Original Research Article

DOI: http://dx.doi.org/10.18203/issn.2454-5929.ijohns20181469

Usefulness of P300 audiological test assessment in patients with snoring for cognitive ability

Gowri Shankar M.¹*, Athiyaman K.¹, Natarajan S.¹, Anitha Mahadevan²

Department of ENT, ¹Govt. Stanley Medical College Hospital, Chennai, ²Sivan ENT Care, KK Nagar, Chennai, Tamil Nadu, India

Received: 10 March 2018 Revised: 05 April 2018 Accepted: 07 April 2018

*Correspondence: Dr. Gowri Shankar M.,

E-mail: drnatsmo@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Snoring is a sleep disorder which often causes cognitive dysfunction, due to inadequate rhythms of sleep cycle. Commonly evaluated with polysomnography. P300 is an electrophysiological method to measure the cognitive dysfunction. Usefulness of P300 audiological test in snoring for cognitive ability is studied here.

Methods: Prospective study with 20 cases and 30 controls. Cases were selected with simple sleep apnoea questionnaires and snoring people were selected as cases. Healthy non snoring people were selected as controls.

Results: Significant increase in latency of P300 in snoring people (50%); more in males and in the middle aged group.

Conclusions: P300 is an electrophysiological method to measure the cognitive dysfunction in snoring people.

Keywords: P300, Snoring, Cognitive function, Audiology test for snoring

INTRODUCTION

It is very well known that patients with OSA syndrome have daytime somnolence leading to cognitive disability. 1 Very few tests are available for the assessment of the cognitive ability.P300 is an audiological test which is used for the assessment of cognitive ability of a person. This study assesses the usefulness of P300 assessment for the evaluation of cognitive abilities of the person with simple snoring disorder. 20 snoring people were evaluated by using standard sleep apnoea questionnaires and subjected to ENT evaluation and then P300 assessment, it is compared to normal non snoring healthy controls and results were analyzed. Snoring is an important problem for both men and women socially as well as personally. In Indian population it is 19.5% prevalent in men and 7.5% in case of females. 40 Percent of snoring people have mild cognitive impairment. Cognitive dysfunction is the loss of intellectual functions

such as thinking, remembering, and reasoning of sufficient severity to interfere with daily functioning. Patients with cognitive dysfunction have trouble with verbal recall, basic arithmetic, and concentration. Evaluation of cognitive dysfunction done by following methods

P300 event related or endogenous evoked response, the mirror-drawing test was used to study procedural memory and trail-making test (TMT) was used to evaluate divided attention and executive function. In our study P300 audiological test is used for measurement of cognitive ability.²

METHODS

To evaluate the cognitive functions using P300 Latency in patients with simple snoring disorder. This prospective case control study was conducted in SIVAN ENT care,

Chennai between January 2018 to February 2018 on 20 snoring people selected by simple sleep apnoea questionnaires. 30 non snoring healthy people were selected as controls. Both cases and controls subjected to ENT and Pure tone audiogram evaluation. All patients with snoring disorder were included in our study. Unwilling patients, patients with prior audiological

disorders, patients with prior mental dysfunctions and patients with medications that would affect the cognition were excluded from our study. After complete evaluation P300 audiological test was done for both groups and results were statistically analyzed by using the IBM.SPSS software version 23, CHI Square test. Values of P value ≤0.01 was considered highly significant.

Table 1: Test protocols.

Terminology	Description
Stimulus odd ball paradigm	There are at least two stimuli. One stimulus is presented frequently and the other is presented infrequently
Standard	The frequent signal in the oddball paradigm. Standard stimuli are predictable, accounting for 80% of the stimulus presented in the oddball paradigm
Target	The infrequent, unpredictable, rare stimuli, accounting for 20% of stimuli presented.
P300	response that appears 300ms after presentation of the rare stimulus in oddball paradigm ³

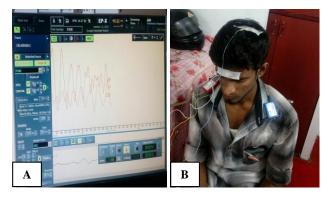


Figure 1: Test procedure. A=P300 recording in computer; B=P300 testing represent (one electrode placed over the right mastoid second electrode placed over vertex and control electrode placed over the forehead).⁴

P 300 latency

P300 is a positive deflection in the waveform within latency region of 250-400 ms.⁵

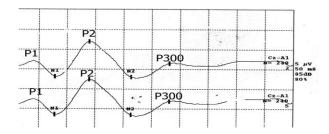


Figure 2: P 300 waveform.

RESULTS

In our study 20 snoring people selected as cases, 30 non snoring healthy adults taken as controls (Figure 3). Out of these 20 cases 10 cases had prolonged P300 (400-500

ms) latency, 10 cases had normal P300 (200-400 ms). (Figure 4). In our study most of the people belongs to middle age group (36-50 yrs) (Figure 5). Male predominantly affected in our study (Figure 6). In our study controls P300 latency 14 controls ranges (200-300 ms), 16 controls ranges (300-400 ms). Out of 20 cases, 4 cases ranges (200-300 ms), 6 cases ranges (300-400 ms), 10cases ranges (400-500 ms). Following Pie chart and Bar chart illustrated the results of P300 test.

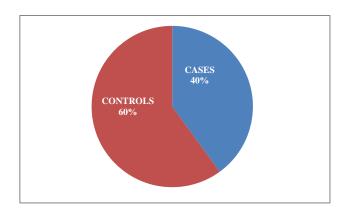


Figure 3: Distribution of study population among controls and cases.

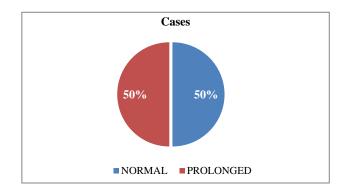


Figure 4: Distribution of study population with P300 latency among controls and cases.

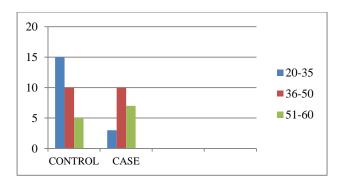


Figure 5: Age distribution in our study.

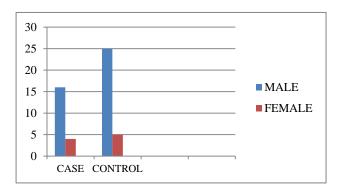


Figure 6: Gender distribution in our study.

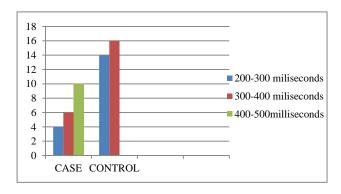


Figure 7: P300 latency in our study.

DISCUSSION

From our study snoring people have prolonged P300 latency because they have tendency to develop cognitive impairment which is easily detected by simple noninvasive electrophysiological test P 300. Previous study which supporting ours study is "abnormal auditory P300 latency indicates the cognitive dysfunction in OSAS patients. Nocturnal hypoxaemia may play an important role on it. Snorers should be monitored because of the tendency to develop cognitive impairment". 6 P300 latency significantly increased in snoring people (50%) and also mainly in middle age male people were affected in our study. P300 is an event related or endogenous evoked response identified in the 1960's. The P300 is a component within an extended ALR time frame recorded using an oddball paradigm (standard and target signal). Target signal produces a positive peak in the latency of 300ms, which is also called P3. A missing, rare or a deviant signal can elicit P300 response. It is often described as cognitive evoked response as it depends on the detection of the difference between frequent vs. rare signals.⁷ Diverse regions of the brain contribute to the generation of P300 including sub cortical structures hippocampus, other structures within the limbic system and the thalamus, auditory regions in cortex, frontal lobe.8 Gender has no significant difference in latency and amplitude, larger P300 amplitude for left handed individuals at Fz, right handed subjects at posterior sites, shorter latency for left vs. right handed subjects, possible explanations include larger corpus callosum in lefthanded subjects, differences in skull thickness, STM, attention. P300 latency is a reflection of information processing time. Memory updating for target signal is required as standard forms for good representation, anticholinergics have negative effect on P300, acute alcohol ingestion slightly increases P300 latency.



Figure 8: P300 testing in subject connected to computer software.

CONCLUSION

Snoring and sleep apnea is a common clinical problem in our society. It affects the cognition. Evaluation of cognition is needed for complete assessment, Because it will affects the day time activities like driving, studying, poor performance in working place. Most of the people with snoring have prolonged P300 latency. P300 is a non-invasive electrophysiological method of assessment of cognition.

As per previous studies abnormal P300 latency in OSA people with cognitive impairment. Based on our study snoring people have prolonged P300 latency. So snoring people have cognitive impairment, which needs evaluation much earlier to avoid poor performance in day today activities like driving, studying etc. Based on our study results, we have brought out the usefulness of P300 in assessing the cognitive function in people affected by snoring. The test has shown significant result in gender distribution with males being more affected. The P300 latency is increased significantly in cases with snoring. It has further shown that middle aged group has been more affected than other age groups.

Funding: No funding sources Conflict of interest: None declared

Ethical approval: The study was approved by the

Institutional Ethics Committee

REFERENCES

- 1. McCarthy G, Donchin E. A metric for thought: A comparison of P300 latency and reaction time. Science. 1981;211:77-80.
- 2. Halgren E, Marinkovic K, Chauval P. Generators of the late cognitive potentials, in auditory and visual oddball tasks. EEG Clin Neurophysiol. 1985;60:343-55.
- Hansen JC, Hillyard SA. Endogenous brain potentials associated with selective auditory attention EEG Clin Neurophysiol. 1980;49:277-90.
- 4. Davis H. Enhancement of evoked cortical potentials in humans related to task requiring a decision. Science. 1976;193:1142-6.
- 5. Hillelprat. Evoked physiological measurement of auditory sensitivity. Scott-Brown's otorhinolaryngol

- Head Neck Surg. 7th edition. UK: Hodder Arnold; 2008: 3276-3290.
- 6. Peng B, Li SW, Kang H, Huang XZ. Cognitive and emotional impairment in obstructive sleep apnea syndrome. Europe PMC. 2004;19(4):262-5.
- 7. Colrain IM, Campbell KB. The Use of Evoked Potentials in Sleep Research. Sleep Med Rev. 2007;11(4):277–93.
- 8. Gelir E, Başaran C, Bayrak S, Yağcıoğlu S, Budak MT, Fırat H, et al. Electrophysiological Assessment of the Effects of Obstructive Sleep Apnea Cogn. 2014.
- 9. Hall JW. Evoked response potential. New Handbook of Auditory Evoked Responses. Boston: Pearson; 2007: 450-600.

Cite this article as: Gowri Shankar M, Athiyaman K, Natarajan S, Mahadevan A. Usefulness of P300 audiological test assessment in patients with snoring for cognitive ability. Int J Otorhinolaryngol Head Neck Surg 2018;4:690-3.