Posterior cortical atrophy with prominent alexia without agraphia in a Tourette syndrome

Nina Antonetta Fragassi · Laura Chiacchio · Luca Errichiello · Sabina Pappatà · Maria Rosaria Tedeschi · Pasquale Striano · Salvatore Striano

Received: 12 June 2010 / Accepted: 27 August 2011 / Published online: 13 September 2011 © Springer-Verlag 2011

Abstract We report for the first time a patient with childhood-onset Tourette’s syndrome (TS) who developed alexia without agraphia, acalculia, visual agnosia for objects and faces, and preserved mnesic functions in older age. Neuroimaging studies demonstrated temporo-parieto-occipital cortical atrophy and fronto-temporo-parieto-occipital hypometabolism, both more prominent on the left side. This case fulfills the diagnostic criteria of posterior cortical atrophy (PCA). The possible link between TS and PCA is discussed.

Keywords Posterior cortical atrophy · Tourette syndrome · Dementia · Alexia · Alexia without agraphia · Visual agnosia

Introduction

Focal dementia and their relationships with Alzheimer and Pick disease are gaining increasing interest in the last decades [2]. Progressive atrophy of the occipitoparietal cortex, associated with progressive signs of focal dysfunction as agraphia, alexia, and visual agnosia has been described by Benson et al. [4] as posterior cortical atrophy (PCA). However, also a frontal involvement has been assessed in some patients with PCA [14].

Tourette syndrome (TS) is a neurodevelopmental disorder primarily characterized by multiple motor and vocal tics and frontostriatal dysfunction, with possible long-lasting impairment of neuropsychological and cognitive performances in the adult age [8].

We report a patient with childhood-onset TS developing PCA in his elderly and in whom neurophysiological and neuroimaging data at the onset support the focal involvement of posterior cortex. The possible pathogenetic mechanisms for this association are discussed.

Case report

A 67-year-old right-handed man was referred to our neurology clinic because of progressive reading difficulties, started about 1 year before and then severely affecting his job. Family history was unremarkable for neurological diseases, including dementia and movement disorders. During his early childhood, the patient developed motor and vocal tics, coprolalia, and copropraxia, followed by a severe obsessive-compulsive disorder during the adolescence. Therefore, a diagnosis of TS was made but he refused any therapy. This disorder lasted during his lifetime, severely affecting his life activities. Nevertheless, he concluded with success the secondary school and satisfactorily practised the activity of tax advisor. At the age of 57 years, the man underwent implantation of a cardiac pacemaker because of arrhythmias.

At our observation, he showed severe motor and verbal tics with coprolalia that the patient tried to dissimulate
Mini mental state examination (MMSE) was 24/30. The patient was administered a neuropsychological battery of tests for memory, language, praxies, executive functions, visuo-perceptual, and visuo-spatial abilities [32]. Language evaluation was also carried out by means of the battery for the analysis of aphasic deficits [23]. Severe alexia with slow (letter-by-letter) reading and impairment of lexical decision of words and neologisms were evident. The man was able to write properly, but he could not read or understand what he had written, as reported in alexia without agraphia. In addition to alexia, the examination revealed mild acalculia and visual agnosia. The patient had remarkable impairment in visual recognition and denomination for standardized pictures made by Snodgrass and Vanderwart [31] brief test (12 anomic errors and 16 agnostic errors out of 80 pictures) and by the examination of language by Ciurlis et al. [9], so we argued he suffered from an associative type of visual agnosia. He also displayed normal scores at the Benton facial recognition test (43, normal values 41–54) [5], whereas he failed the famous faces recognition test (16 anomic errors out of 30 faces), according to the diagnosis of anomic prosopagnosia. Semantic paraphasias and mild executive deficits were also present. He showed impaired phonological verbal fluency, low scores at visual search task and Frontal Assessment Battery (FAB) test (12/18; equivalent score 0). His mnemic functions were normal.

EEG showed low voltage, slow alpha activity on the posterior areas of the right hemisphere, and low-voltage theta-delta activity on left posterior areas (Fig. 1). Brain CT scan revealed temporo-parieto-occipital cortical atrophy, more evident on the left side. Magnetic resonance imaging (MRI) was not performed because of his cardiac pace-maker. Brain fluorodeoxyglucose positron emission tomography (FDG-PET) showed temporo-parieto-occipital hypometabolism, more prominent on the left side. Left thalamus, and, to a lesser extent, left frontal lobe also showed reduced metabolic activity (Fig. 2).

Diagnosis of PCA was made. At 6-month follow up MMSE score was 22/30. The patient showed a worsening of his performances, in particular of alexia, visual agnosia, and marked topographical disorientation.

Discussion

According to the DSM IV diagnostic criteria [3], the association of motor and vocal tics, echolalia, palilalia, coprolalia, copropraxia, and obsessive–compulsive disorder configures a typical TS. This condition can influence negatively scholastic performances, because of the frequent association with an attention deficit-hyperactivity syndrome and with obsessive–compulsive disorder [13]. Depression, anxiety, and behavioural problems can also interfere with the performances of a child with TS [15]. Several cases of association between TS and selective neuropsychological deficits, such as dysgraphia, dyslexia, learning difficulties, and impairment of visuo-motor integration ability, have been reported [10]. Tics and associated disorders can also bring to social withdrawal and loss of self-esteem. Side effects of neuroleptics, clonazepam and other drugs, often used in TS therapy can also induce cognitive problems. However, our patient never took neither neuroleptics nor benzodiazepine.

Pathogenesis of TS still remains largely unknown. Electrophysiological data suggest a subcortical origin for tics in TS and activation of neuronal pathways different from those involved in normal movements [27], although these findings are still controversial [18]. Functional neuroimaging techniques suggest disorders of cortico-striatal circuitry [24], but these data have not been clarified yet.

However, despite the severity and lifelong duration of TS, our patient has preserved normal cognitive abilities, social integration and a successful career until the appearance of reading disturbances, at about 66 years of age.

The neuropsychological features of this case fulfill the diagnostic criteria for PCA [19, 20], i.e., (a) visual or visuospatial deficits at the onset, in the absence of ophthalmologic impairment; (b) complex visual disorders (visual agnosia, topographical disorientation); (c) slight problems of memory and verbal fluency; (d) preserved insight; and (e) insidious onset and progressive evolution of symptoms. Additional diagnostic criteria for PCA in our case were (a) early alexia, (b) dyscalculia, (c) negative neurological objective examination, (d) pronounced visuo-perceptual deficits, and (e) neuroimaging and electrophysiological evidence of parieto-occipital atrophy.

PCA is usually a pre-senile dementia, in most cases evolving in a generalized dementia [26], similar to AD. Differences between AD and PCA have been recently reviewed [7]. PCA patients show higher scores in episodic memory tests and lower results in visual-perceptive and visual-spatial tests. They also display better language, but more insight, depression and posterior atrophy on MRI. PET studies reveal occipito-parietal hypoperfusion and hypometabolism seen in PCA are different from the pattern of temporoparietal involvement observed in AD [25]. For these reasons, some authors consider PCA as a distinct clinical syndrome and not just AD with prominent visual deficits [21, 30]. Despite these findings, post-mortem studies have shown PCA has a similar histopathological pattern of AD [34]. Moreover, similar familial and apolipoprotein E risk factors could suggest that PCA is most commonly an early-onset posteriorly shifted AD variant [21].
Fig. 1 EEG of the patient at the age of 67 years. In the insets, frequency spectral analysis enhances the asymmetry of activity on the posterior temporal areas. On the right (T6) is still present, even if slowed, of low voltage and disregulated, alpha activity. On the left (T5) alpha has been replaced by low-voltage theta-delta activity.

Our patient displayed neither early visual hallucinations and parkinsonism nor asymmetric limb apraxia and alien limb phenomena to raise the possibility, respectively, of dementia with Lewy bodies and corticobasal degeneration. Cardinal features of Gerstmann’s syndrome (acalculia, agraphia, left–right disorientation, and finger agnosia) are sometimes present in PCA [19]. Our patient did not satisfy the criteria for Gerstmann’s syndrome, displaying only a mild acalculia. Reading deficits in PCA are often described as alexia without agraphia, even if other types of alexia have been reported, as visual-perceptive alexia, attentional alexia or central reading difficulty [1, 6, 11, 12, 22]. We could speculate that alexia without agraphia in this case can be attributed to the disconnection of the right visual areas from the left hemisphere verbal areas, as suggested by splenium of corpus callosum atrophy observed by some authors [35]. Unfortunately, we could not perform MRI in our patient.

The symptoms of the most part of PCA patients suggest predominant dysfunction of the occipitoparietal stream (dorsal “where” pathway) with abnormalities in visual localization and visuospatial integration [19–21, 25]. Symptoms of involvement of occipitotemporal stream (ventral “what” pathway), such as deficits of visual recognition, are less frequent, but reported by several authors [6, 12, 19]. Our patient belongs to the latter group, displaying visual agnosia.

The asymmetrical hypometabolism we found has been reported in a few PCA patients, even if it more often concerns the right side of the posterior cortical areas [34].

Frontal eye field hypometabolism has been described in PCA patients [14, 30] and it is considered as part of progression of PCA towards Balint’s syndrome [25]. In fact, loss of input from the occipito-parietal region may be the mechanism inducing the ocular apraxia of Balint’s syndrome. However, so far, we did not observe oculomotor apraxia in our case. Frontal metabolic involvement we found is related to slight executive deficits and may be explained by the impairment of fronto-striatal streams, often described in TS [25]. Interestingly, our patient shows a striking congruence of clinical, neuroimaging and electrophysiological findings. Alexia without agraphia is in fact
associated with CT (mainly, left temporo-parieto-occipital area) findings.

To our knowledge this is the first description of a TS developing PCA in older age. TS has been previously associated with several types of dementia [16, 28, 33]. Moreover, atypical presentation of PCA, featuring prominent basal ganglia involvement, has been previously described [17]. Furthermore, deficits of visual memory, a function related to the occipital cortex, have been found both in TS [29] and in PCA [36]. Although we cannot exclude that this association is incidental and the possible etiopathological basis are still lacking, the links between the two diseases are intriguing. Additional observations and a long term evaluation should be considered to assess a possible increased risk of focal dementia in TS patients.

References

visual variant of Alzheimer’s disease) with FDG-PET. J Neurol Neurosurg Psychiatry 74(11):1521–1529