White matter lesions, clinical parameters and neuropsychological deficits in patients with OSAS

G. Donzuso, L. Giuliano, C. Sanfilippo, V. Sofia, F. Le Pira and M. Zappia.

Department G.F. Ingrassia, Section of Neurosciences, University of Catania, Italy

Objectives

Obstructive Sleep Apnea Syndrome (OSAS) related cognitive dysfunctions have already been reported. However, no significant correlations were found between cognitive dysfunctions and clinical and polysomnographic parameters. Nevertheless, silent cerebrovascular lesions have been found in these patients, suggesting that a subcortical damage may be the cause of the cognitive alterations found in these patients. Aim of the study was to analyze the correlations between neuroradiological findings, clinical parameters and cognitive deficits of patients with OSAS.

Patients and Methods

Patients with diagnosis of OSAS made according to ICSD-2 criteria were consecutively enrolled. They completed a neuropsychological battery, including measures of attention, working memory, verbal memory, executive functions and visuospatial skills. OSAS was assessed by polysomnography. The patients underwent MRI acquisitions with T1 and FLAIR sequences. An automatic measurement of white matter (WM) lesions volume was carried out through the use of LST SPM8 software (Fig.1).
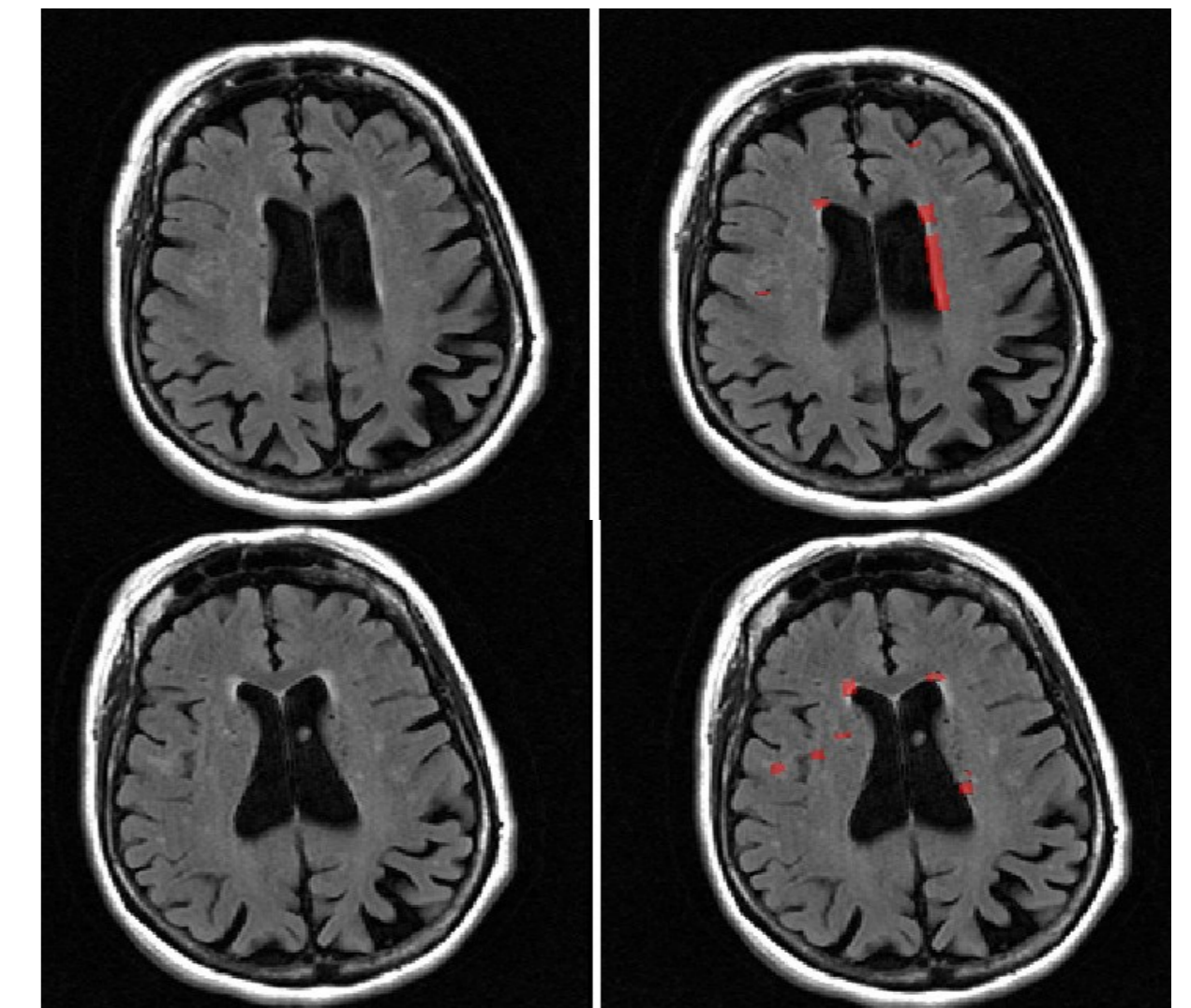

Figure 1 FLAIR MR images (on the left) and the same slice with automated segmented lesions (on the right).

Results

Demographics and MRI characteristics of our 27 patients are shown in table 1 and table 2. The volumes of gray matter, white matter, cerebrospinal fluid and intracranial lesion load were calculated. Significant correlations between WM lesions and neuropsychological tests were found and are shown in table 3. No significant correlations were found between the indices of severity of apnea and neuropsychological tests nor neuroimaging parameters.

Table 1: demographic characteristics

Variable	Mean ± SD
Age (years)	56.81 ±12.38*
Sex (M) (%)	78
Education (years)	7.96 ± 3.71
BMI (kg/m2)	31.91 ± 4.48
Diabetes (%)	33
Hypertension (%)	67
Dyslipidemia (%)	56
ESS	14.5 ± 4.68
AHI	36.31 ± 30.63
ODI	36.62 ± 31.08

*$\rho = 0.582$; $p = 0.001$;
BMI=Body mass index; M=male; ESS=Epworth Sleepiness Scale; AHI=Apnea/Hypopnea Index; ODI=Oxygen Desaturation Index

Table 2: MRI parameters

MRI Parameter	Volume (Mean ± SD)
GM	470.4 ± 85.4
WM	591.1 ± 99.5
CSF	224.2 ± 49.3
ICV	1239.8 ±270.2
Lesions	1.8 ± 4.3

GM=Grey Matter; WM=White Matter; CSF=Cerebrospinal Fluid; ICV=Intracranial volume Data are shown in ml.

Table 3: correlations of neuropsychological tests with WM lesions.

Test	Score (Mean ± SD)	Correlation with WM lesions
MMSE	26.56 ± 2.30	$\rho = -0.420$; $p = 0.029$
FAB	14.40 ± 3.65	NS
Hamilton	7 ± 4.83	NS
RAVLT		
Immediate recall	30.69 ± 5.56	NS
Delayed recall	5.36 ± 1.58	NS
Words recognition	10.78 ± 2.90	$\rho = -0.473$, $p = 0.013$
False recognition	1.56 ± 1.45	NS
Digit Span		
Span forward	5.15 ± 1.46	$\rho = -0.463$; $p = 0.017$
Span backward	2.92 ± 1.26	NS
MFTCT		
Accuracy	0.93 ± 0.09	NS
Time (sec.)	126.81 ± 47.09	NS
False	0.91 ± 2.08	NS
Stroop		
Time (sec.)	22.84 ± 10.32	NS
Errors	1.22 ± 1.62	$\rho = 0.464$; $p = 0.017$
COWAT	24.86 ± 8.37	$\rho = -0.484$; $p = 0.012$

Conclusion

A significant correlation was found between some neuropsychological performances and WM lesions load, independently from vascular risk factors and severity of apnea indices. Our results point out the role of age related WM lesions in the pathogenesis of cognitive deficits found in patients with OSAS.

References

· M. L. Ho, S. D. Brass. Obstructive sleep apnea. Neurology International 2011; volume 3:e15; 60-68.
· D. W. Beebe, L. Groesz, C. Wells, A. Nichols, K. McGee. The neuropsychological effects of obstructive sleep apnea: a meta-analysis of norm-referenced and case-controlled data. Sleep. 2003; 26(3): 298-307.
· M. Alchanatis , N. Zias, N. Deligiorgis, A. Chroneou, C. Roussos. Comparison of cognitive performance among different age groups in patients with obstructive sleep apnea. Sleep Breath. 2008; 12(1): 17-24.