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Psychology

CORRELATION OF FOCAL THICKENING OF CORTEX WITH MILD PAUCITY OF UNDERLYING WHITE MATTER IN LEFT TEMPO-PARIETO-FRONTO-REGION AND FUNCTIONAL IMPAIRMENT IN PATIENT WITH BRAIN INJURY.

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ABSTRACT

Background: Although magnetic resonance imaging (MRI) is a high-resolution structural and functional imaging technique for measuring the brain dysfunction but neuropsychological assessment is traditional methods to assess the extent of impairment of a particular skill and also identify the brain area, which may have been damaged following brain injury or neurological illness.

Aim: To see the correlation between focal thickening of cortex with mild paucity of underlying white matter in left tempo-parieto-fronto-region and functional impairment in patient with brain injury.

Method: The present study was conducted on a patient with tempo-parieto-frontal lesions in Central Institute of Psychiatry, Ranchi. Patient underwent MRI and neuropsychological assessment, after that the neuropsychological test findings has been correlated with MRI findings.

Results: MRI findings had shown the focal thickening of cortex with mild paucity of underlying white matter in left tempo-parieto-fronto-region, which could locate only structural lesions accurately, but could not accurately predict the functional sequelae. Neuropshycological assessment has been used to assess the functional sequelae. Which had found the impairments in the area of attention, working memory, recent memory, visuo-spatial and visuo-motor coordination, as well as in the naming function of language. While the remote memory, recognition, retention, comprehension, expressive and receptive speech, planning, foresight, and adopting alternatives were relatively preserved in the patient.

Conclusion: By the use of neuropsychological assessment, we can get a better idea about the impairment and intact function of the brain area in-patient with brain injury. Which may be implicated in the rehabilitation plan for the patient.

KEYWORDS : Brain injury, Cognitive functioning, Neuropsychological assessment, Rehabilitation ,tempo-parieto-frontal lesion.

Introduction

One of the exciting developments in medical technology is the advent of high-resolution structural and functioning imaging of the brain, which allows highly precise examination of lesions. A major question that arises after detection of any such a brain change is whether there is any functional importance of these changes. Neuropsychological assessment will likely provide better and cheaper information about changes in cognitive functioning than repeated scans (Quigley, Colloby&O'Brien ,2011).because it is already well known that the presence of significant brain changes can be associated with nearly normal cognitive functioning, while individuals with no lesions detectable on imaging can have substantial cognitive and functional limitations (Tracy, McGrory, Josiassen& Monaco, 1996).

Neuropsychological assessment is not focused exclusively on individual's inherent deficits. It provides both general and specific information about current levels of cognitive performance (Harvey, 2012).An average or composite score across multiple ability areas provides an overall index of, how well a person functions cognitively at the current time (Zakzanis&Jeffay, 2011).

Indications for neuropsychological assessment includes:

- When there are deficits on standard mental status testing or clinical interview.
- When neuropsychological data can be combined with clinical, laboratory, and neuro-imaging data and a neuropsychological assessment is needed to establish the presence of abnormalities or distinguish them from changes that may occur with normal aging.
- Assessment of neurocognitive functions for the formulation of rehabilitation and/or management strategies among individuals with neuropsychiatric disorders.

Rational for study:

Imaging techniques (both structural and functional) can visualized location of brain damage but can not predicts the effect of brain damage on behavior. However, NP assessment can properly evaluate and define the relationship between the direct effect of brain damage and psychological factors that may result directly from the injury. It is not only determine whether impairment exists, but also give the existence of the impairment, to assess its implications for the person's functioning. Therefore, in the present study, we did the neuropsychological assessment to see the impairment and intact functioning of a patient with brain injury.

Method:

Participant: The present study was conducted with a patient in Central Institute of Psychiatry, Ranchi. The study was carried out with 44 year old, Hindu, Married male, working as a farmer, hailing from rural Varanasi with nil contributory of family history and past history.Pre-morbid personality was well adjusted with insidious onset, course continuous and progress deteoriating with predisposing factor meningitis fever. Came here with the chief complaints difficulty in remembering names for the last 7 months and Seizure attacks, frequent headaches, pain in the right side of the body for the last 4 months.MRI findings reveal focal thickening of cortex with mild paucity of underlying white matter in left temporo-parieto-fronto region.

During behavioral observation and mental status examination patient recent memory was comparatively poor, as the client was finding it difficult to give the names. A forward digit span of 2 was obtained. The client could not perform on the backward digit span test, and he complained of forgetfulness in the task.

Procedure:

Participant was recruited and all procedures took place in the Central Institute of Psychiatry, Ranchi. Participant and relative were provided written informed consent and patient underwent through procedures. Participant was assessed in Mini Mental Status Examination (MMSE), Bender Visual Motor Gestalt Test (BVMGT),PGI Battery for Brain Dysfunction (PGI- BBD),Addenbrooke's Cognitive Examination (ACE-R)- On the basis of the chief complaints, only two specific domains of language were selected for assessment on ACE-1(Line Drawing Test to assess naming in Language 2) Language-Comprehension.

Results:

1. On the Bender Gestalt test (BGT), the z score of the client was found to be 176, which suggests significant cognitive dysfunction.
2. Mini Mental State Examination (MMSE) the client obtained a score of 9 on 30 (cut off <24), which indicates severe cognitive impairment in the domains of attention, registration, recall, naming, and visuo-motor skills like drawing. Orientation seemed to be comparatively better than other domains.

Table 2(a). Score of PGI Battery of Brain Dysfunction (PGI-BBD) on the domain of memory functioning, intellectual functioning, visuo-motor coordination.

Sub tests	Dysfunction rating
Remote and recent memory	**0**
Mental balance, visual retention, recognition	**2**
Attention and concentration, delayed and immediate recall, retention for similar and dissimilar pairs	**3 (Total=5)**

(b)

Performance Intellectual functioning		**Verbal intellectual functioning**		
Test	***TQ***	***Test***	***TQ***	***Dysfunction rating***
		Information	84	3
Koh's Block	83	Digit span	74	2
Pass A long	**74**	Arithmetic	87	**3**
P/K*100	89 (Dysfunction rating =0)	Comprehension	60	**0**
PQ	**78 (Dysfunction rating = 2)**	VQ	**76 (Dysfunction rating= 2)**	

His performance quotient was found to be 78 which indicate impairment in performance ability and verbal quotient.

Test	Raw Score	Dysfunction rating
Nahor Benson test	4	2
Bender visual motor gestalt test	14	3

1) On the PGIBBD, the client's total dysfunction rating score was found to be above 20, which is indicative of cognitive impairment. Significant impairment was observed in mental balance, attention, immediate and delayed recall, verbal and visual retention, arithmetic, digit span, information, visuo-spatial tasks and visuo-motor coordination ability (table 1a).
2) On the block design subtest of visuo-spatial organization, it was found that the client could perform simple task without much difficulty. As the difficulty level increased, it was observed that the client was finding it difficult to construct the designs. While performing the task, It was noted that he was becoming confused regarding the placement and organization of the blocks and was trying several alternatives to attain the target. However, the client failed to complete the difficult designs on the task. This indicates that although the client might have deficits in visuo-spatial integration, but the ability to understand errors, adopting alternatives as well as planning and foresight are comparatively preserved in the client.

On the Alexander Pass Along subtest, it was found that the client's performance was comparatively better than that of the block designs.

a) The ACE-R Line Drawing Test was specifically used to assess the confrontational naming of the client. It was seen that the client completely failed to name the objects presented to him. However, he was able to give descriptions of the pictures. b) While assessing comprehension on ACE-R, it was found that the client was able to point to the correct picture on all the items.

Discussion:

The aim of the present study was to examine the domains of cognitive functioning were associated with lesions of Temporo-Parieto-Fronto region.

The findings on the various tests and subtests had been found deficit in the domains of attention, naming, registration, recent and immediate memory, as well as visuo-spatial and visuo-motor integration skill (Margolis, Williger, Greenlief, Dunn &Gfeller ,1989).

The immediate and delayed recall is clearly an attentional function which involves rehearsing the digits in order to prevent them to decay from the storage and simultaneously reversing the numbers backward, and in the process calling upon the central executive. The inability of the client to perform on this task can be explained as a result of impairment in sustained mental effort and concentration.Which is mainly associated with deficits in the frontal and parietal areas that govern the attention functions (Hoshi et al., 2000). Also, deficits in attention and sustained mental effort to a large extent can be explained as a result of the inability to hold information for an appreciable time period, because of deficits in recent and immediate memory functions that are largely governed by the temporal networks. While assessing naming, it was clearly evident that the patient's sole difficulty was in giving the 'names' of the objects shown to him on the line drawings. He was able to comprehend the instructions and recognize the objects by describing their attributes and utility in everyday life, which clearly points to the fact that comprehension, recognition and retention is markedly preserved. He was also able to recognize the correct word when it was given to him at the end of the task. Expressive and receptive language skills were also noted to be unaffected. From this, it can be deduced that it is the association between the object and its particular noun that is lost. Hence the area of deficit lies in the posterior region of the temporal convolution on the dominant side. Significant deficits in the visuo-spatial and visuo-motor ability, abstraction and categorization further reveal the involvement of the posterior parietal regions. On the whole, deficits in the posterior areas of the parietal-temporal regions of the dominant side are largely evident than the anterior ones.

Conclusion:

The following conclusions were derived on the basis of the present study. There is cognitive impairment in the patient, but if we see all the function separately there is some function preserved in the patient. Implication of the neuropsychological assessment should be plan for proper rehabilitation of the patient so that he could perform their daily activity.

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