To evaluate the patients with normal pressure hydrocephalus (NPH), we also used for the visual memory, the Rey complex figure test as described above, because in the first evaluation the patients were in an advanced state of dementia, accepting not to draw any other figure.

We also applied another test for visual memory, the CEPA, which is constituted by a series of figures where the patient, after a brief exhibition, will try to remember the figures showed, the score for this test is 30, but we worked with a lower score, because of the patient's general state⁵.

We also used in the patients with NPH an intelligence series for adults Wechsler Intelligence Scales (WISC-III) with two subtests, the vocabulary to verify the verbal function and the block design with the formation of figures to evaluate a little of the their executive functions⁸.

Moreover, in order to help in the verbal function evaluation we used the Rey auditory and verbal test, which is constituted of 15 words which are read and the patient is promptly asked to say the words that were said. This is done again and again and we also investigated the aural memory as well as the short term memory through this test⁶.

Finally, we used the Dementia Classification Scale, the CDR, known as the Rating Scale, to classify the dementia

before the PVD surgery, seven days after the surgery, and thirty days after the surgery⁷.

RESULTS

Through the results of the neuropsychological tests, we had the opportunity to identify cognitive deficits in all cognitive spheres of the children with CH, and related to the patients with NPH, a progressive improvement was observed in both verbal and executive functions as well as in the visual memory after the peritoneal ventricle derivation surgery.

DISCUSSION

We all know that the children with CH present memory deficit that represent damages to their school lives, and through the neuropsychological tests we can identify which cognitive function is more damaged or more preserved, helping us to establish, together with school and family, goals that can help them in their intellectual growth.

Related to NPH, the neuropsychological tests help us to follow the cognitive improvement closely after the peritoneal ventricle derivation, it is important to say that before the surgery these patients were classified as gravely demented or moderated demented, responding not or responding poorly to the task of verbal and executive function, and after the derivation, even in the first week, there happens a significant improvement, and a month later some of these patients get out of the state of dementia according to the CDR. These observations were confirmed only after the application of the neuropsychological tests.

CONCLUSION

The neuropsychological tests help to identify the cognitive deficits in the CH, and to follow the cognitive recovering of the patients with NPH after the peritoneal ventricle derivation surgery.

REFERENCES

- 1 Duikerke,A- Cognitive recovery in idiopathic normal pressure hydrocephalus after shunt – Cogn Behav Neurol. 2004;17: 179-84.
- 2 Ina Heinsbergen – Outcome in shunted hydrocephalic childrens. Neurology.2002;6:99-107.

- 3 Macedo M – Validade da versão em português da clinical Dementia Rating- .Rev. Saúde pública 2005;39(6)912-7
- 4 M.Mataró – Cognitive changes after cérebro spinal Fluid. Neurosurgery. 2000;68:615-621.
- 5 Otavio Rainho -Bateria Fatorial Cepa – (Centro de psicologia aplicada) Rio de Janeiro 2002, 2ª edição.
- 6 Rey A. - Teste de Cópia e reprodução de figuras geométrica complexas,manual .São Paulo: Casa do psicólogo, 1999.
- 7 Weschsler D. -Escala de inteligência para crianças. Wisc III: Casa do psicólogo. 3ªedição -São Paulo, 2002.
- 8 Weschsler D. - Wais III, Escala de inteligência para adultos. Manual de aplicação – adaptação brasileira 2004, 1º edição, São Paulo ,Casa do Psicólogo.

