



## INTRODUCTION

**Anosognosia for hemiplegia (AHP)** is relatively common following a stroke and is generally a transient and variable condition in the acute and post-acute phases. AHP is often associated with lesions of the right hemisphere, but it may also occur after lesions in other brain locations.

Individuals with AHP have motor impairment leading to gait and self-care deficits, but are unaware of the impairment and the deficits in functioning. Additionally, they do not realize the need for therapeutic interventions, leading to a refusal to participate in rehabilitation. Many studies have shown a correlation between AHP, longer rehabilitation stays<sup>1</sup> and poorer outcomes following a stroke<sup>2</sup>.

Given the prevalence of AHP after a stroke and its impact on recovery and rehabilitation, research has focused on a better understanding of the pathophysiology and its appropriate assessment.

There are several aetiological hypotheses regarding anosognosia and the pathogenesis of this phenomenon is widely debated. It has been explained as owing to psychological denial, disconnection between the left and right hemispheres or dysfunction of the system that monitors the intention to move and actual movements.

This study aims to investigate AHP in all patients after a first stroke and to assess a possible correlation between the level of awareness and education.

## METHOD

### Participants

Thirty patients affected by a first stroke were considered in the study according to the following inclusion criteria:

- no known psychiatric problem or alcoholic abuse prior to the brain damage;
- evidence of recent vascular unilateral lesion on CT scan or MRI.

Two patients (i.e. 7%) were excluded from the study because their severe language difficulties precluded their understanding of the test. Therefore **28 patients** (11 women and 17 men) entered the study. Their mean age was 73.86 years (range: 52-97 ys, SD: 11.07) with an average formal education of 7.7 years (SD: 3.56).

### Anosognosia assessment

We evaluated the presence of unawareness using the **Visual-Analogue Test for Anosognosia for Motor Impairment (VATAm)**<sup>3</sup>. The VATAm assesses patients' awareness of their ability to perform specific motor tasks. It is an easy tool to identify degrees of awareness of motor impairment and is suitable for assessment of patients with language deficits<sup>4</sup>. The test comprises 12 questions about the patient's ability to perform tasks that require the use of both hands (8 questions), or both feet (4 questions). The patients are asked to rate their ability using a 4-point visual-analogue scale. A rating of 0 indicates *no problem in carrying out the task* and a rating of 3 indicates *major difficulty or impossibility in carrying out the task*. For each patient, one caregiver is asked to rate the patient's motor capabilities using the same scale. The total rating of the VATAm ranges from 0 to 36. Each patient's self-evaluation score is then subtracted from that of their caregiver. A previous study reporting norms for the VATAm test<sup>3</sup> suggested that a patient/caregiver discrepancy equal to or higher than 6.3 should be considered as an indicator of unawareness (6.3-12.0 "mild anosognosia"; 12.1-24 "moderate anosognosia"; 24.1-36 "severe anosognosia").

## RESULTS

### (1) VATAm score

Nine of the 28 patients (i.e. 32%) showed evidence of unawareness according to the total VATAm score. Two of them showed mild anosognosia, 3 moderate anosognosia and 4 severe anosognosia.

### (2) AHP and brain lesion

Four of the 9 anosognosic patients (i.e. 44%) had a lesion that did not involve the right hemisphere.

VATAm score	Location of the brain lesion		
	Right hemisphere lesion	Left hemisphere lesion	Other brain lesion
Unaware	5 (56%)	3 (33%)	1 (11%)
Aware	7 (37%)	8 (42%)	4 (21%)

Six of the 9 anosognosic patients (i.e. 66%) had a lesion involving either frontal and parietal lobes or both.

VATAm score	Location of the brain lesion				
	Frontal and parietal lobes	Frontal lobe	Parietal lobe	Others	Total
Unaware	1 (11%)	2 (22%)	3 (33%)	3 (33%)	9 (100%)
Aware	1 (5%)	3 (15%)	5 (26%)	10 (53%)	19 (100%)

### (3) Anosognosia and level of education

Six of the 9 anosognosic patients (66%) had attended only primary school.

Level of education (years)	Anosognosia (VATA-m score)		
	Mild	Moderate	Severe
5		2	4
8	1		1
>8	1	1	

## DISCUSSION

Thirty-two per cent of patients resulted anosognosic and in about half of them the right hemisphere was not involved.

A review by Pia et al.<sup>5</sup>, reported an increased incidence of anosognosia when the lesion involved both parietal and frontal lobes. Our study shows that 66% of the patients who exhibited anosognosia had lesions involving either frontal or parietal lobes or both, whereas 46% of the patients who were fully aware of their motor impairment showed the same lesion pattern.

However the association between lesions of the frontal and parietal lobes and the presence of anosognosia was not significant (Fisher's exact test,  $p = 0.43$ ).

We performed a non-parametric analysis (Spearman's rank correlation coefficient) in the anosognosic group. It evidenced a **statistical significant inverse correlation between years of formal education and the degree of anosognosia** according to VATAm score ( $p=0.017$ ).

## CONCLUSIONS

Anosognosia is a multifaced phenomenon and several factors may underlie deficit of awareness. Different theories have been proposed to account for anosognosia, but no theoretical interpretation appears to account for all of the different aspects of anosognosia.

Our findings confirm that AHP occurs frequently also following lesions that do not involve the right hemisphere, but they do not support a definitive pattern of brain lesions.

A low educational level may influence the severity of AHP following a stroke suggesting that it may be a predisposing factor to a low degree of awareness. Previous experience may play a role in this phenomenon.

## REFERENCES

- Gialanella B, Manguzzi V, Santoro R, Rocchi S. Functional recovery after hemiplegia in patients with neglect: the rehabilitative role of anosognosia. *Stroke* 2005; 36: 2687-90.
- Hartman-Maeir A, Soroker N, Katz N. Anosognosia for hemiplegia in stroke rehabilitation *Neurorehabil Neural Repairs* 2001; 15: 213-22.
- Della Sala S, Cocchini G, Beschin N, Cameron A. VATAm: Visual-Analogue Test Assessing Anosognosia for motor impairment. *Clin Neuropsychol*. 2009 Apr; 23(3):406-27.
- Cocchini G, Beschin N, Cameron A, Fotopoulou A, Della Sala S. Anosognosia for Motor Impairment following left brain damage *Neuropsychology* 2009; 23 (2) 223-30.
- Pia L, Neppi-Modona M, Ricci R, Berti A. The anatomy of anosognosia for hemiplegia: a meta-analysis. *Cortex* 2004; 40: 367-77.

### E-mail:

rossella.pagani@gmail.com  
antonino.previtiera@unimi.it