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COGNITIVE LINGUISTIC SKILLS IN INDIVIDUAL WITH THIRD VENTRICLE LESION: A PRE-POST SURGICAL CASE REPORT

KEY WORDS: Cognition, Language, Third ventricle, Hydrocephalus

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ABSTRACT

Cognition and language are the basic prerequisites for effective communication among humans. The cognitive and linguistic skills are controlled and regulated by various areas and their connections present in the human brain. Any damage in these connections and the respective areas may lead to altered communicative skills and consequently deteriorated quality of life. The current case report aims to study and compare pre and post surgical speech, language and cognitive skills in case of third ventricle lesion with obstructive hydrocephalus in order to plan and implement an effective therapeutic intervention programme for further rehabilitation.

INTRODUCTION

The human brain is the control centre of human nervous system that comprises of several structures which are responsible for different motor and sensory functions of the body. Out of the four ventricles in the brain, the third ventricle is a median cleft in the diencephalon between the two thalami, and is filled with a fluid called cerebrospinal fluid (CSF) which helps to protect the brain from injury and transport nutrients and waste. The third ventricle is connected to the lateral and fourth ventricle via the foramen of Monro and the cerebral aqueduct respectively. The third ventricle also helps in normalising the CSF pressure inside the brain and consequently protects the brain from injury. However, any lesion in the third ventricle may lead to increase in the fluid pressure resulting in obstructive hydrocephalus. Intra ventricular tumour usually occludes CSF circulation resulting with hydrocephalus and raised intracranial pressure syndrome. They reach high volume until findings of hydrocephalus emerge and they require usually emergency intervention (Postalci, 2014). It may also affect the adjacent lateral and fourth ventricles and the subcortical structures as well. These all lesions can subsequently cause disturbance in cognitive abilities as well as language functioning and processing may also get interrupted. Patients with third ventricle tumors are at risk for developing impairments in memory, executive function, and fine manual speed and dexterity, which are domains associated with frontal subcortical functions (Friedman & Meyers, 2003). With lesions in and around the third ventricle, however, the patients frequently retain good personality and intellect but show gross defects of memory. The loss is not for particular events, nor for immediate appreciation of impressions, rather for their normal endurance and retention (Williams & Pennybacker, 1954). Linguistic deficits can also be marked due to acquired hydrocephalus. The core discourse deficits is a characteristic of children with hydrocephalus are concerned with computing meaning from context and resulted that they have difficulty making inferences and recalling factual information from the story and interpreting novel figurative expressions (Barnes & Dennis, 1998). As third ventricle has its contribution in regularizing CSF flow, protecting the other brain structures; any lesion to it can cause altered cognitive and linguistic abilities. Surgical correction of third ventricle lesion can improve these skills. The current case study aims compare the pre and post surgery speech, language and cognitive abilities in such a case which holds its significance in clinical correlation of results in implementing effective rehabilitation.

CASE REPORT

A 15 year old male reported with the complaint of reduced memory skills with effortful speech production and right hemiparesis since 3 months with no complaint of swallowing difficulty. Medical history of high grade fever, vertigo and unconsciousness was reported. Similarly, episode of fits followed by whole body numbness for 25 days was seen. Hence, client was diagnosed as third ventricle lesion with obstructive hydrocephalus based on CT. The brain CT scan interpreted as neurocysticercosis of third ventricle with multiple choroid plexus cysts.

Pre surgical: Oro peripheral motor examination suggested of hypotonicity of oral musculature which lead to inadequate intraoral breathe pressure on left side, lip deviation towards left. Rate of movement of tongue on lateralization and elevation were inadequate and observed to have poor taste sensation for sweet items along with restricted jaw movement towards right side. There was incomplete closure of right eyelids with prolonged and reduced eye blinking reflex for both the eyes and poor color discrimination. There was an observable strained voice as per the scoring based on Consensus for Auditory Perceptual Evaluation of Voice (ASHA, 2002), which indicated mild to moderate roughness and strain. Patient had weakness on right shoulder and imbalance in walking. Cranial nerve examination was suggestive of lesions to III, IV, V (motor branch), VI, VII (motor branch), X, XI and XII nerves. Reading and writing samples were taken which suggested poor literacy skills in Hindi language and while English reading and writing was relatively intact. There was no difficulty in spatio-temporal orientation, the patient could correctly answer eight out of ten questions related to spatio-temporal orientation, however rote memory was partially affected, three tasks were given related to naming of week days, months and counting and the patient could not perform correctly in any of the three trials for all the tasks. Semantic memory showed a significant deviation as the client could not recall any of the five objects in a sequence named. The patient could perform poor in semantic fluency and phonemic fluency tasks in which he could name only three animals in 60 seconds for semantic memory and only two meaningful words starting with /p/ in 60 seconds for phonemic fluency whereas auditory comprehension and execution of commands was intact. Lexical decision and association priming tasks resulted in prolonged reaction time with 50% accuracy; these tasks were performed using paradigm experiment (version 2.5) and administered individually. For the first task 15 meaningful and 15 nonsense word images of equal sizes were aligned in centre and presented in random order. Participants were instructed to press right arrow on the keyboard for every meaningful word and left arrow for non meaningful words. For the association priming task, 15 pairs of related images and 15 pairs of unrelated images were aligned in the left centre and right centre and the participants were instructed to press right arrow key for every pair of related images and left arrow key for unrelated image pairs. The results were exported to excel and summarized on the basis of accuracy and reaction time of each task stimuli. Frenchay Dysarthria Assessment (Enderby, 1983) was carried out for assessing speech intelligibility aspects and resulted in mild to moderate deviation in overall tasks performance. Figure 1 shows pre surgical computerized tomography (CT scan) image.

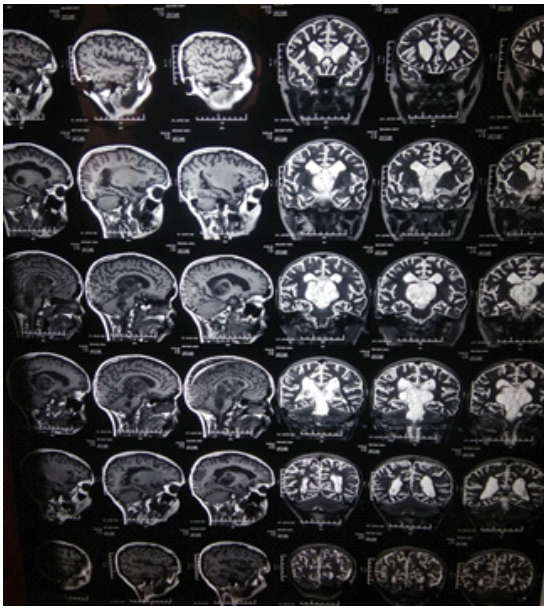

Figure 1., Pre surgical CT scan

Medical treatment: Therefore right ventriculo- peritoneal shunting was carried out after two days of admission in the hospital to drain out the excessive CSF. The surgery for neurocysticercosis of third ventricle was done one week after the speech, language and cognitive evaluation and a follow up re evaluation was carried out one week after the surgery.

Post surgical: Oro peripheral motor examination and cranial nerve examination indicated a significant improvement for all the structures and functions post surgery and CT image of the same depicted as figure 2. The reading, writing, cognitive and memory tasks showed no improvement as compared to pre surgery assessment. Lexical decision and association priming tasks resulted in prolonged reaction time but the accuracy of responses improved up to 60%. Language tasks of semantic fluency and phonemic fluency showed a relative improvement but the results still showed deviation whereas auditory comprehension and command execution remained intact. FDA was suggestive of mild grade deviation in speech and intelligibility in overall task performance.

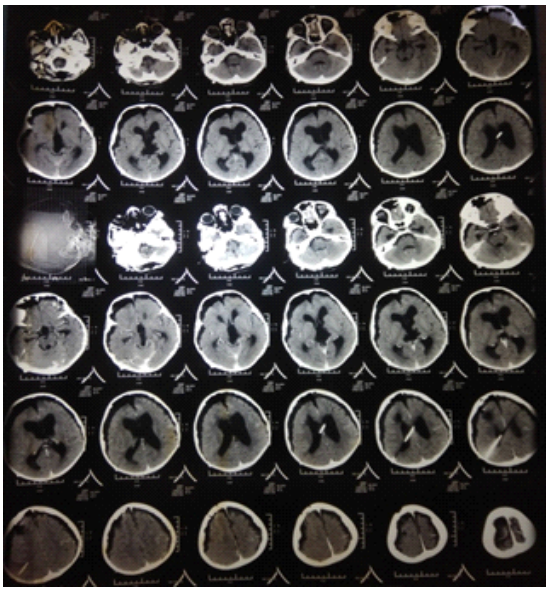

Figure 2., Post surgical CT scan

DISCUSSION

The lesion of third ventricle with obstructive hydrocephalus leads to altered language processing, cognition, memory and speech abilities. In the current study, it has been observed that there is no significant improvement in reading, writing, cognitive and memory tasks, though speech and language tasks showed relative improvement with residual mild deviation post surgery. The similar results have been shown in a study by Friedman and Meyers (2003). Obstructive hydrocephalus along with lesion in third ventricle can also be marked as a contributing factor for linguistic and cognitive deficits. This is in agreement with Barnes and Dennis (1998), where hydrocephalus showed deviant linguistic skills. However there can be some improvement in these tasks post surgery but there will be an observable deviation as long term effects which need further speech and language therapy and rehabilitation.

CONCLUSION

A comparative study was carried out to compare the pre and post operative abilities of speech, language, memory and cognition in case of third ventricle lesion with obstructive hydrocephalus which resulted in significant deviations for these skills due to the lesion with some improvement after the surgical intervention.

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