PN 86

EARLY FUNCTIONAL CONNECTIVITY CHANGES IN A PRODROMAL SEMANTIC VARIANT OF PRIMARY PROGRESSIVE APHASIA: A LONGITUDINAL CASE REPORT

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INTRODUCTION AND AIM

Our goal was to define initial and progressive brain functional activity associated with silent naming (SN) and object knowledge (OK) in a case of prodromal semantic variant of PPA (svPPA) who developed a frank core symptomatology during the study.

METHODS

We report the case of a 49-year-old right-handed woman which started to complaint frequent anomias two years before the first visit. She has 17 years of education (with a master degree in foreign languages) and is currently employee.

The patient was followed longitudinally across three different visits (baseline, month (M) 8, and M16).
At each visit, she underwent:

- ✓ A comprehensive cognitive assessment (**Table 1**);
- ✓ A MRI scan (with 3D T1-weighted and task-based functional MRI-fMRI- sequences). During the fMRI sessions, she was asked to perform SN and OK tasks (**Figure 1**, column TASK) alternated by control conditions in two block designs.

MRI analysis

MRI analysis was focused on task-based fMRI sessions and performed in SPM12. Single-subject models investigating the effect of the SN and OK tasks (*vs* the control conditions) were performed considering the areas activated by the healthy controls in similar tasks, as described in literature.

RESULTS

Table1. Cognitive features of patient at each visit.

	Raw	Adjusted	Deficit	Cut-off
Baseline				
Confrontation naming, S.A.N.D.	5	4.43	*	≤9.69
Word-picture matching test, S.A.N.D.	12	-		≤10.25
Pyramids and Palm Tree Test (visual)	52	49.68		≤40.15
Pyramids and Palm Tree Test (verbal)	53	49.45		≤40.78
Total repetition, AAT	150	-		≤142
Sentence repetition, S.A.N.D.	6	-		≤2.45
Apraxia of speech	Absent	-		
Month 8				
	Raw	**Adjusted**	**Deficit**	**Cut-off**
Confrontation naming, S.A.N.D.	3	2.43	*	≤9.69
Word-picture matching test, S.A.N.D.	10	9.77	*	≤10.25
Pyramids and Palm Tree Test (visual)	48	44.45	+	≤40.15
Pyramids and Palm Tree Test (verbal)	46	43.68	+	≤40.78
Total repetition, AAT	150	-		≤142
Sentence repetition, S.A.N.D.	6	-		≤2.45
Apraxia of speech	Absent	-		
Month 16				
	Raw	**Adjusted**	**Deficit**	**Cut-off**
Confrontation naming, S.A.N.D.	4	3.43	*	≤9.69
Word-picture matching test, S.A.N.D.	12	-		≤10.25
Pyramids and Palm Tree Test (visual)	42	38.45	*	≤40.15
Pyramids and Palm Tree Test (verbal)	43	40.68	*	≤40.78
Total repetition, AAT	150	-		≤142
Sentence repetition, S.A.N.D.	9	-		≤2.45
Apraxia of speech	Absent	-		

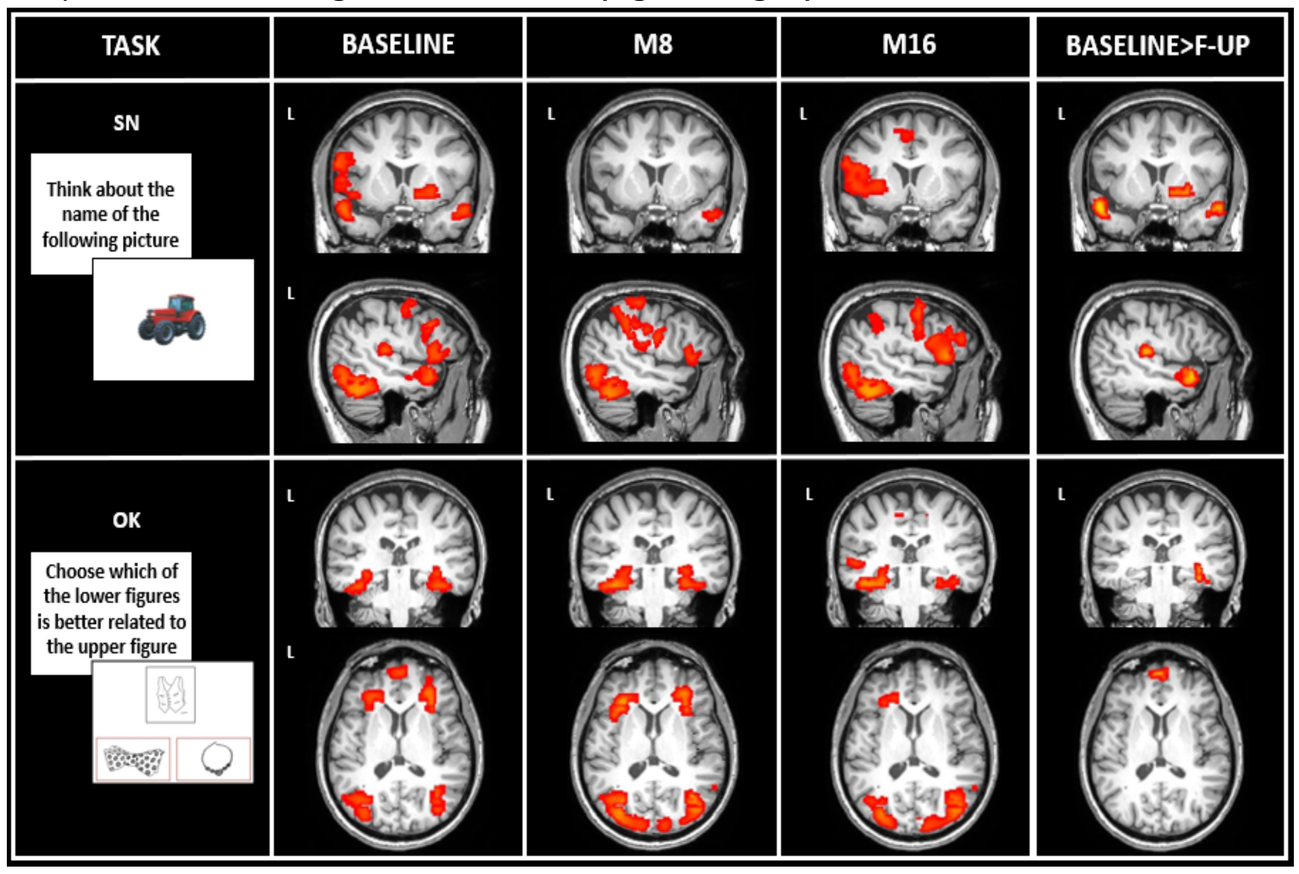
Number reflect patient's performance in terms of raw and adjusted (according to normative data) scores. +=borderline performance; *=abnormal performance.
S.A.N.D.=Screening for Aphasia in NeuroDegeneration; AAT=Aachener Aphasie Test.

Compared to baseline, where she presented with disturbances in confrontation naming only, at M8 and at M16 she progressively impaired in single-word comprehension and object knowledge, thus covering a symptomatology typical of a semantic variant of PPA.

RESULTS

The structural MRI showed a focal mild left temporal pole atrophy that remained unchanged across all visits.

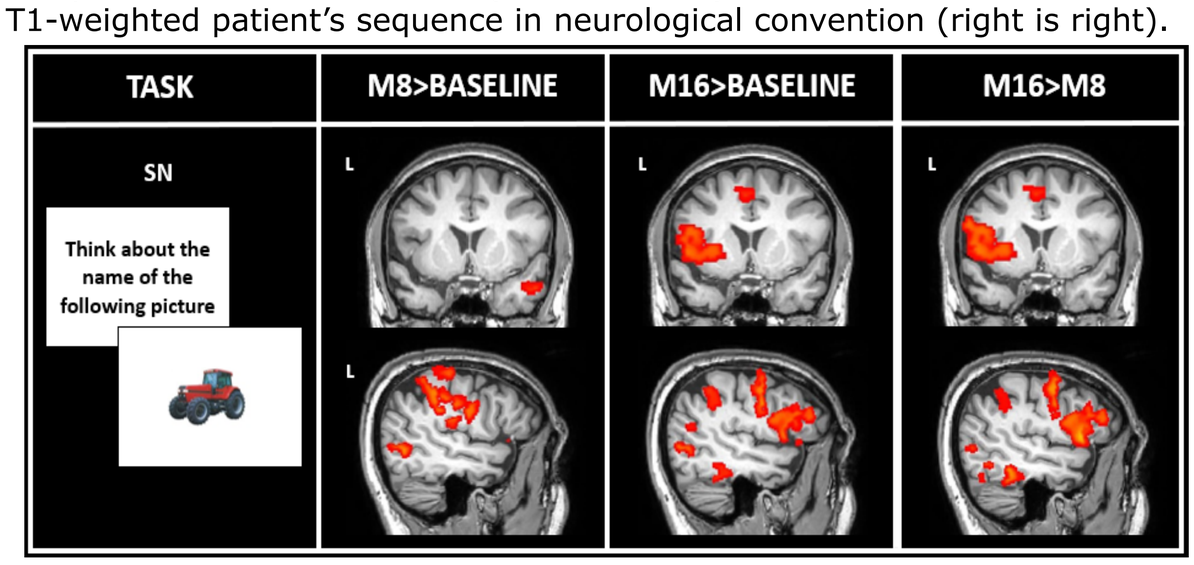
Figure 1. Functional MRI activations during the silent naming (SN) and object knowledge (OK) tasks, each compared with the control condition at baseline, month (M) 8, and M16 (warm colours). The last column (Baseline>F-UP) shows the greater functional recruitment observed at baseline when compared to the successive scans. Results are overlaid on the 3D T1-weighted patient's sequence in neurological convention (right is right).



Soon after the second visit, the patient undertook a 7-month speech therapy program focused on reinforcing lexical-semantic abilities.

At the last visit (M16), the patient showed a stabilization of naming disturbances, an improvement on single-word comprehension (**Table1**), and likely compensatory functional activity during the SN task (**Figure 2**).

Figure 2. Silent naming (SN) fMRI task. Functional activations at month (M) 8 compared to baseline and at M16 (last visit, soon after the speech therapy) compared to baseline and M8 (warm colours). Results are overlaid on the 3D T1-weighted patient's sequence in neurological convention (right is right).



CONCLUSIONS

- ✓ We showed the progression of brain functional activity during semantic tasks from the prodromal to the overt stage of svPPA.
- ✓ The functional activations during OK-fMRI, together with the progressive decline of semantic knowledge, suggested a critical role of the inferior frontal gyrus and the middle orbital inferio-frontal gyrus for the success of this cognitive domain.
- ✓ At the last visit, the hyperactivity of the left iFG during SN-fMRI reflects a compensatory mechanism in line with the stabilization of naming disturbances, likely due to the speech-therapy.
- ✓ Compared with structural MRI, the investigation of brain functional activity seems to be more powerful to detect early and progressive brain changes associated with the disease and to observe the effects of treatment.

Supported by the Italian Ministry of Health (GR-2011-02351217)

SINdem Associazione Autonoma Aderente alla SIN per le Demenze

XV CONGRESSO NAZIONALE
12 – 14 MARZO 2020 - FIRENZE

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