Short Communication

Open Access

CrossMark

Utility of the repeatable battery for the assessment of neuropsychological status in focal epilepsy patients in an Arab Cohort

Abstract

The RBANS (Repeatable Battery for the Assessment of Neuropsychological Status) is a widely used screening battery in patients with cerebral dysfunction. However, there is little published research in patients who have epilepsy. We present its utility in patients in an Arab cohort, who have focal epilepsy. In this observational study, we selected patients with focal epilepsy who were referred from Epilepsy clinic for neuropsychological evaluation in a tertiary care hospital, in Al Ain, UAE. The RBANS was administered to patients and their standard scores were calculated for each of the five Indexes of the battery (Immediate Memory, Visuospatial/Constructional, Language, Attention and Delayed Memory) and compared to matched healthy controls. Anti-Epilepticdrugs (AED) usage was accounted for and type and number of drugs were noted. Epilepsy patients showed impairments across RBANS Index and Total scores compared to healthy controls. We conclude that RBANS is a quick and convenient tool for detecting cognitive impairment in a cohort of Arab patients with focal epilepsy and can be used to identify impaired cognitive domains for further selective neuropsychological evaluation. The utility of the RBANS in a larger cohort of epileptic patients should be further investigated.

Keywords: Epilepsy, RBANS, Neuropsychological assessment, Arab

Shannaz AlJarrah, Muhammad A Arif, Khurram A Siddiqui
Department of Neurology, Medical Institute, Al Ain Hospital, United Arab Emirates

Correspondence: Shannaz AlJarrah, BSc; MSc; D.Psy.Clin. Chartered Clinical Psychologist, Department of Neurology, Medical Institute, Al Ain Hospital, PO Box: 1006, Al Ain, United Arab Emirates, Tel +971-502-356-106, Email sjarrah@seha.ae

Introduction

Patients with temporal lobe epilepsy account for about 30 to 40% of the pharmacoresistant epilepsy and can be associated with impairments in multiple cognitive domains, including memory, language, executive function, intelligence and motor speed. Research studies investigating the generalized nature of cognitive impairment in temporal lobe epilepsy, which accounts for the commonest form of focal epilepsy, suggest that structural brain changes might be present outside the epileptogenic zone. Many studies have shown the involvement of extratemporal regions.[1-12] Significant bilateral volumetric reductions in frontoparietal regions have been reported in TLE male patients[1] as well as whole brain volumetric abnormalities.[2] Riley et al.[3] reported widespread disturbances in four white matter regions, namely, anterior temporal lobe, posterior mesial temporal lobe, cerebellum ipsilateral, as well as frontoparietal lobe contralateral to the side of seizure onsetin temporal epilepsy patients. The authors reported an association between three of these abnormal white matter clusters and distinct cognitive functions using the Repeatable Battery of Neuropsychological Status (RBANS). The mesial temporal and anterior temporal lobes clusters were correlated with performances on immediate and delayed memory. The cerebellar, an extra-temporal region, was correlated with executive function performances. Compared to temporal lobe epilepsy, extratemporal epilepsies occur in approximately 20% of patients with partial epilepsy with Frontal Lobe Epilepsy (FLE) being the most prevalent type of extra-temporal epilepsy. Much of the literature has examined differences in cognitive performances between patients with FLE and temporal lobe epilepsy. The research has found that FLE patients have higher IQ and less significant memory difficulties than patients with temporal lobe epilepsy.[13] Moreover, patients with FLE have shown to perform more poorly on executive function measures, motor programming/sequencing and coordination, phonological processing, visuomotor and visuoperceptual speed and complex visuoconstruction. Detailed neuropsychological evaluations are clinically valuable, but time-consuming. Some research has suggested the use of short cognitive screening measures for use with pre-ictal, ictal and post-ictal patients. For example, Andrewes et al.[14] found a significant association between side of seizure focus and selective memory impairment, post-ictally. The Montreal Cognitive Assessment (MoCA) was found to detect mild cognitive impairment in cryptogenic epilepsy patients despite normal Mini Mental State Examination (MMSE) scores and has been recommended as a screening test for patients with epilepsy.[15]

Usage of AED (Anti-Epileptic Drugs) has been known to induce potentiation of gamma-aminobutyric acid (GABA) inhibitory neurotransmission which has sedating effects ranging from cognitive slowing to anti-manic effects. Also other mechanisms of actions of AEDs include attenuation of glutamate excitatory neurotransmission, which has anxiogenic and antidepressant actions.[16]

The RBANS is a more detailed and widely used cognitive screening battery in patients with neurological cerebral dysfunction.[17] However, there is limited published literature on its use with epileptic patients. The aim of this study was to describe the cognitive deficits in an Arab cohort of intractable epileptic patients using the RBANS.

Material and methods

Seven patients with focal epilepsy were referred for a neuropsychological assessment as part of the evaluation of their focal epilepsy. The medical records of TLE (n=4) and extra TLE epilepsy (n=3) patients were reviewed. The diagnosis of focal epilepsy patients was confirmed using magnetic resonance imaging (MRI) and electroencephalography (EEG). AED usage was documented and noted in all patients, none of the patients were on reducing or changing doses or the type of the AEDs.

Control subjects were comprised of seven administration personnel recruited from a tertiary hospital and an ambulatory health

Utility of the repeatable battery for the assessment of neuropsychological status in focal epilepsy patients in an Arab Cohort

Copyright:
©2015 AlJarrah et al.   2

care centre. Subjects were native Arabic speakers without histories of the following:

a. Neurologic diagnosis.

b. Medical or psychiatric diagnosis that could affect cognitive functioning.

Informed consent was obtained from all research participants.

Neuropsychological assessment

Neuropsychological assessment using the Repeatable Battery of Neuropsychological Status (RBANS) was carried out on all patients and controls, in the Arabic language, using procedures specified in the manual. The RBANS has not been previously validated on an Arabic population. Standard scores for the age group for each patient were calculated for each of the five battery indexes. The Immediate Memory Index includes a four-trial 10-item list learning subtest and a two-trial story recall subtest. The Visuospatial/Constructional Index consists of figure copy and line orientation subtests. Digit span forward and digit-symbol coding comprise the Attention Index. Language assessment was based on a visual naming subtest and a category fluency subtest. The Delayed Memory Index included a delayed spontaneous recall of the story and list learning tasks and a delayed visual memory trial for the figure.

Statistical Analyses

The Mann Whitney U test was carried out to compare mean scores between the two groups on the five RBANS indices and the total score.

Results

Subjects were comparable in age and sex distribution (age 26.71±4.6 years) mean & standard error of the mean (SEM), male/female 1/6 and healthy controls (28.29±3.7 years, male/female 1/6). Five patients were on polytherapy (2 to 3), two were on monotherapy with AEDs. Type of AEDs were Carbamazepine, Valproate, Topamax, Levetiracetam, Oxcarbazepine, Topamax and Lamotrigine. None of the AEDs were altered during the study phase.

Epilepsy patients showed impairments (≤75) across RBANS Indexes and the Total score compared to healthy controls U=0, p ≤0.01. Observed mean scores for memory and attention indexes fall -3 SD below controls. Mean scores for language and visuospatial/constructional indexes fall -2 SD relative to controls. Forty three percent (3) of epilepsy patients obtained standard scores of ≥75on the visuospatial/constructional index and 29% (2) above 75 on the Language index. Eighty six percent (5) of healthy controls obtained a mean score of ≤75 on the attention index. Mean RBANS scores are presented in Table 1.

Table 1 Neuropsychological performance in epilepsy patients & controls

Domain	Test	Epilepsy	Controls	P-value
Immediate Memory	List learning	55.6±11.4	93.3±19.8	0.0021
	Story recall			
Delayed Memory	List learning	49.1±5.1	96.3±7	0.0021
	Story recall			
	Visual recall			
Attention	Digit span	48.7±14.2	78.9±22.2	0.0151
	Coding			
Language	Naming	59.7±18.4	86.0±6.4	0.04136
	Category fluency			
Visuospatial/ Construction	Figure recall	72.1±17.6	109.9±11	0.00596
	Line orientation			

Discussion

This pilot study aimed to describe the cognitive deficits in an Arab cohort of focal epilepsy patients. The RBANS was administered in the Arabic language to a group of patients with temporal lobe epilepsy and extra temporal lobe epilepsy and their results compared against a group of healthy controls.Epilepsy patients' showed impaired performances across the RBANS Indexes and the total score compared to controls. Patients' exhibited poorer performances on the memory (immediate and delayed) and attention domains compared to visuospatial/constructional and language indexes. These results were evenly distributed among TLE and extra TLE patients and are generally consistent with studies showing the generalized neuropsychological dysfunction in chronic epilepsy.[18] An unexpected finding was that the majority of healthy controls performed outside normal limits on the attention index. The differences in performance on the Digit Span task may be accounted for by the language spoken by the subjects. Naveh-Benjamin et al.[19] found that digit span was larger for native English speakers than for Arabic speakers. The only explanation for this finding is that Arabic numbers have more syllables and take longer to pronounce than English numbers. Moreover, in another study examining performance on a serial recall test, participants could remember more one-syllable words than five syllable words.[20] The author concluded that long words were harder to recall because participants said the words to themselves under their breath and longer words take longer to articulate. In the Coding subtest the examinee is given 90 seconds to fill boxes with numbers (1 through 9) corresponding to their geometric shape. Unlike letters, numbers in Arabic are written from left-to-right. However, the response format was in English which may have affected writing speed. It is also important to consider the cognitive side effects of anti-epileptic medication on neuropsychological performance. Most AEDs have been reported to cause varying levels of impairment on tests measuring attention, concentration, learning, memory, mental processing speed, reaction time and motor speed.[21] Moreover, research has shown that the risk of side effects is increased with polytherapy and less likely in patients on monotherapy.[16] In the present study most patients were on polytherapy which may have compromised their performance on neuropsychological assessment.

In conclusion, this study found that Arab patients with intractable epilepsy showed impairments across subtests on the Repeatable Battery of Neuropsychological Status (RBANS) compared to healthy controls. The results lend some support to the generalized nature of cognitive impairment in focal epilepsy patients, which can be related to the underlying type of epilepsy as well as AEDs. Further validation studies are required on a larger cohort of epileptic patients.

Acknowledgments

Conflicts of interest

None.

References

1. Smestad C, Sandvik L, Celius EG. Excess mortality and cause of death in a cohort of Norwegian multiple sclerosis patients. *Mult Scler*. 2009;15(11):1263–1270.

2. Marsh L, Morrell MJ, Shear PK, et al. Cortical and hippocampal volume deficits in temporal lobe epilepsy. *Epilepsia*. 199738(5):576–587.

3. Lee JW, Andermann F, Dubeau F, et al. Morphometric analysis of the temporal lobe in temporal lobe epilepsy. *Epilepsia*. 1998;39(7):727–736.

Utility of the repeatable battery for the assessment of neuropsychological status in focal epilepsy patients in an Arab Cohort

Copyright:
©2015 AlJarrah et al. **3**

4. Riley JD, Franklin DL, Choi V, et al. Altered white matter intensity in temporal lobe epilepsy: association with cognitive and clinical profiles. *Epilepsia*. 201051(4):526–545.

5. Martin RC, Hugg JW, Roth DL, et al. MRI extrahippocampal volumes and visual memory: correlations independent of MRI hippocampal volumes in temporal lobe epilepsy. *J Int Neuropsychol Soc*. 1999;5(6):540–548.

6. Kuzniecky R, Bilir E, Gilliam F, et al. Quantitative MRI in temporal lobe epilepsy: evidence for fornix atrophy. *Neurology*. 1999;53(3):496–501.

7. Bernasconi N, Bernasconi A, Andermann F, et al. Entorhinal cortex in temporal lobe epilepsy: A quantitative MRI study. *Neurology*. 1999;52(9):1870–1876.

8. DeCarli C, Hatta J, Fazilat S, et al. Extratemporal atrophy in patients with complex partial seizures of left temporal lobe origin. *Annals of Neurology.* 1998;43(1):41–45.

9. Moran NF, Lemieux L, Kitchen ND, et al. Extrahippocampal temporal lobe atrophy in temporal lobe epilepsy and mesial temporal sclerosis. *Brain*. 2001;124(Pt 1):165–167.

10. Bohnen NI, O'Brien TJ, Mullan BP, et al. Cerebellar changes in partial seizures: Clinical correlation of quantitative SPECT and MRI analysis. *Epilepsia*. 1998;39(6):640–650.

11. Ney GC, Lantos, G, Barr, WB, et al. Cerebellar atrophy in patients with long term Phenytoin exposure and epilepsy. *Arch Neurol*. 2000;51(8):767–771.

12. Sandok EK, O'Brien TJ, Jack CR, et al. Significance of cerebellar atrophy in intractable temporal lobe epilepsy: A quantitative MRI study. *Epilepsia*. 2000;41(10):1315–1350.

13. Specht U, May T, Schulz R, et al. Cerebellar atrophy and prognosis after temporal lobe resection. *J Neurol Neurosurg Psychiatry*. 1997;62(5):501–506.

14. Lassonde M, Helstaeder C, Hermann B, et al. Neuropsychology in the care of people with epilepsy. *John Libbey Eurotext*, France. 2011.

15. Andrewes DG, Puce A, Bladin PF. Post–ictal recognition memory predicts laterality of temporal lobe seizure focus: Comparison with post–operative data. *Neuropsychologia*. 1990;28(9):957–967.

16. Phabphal K, Kanjanasatien J. Montreal Cognitive Assessment in cryptogenic epilepsy patients with normal Mini–Mental State Examination scores. *Epileptic Disorders*. 2011;13(4):375–381.

17. Cavanna AE, Ali F, Rickards HE, et al. Behavioural and Cognitive Effects of Anti–epileptic Drugs. *Discov Med*. 2010;9(35):138–144.

18. http://images.pearsonclinical.com/images/PDF/technical_reports/RBANS.pdf

19. Hermann B, Seidenberg M. Neuropsychology and temporal lobe epilepsy. *CNS Spectr*. 2007;7(5):343–348.

20. Naveh–Benjamin M, Ayres TJ. Digit span, reading rate, and linguistic relativity. *Q J Exp Psychol A*. 1986;38(4):739–751.

21. Baddeley AD, Thomson N, Buchanan M. Word length and the structure of short term memory. *Journal of Verbal Learning and Verbal Behaviour*. 1975;14(6):575–589.

22. Lee GP. *Neuropsychology of Epilepsy and Epilepsy Surgery*. Oxford University Press, USA. 2010.