Parkinsonism Associated with a Brain Tumor

— A Case of Convexity Meningioma —

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Summary: Parkinsonism occurs in 1-2% of patients with whole brain tumors. The authors describe a case of 70-year-old woman who presented with a bilateral tremor of her upper limbs. CT scan revealed a convexity meningioma. Symptoms gradually improved after total removal of the tumor. It was concluded that the parkinsonian symptoms associated with the tumor were caused by mechanical pressure on the basal ganglia.

Key words: parkinsonism — convexity — meningioma — tremor — rigidity

Introduction

Parkinsonism can be associated with brain tumors but it is difficult to diagnose tumor-induced parkinsonism in the early stages. Several characteristics are known: 1) the tumor is usually located in the supratentorial region, 2) the tumor need not be in the basal ganglia, 3) the symptoms will disappear after removal of the tumor, 4) and a parkinsonian triad is observed in only 15% of cases. This report describes the case of a 70-year-old woman and suggested a mechanism for the pathogenesis.

Case Report

A 70-year-old house wife noticed a bilateral postural tremor of her upper limbs in 1978. Antero-pulsion and a paralytic gait developed at the same time. The diagnosis by her physician was cerebral infarction and she was treated for three years. Her symptoms became progressively worse and she could not arise from bed because she had lost her ability to initiate movement. She was admitted to a psychiatric hospital and a CT scan was performed. A brain tumor was localized in the right frontoparietal region, and she was transferred to the surgical ward at Kurume University Hospital for an operation.

On admission a bilateral postural tremor was observed and hemiparesis was present. Muscle rigidity of the left extremities and hyperreflexia of the left upper limb were found. The patient complained of headaches but there were no choked discs. She moved slowly and had a slight masked face. At age 20 she had suffered from Goiter which was successfully treated by surgery and irradiation. There was no past history relating to parkinsonism.

A plain skull film demonstrated an enlargement of the vascular channels and bone thinning in the right frontoparietal region. Pressure atrophy was not found at the sella turcica (Fig. 1). A CT scan revealed a broad low density area in the right frontoparietal lobes. The bilateral anterior horns of the lateral ventricle were deviated to the left. A round high density
Fig. 1 Plain skull film on admission. Enlargement of vascular channels (↔) and thinning of bone (⇌) had occurred.

area appeared within the low density area. Edema had spread to the right head of the caudate, the putamen and the pallidum (Fig. 2). A right carotid angiogram showed that the right ophthalmic artery, orbitofrontal artery, prefrontal artery and precentral artery supplied the tumor (Fig. 3). A left carotid angiogram demonstrated a square shift of the anterior cerebral artery. The right frontopolar artery, right callosomarginal artery and left superficial temporal artery supplied the tumor (Fig. 4). Bilateral anterior choroidal arteries were visualized normally.

On July 12, 1982, a right fronto-parietal craniotomy was performed, and a reddish gray, firm, globular tumor was totally removed. The tumor was clearly demarcated from the brain. Menigothelial meningioma was confirmed histologically.

The postural tremor and gait disturbance gradually improved. The patient was discharged 4 months after the operation without any neurological deficits.

Discussion

Since Parker (1927) reported the first case of a brain tumor with parkinsonism, many authors have described similar cases (Siarre et al. 1953; Arseni et al. 1959; Oliver, 1959; Chorobski, 1961; Kaijima et al. 1978; Togi et al. 1978). The mechanism of the involuntary movement is still unknown. Parkinsonism is considered to be a dopamine deficiency syndrome due to the loss of neurons in nigro-striatal system. Garcia de Yebenes et al. (1982) analyzed the brain of a patient with craniopharyngioma and parkinsonism, postmortem. He observed a marked loss of neurons in the substantia nigra and a moderate loss of large cells in the caudate and putamen nuclei. Dopamine, 3-methoxytyramine and homovanillic acid were measured in the caudate and putamen. The concentrations of these substances were markedly decreased. The number of $H^3$-spiperone binding sites was severely decreased in the
Fig. 2 CT scan on admission, with (a) and without enhancement (b).

a. A broad low density area was presented in the right frontoparietal region (→).

b. A round high density mass was observed within the low density area. (←) Brain edema had spread to the basal ganglia.

Fig. 3 A right angiogram taken on admission. The tumor was supplied by branches of middle cerebral artery (⇒).
caudate and moderately reduced in the putamen. It was suggested that the parkinsonian symptoms were produced by compression of the substantia nigra or its dopaminergic projection from the striatum and by damage to the norepinephrine rich projection from lower brain stem. Sandyk et al. (1983) described the case of a 38-year-old woman who had parkinsonism associated with a chronic subdural hematoma. The symptoms gradually disappeared after removal of the hematoma. Mechanical pressure on the basal ganglia, torsion or displacement of structures, herniation through the tentorial notch and transient circulatory disturbances of basal ganglia due to the hematoma may have caused the parkinsonism. Normal pressure hydrocephalus can induce a parkinsonian gait which could be treated successfully by cerebro-spinal shunting (Black, 1980).

In the present case, a tremor was observed bilaterally, in the arms. The symptoms gradually disappeared after reduction of the intracranial pressure as a result of total removal of the brain tumor. The tumor was located extraaxially. Mechanical pressure on the basal ganglia may have induced the same biochemical changes as idiopathic parkinsonism.

Parkinsonism occurs in only 1-2% of the patients with whole brain tumors. An age factor must be considered. Hirayama et al. (1977) compared the age distributions of patients with idiopathic parkinsonism, meningioma and meningioma with parkinsonism. The age with the highest frequency of meningioma with parkinsonism was close to the age for the highest frequency of idiopathic parkinsonism.

Due to the use of the CT scan, it is rare to misdiagnose a brain tumor for idiopathic parkinsonism. Careful attention is still required when patients display a hemiparkinsonism.
References


