

## Behavioral disorders in association with posterior callosal and frontal cerebral infarction

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**Behavioral disorders were a prominent clinical feature after the surgical treatment of an anterior communicating artery aneurysm rupture in a 44-year-old man. Callosal apraxia was associated with an alien hand. The latter remained 1 year after surgery while diagonistic apraxia disappeared after 3 months. Other callosal signs included left agraphia, tactile anomia and auditory suppression. MRI revealed posterior callosal infarction and a right frontal infarct. The association of diagonistic apraxia and alien hand is rarely reported.**

**Keywords:** Alien hand – Callosal infarction – Diagonistic apraxia

### INTRODUCTION

The first description of a disconnection syndrome is attributed to Liepmann (1907) who reported the occurrence of apraxia, unilateral agraphia and hemialexia in a patient with anterior cerebral artery infarction. Different behavioral troubles have been described after callosotomy or callosal lesions. Diagonistic apraxia has been reported by Akelaitis (1944-1945) after callosotomy. In this condition, the left hand seemed to be in conflict with the behavior of the right hand while the patient was fully aware of the disturbance. The alien hand has been reported by Goldberg *et al.* (1981) in cases of frontal- and/or callosal-associated damage. Alien hand is a behavior impairment including arm grasping and groping which seems not to be under conscious control of the patient. The alien hand may be uncooperative but patients are not always aware of that. The behavior disorders reported in callosal lesions (Bogen, 1985) have rarely been reported after anterior communicating or anterior cerebral artery aneurysm rupture and repair (Beukelmann *et al.*, 1987; Starkstein *et al.*, 1988; Banks *et al.*, 1989; Tanaka *et al.*, 1990), or callosal infarction (Watson and Heilman, 1983).

### CASE REPORT

A 44-year-old right-handed manager with a past history of hypertension developed headache and acute confusion. Computed tomograms (CT) revealed a subarachnoid hemorrhage. Angiography revealed an anterior communicating artery aneurysm. During surgery, total exclusion of the aneurysm necessitated narrowing of the right anterior cerebral artery. Left hemiparesis appeared after surgery

while persistent vasospasm was noted despite nimodipine administration. Motor impairment and confusion improved within 1 month but there was persistent difficulty in dressing. Neurological examination showed reduced appreciation of touch in the left hand. Functional disability was related to apraxia with antagonist actions of the hands. The patient was unable to put on socks, trousers and shoes alone. When the right hand tried to put on clothes, the left hand or foot tried to take them off. Other activities were also prevented by opposing behavior occurring simultaneously with the left hand. The patient was sometimes unable to leave his car; the left hand opened and closed the car door with grasping movements of the door handle. The behavior disappeared within a few minutes after he turned his attention to something else. The patient expressed astonishment at the apparent autonomous activities of the left hand.

The diagonistic apraxia disappeared within 3 months, but an alien hand occurred 1 year after surgery. CT revealed a small right medial frontal infarct with enlargement of the right frontal horn. Magnetic resonance imaging (MRI) showed damage in the posterior half of the corpus callosum with atrophy and irregular cavities in the sagittal plane and right frontal cortex damage in the axial plane (Fig. 1a and b).

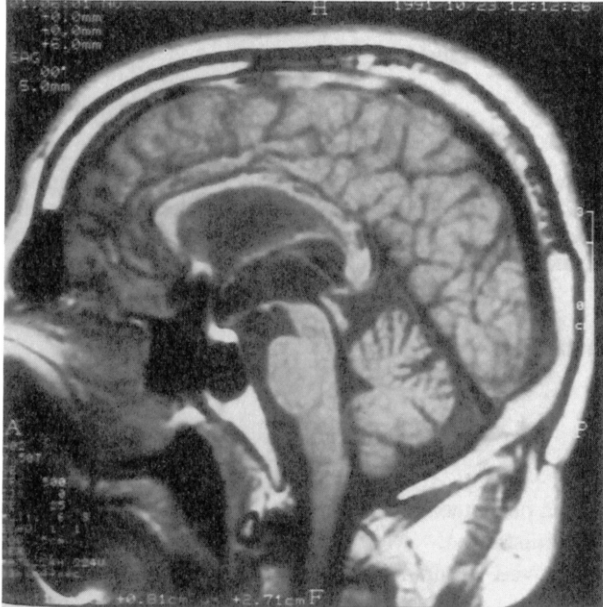
### Neuropsychological assessment

*Language.* Speech was fluent. There were no paraphasias. Comprehension and denomination was normal. There was no hemialexia. Left agraphia was present.

**Tactile denomination.** This was tested with the Fuld test (Fuld, 1981); it was normal with the right hand. Left tactile anomia was associated with tactile confabulations.

**Dichotic listening.** Dichotic listening showed partial left auditory suppression.

(a)



(b)

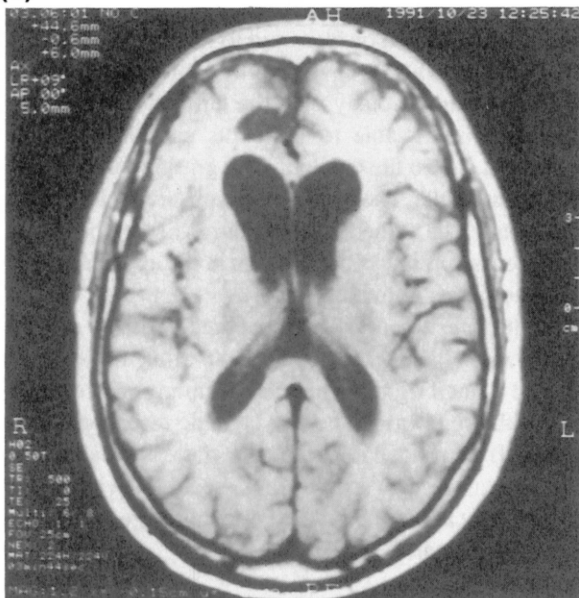


FIG. 1. MRI T1-weighted images showing (a) the corpus callosum infarct in sagittal plane and (b) the right medial frontal lesion in axial plane.

**Somesthetic transfer.** This was impaired with difficulties in cross-replication of hand postures. Agraphhesthesia was noted on the right hand.

**Praxis.** There was no ideomotor, constructional apraxia, or spatial acalculia.

**Half visual field (HVF) denomination.** Three months after surgery, HVF denomination was tested tachistoscopically using a microprocessor (PC 386) which projected one letter or one geometrical form for 100 ms. Letters and forms were different in each half visual field. There was no HVF anomia.

**Memory.** Memory was tested 3 months after surgery according to the BM 144 (Signoret and Whiteley, 1979). Mild impairment appeared in visual memory, both in recall and recognition tasks. Performance on the Wisconsin card sorting test was not impaired. Digit span and fluency were normal. There were no neglect signs.

## DISCUSSION

In the literature, alien hand and diagonistic apraxia have often been merged into one (Banks *et al.*, 1989; Bogen, 1985). The alien hand has also been compared with "le signe de la main étrangère", although the latter was defined as a failure of recognition when one hand is placed onto the other in front of the patient with his eyes closed (Brion and Jedynak, 1972). Alien hand in this publication refers to a different disorder, characterized by grasp reflexes. Goldberg suggested that alien hand occurred in patients with associated callosal and medial frontal lesions. Diagonistic apraxia, in which the non-dominant hand is in conflict with volitional action of the dominant hand, is associated with autocriticism and frustration due to the intermanual conflict (Starkstein *et al.*, 1988). Our patient showed both intermanual conflict and grasping uncooperative movements suggesting the association of alien hand and diagonistic apraxia. This association has not often been clearly described in the literature, although it had been suggested in some clinical descriptions (Banks *et al.*, 1989). This association, reported by Leiguarda *et al.* (1989), has been related to the combination of a medical callosal lesion and unilateral medial frontal cortex damage. Nevertheless, the precise anatomic lesion was not clear because of the lack of MRI or *post-mortem* study. In our patient, CT performed after surgery showed only the right frontal infarct while MRI also revealed caudal lesions in the corpus callosum. The association of both lesions may be relevant to the appearance of both behavioural disorders. Nevertheless, diagonistic apraxia can occur after either medial callosal lesions (Leiguarda *et al.*, 1989) or caudal lesions (Brion and Jedynak, 1975), as in our

patient. In right-handed patients, agraphesthesia was usually reported in the left hand. In our patient and in a previous report, this sign appeared in the right hand (Yamadori *et al.*, 1980). This suggests that graphesthesia may depend on interhemispheric transfer of spatial data coming from the right hemisphere as occurs in constructional apraxia. Confabulations associated with tactile anomia were described by Brion and Jedynak (1972) in a patient with Korsakoff syndrome associated with the callosal syndrome. MRI in the sagittal plane showed lesions involving the caudal half of the corpus callosum. The site of the lesions appeared to be closely related to the predominating somesthetic symptoms: tactile anomia and impairment in cross-replications of posture. The lack of HVF anomia might be explained by the delayed evaluation of HVF denomination.

The callosal injury in our case was probably due to persistent vasospasm after the subarachnoid hemorrhage and to the partial occlusion of the anterior cerebral artery during the surgical procedure. In a previous report, the diffusion of interfrontal subarachnoid hemorrhage was suggested as the likely cause (Leiguarda *et al.*, 1989).

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