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Catecholamine Syndrome, Carcinoid Lung Tumor and Stroke

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vealed a left lung lesion confirmed by thoracic CT scan; this tumor was peripherally located. A transbronchial biopsy ensured the diagnosis of an atypical carcinoid tumor. On electron microscopy, abundant dense-core granules were seen (fig. 1). A quantitative immunohistochemical analysis was performed both on neoplastic and healthy tissue; norepinephrine, adrenaline and dopamine levels reached 767 $\mu\text{g/g}$, 26.6 $\mu\text{g/g}$ and 120 $\mu\text{g/g}$, respectively, in the neuroendocrine carcinoid tissue, whereas the norepi-
On March 29, 1978 a 41-year-old man, without any risk factors for stroke, experienced a sudden gait disturbance accompanied by posterior headache. On examination, a heavy ataxia of stance, a left-side cerebellar ataxia of limb movements, a right hemiparesis sparing the face with bilateral Babinski’s sign, a left horizontal nystagmus and a marked dysarthria were noted. Sensory testing, alertness and memory were not impaired. His blood pressure was 175/ 75 mm Hg, pulse was regular, heart and neck auscultation and optic fundi appeared normal as did chest X ray, electrocardiogram and transthoracic echocardiography. On March 30, 1978 cerebral angiography performed by the Seldinger route was normal, and the head computed tomogram showed bilateral cerebellar infarcts. Three months later he complained of intermittent vasomotor disturbances such as palpitation, sweating or flushing, and as time went by his wife noticed paroxysmal behavioral changes. Anxiety, nervousness and depression were observed. In March 1988 he was in an insufferable state and was referred to our institution. Neurological examination was normal, his blood pressure was 180/100 mm Hg; a Holter recording showed continuous hypertension. Biological screening ruled out hyperthyroidism, Cushing’s syndrome or abnormal serotonin secretion. An increase of urinary catecholamine was discovered by the trihydroxyindole method: the norepinephrine level reached 2,394 nmol/24 h (normal value <1,660 nmol/24 h). Chest X ray re-nephrene level in healthy parenchyma was only 37 $\mu\text{g/g}$. Adrenalin and dopamine levels were not determined, abdominal computed tomography ruled out any tumor of the adrenal glands, bone scintigraphy was normal. Psychiatric and vasomotor symptoms cleared after surgery, and the patient’s blood pressure normalized. The urinary catecholamine level returned to a normal value. The long-term outcome was uneventful; 3 years later, there were no mood disturbances and his blood pressure was in the normal range.

Fig. 1. Electron micrograph showing large dense-core granules in the tumor (arrows) x 15,000.

The histological characteristics of atypical endocrine tumors were described by Arrigoni et al. [1]; their incidence among lung cancers ranged from 2.7 to 9.3% [2, 3]. These tumors grow slowly, have a tendency to be localized at the time of diagnosis, and are amenable to long-term control by surgical resection [3]. Our patient's clinical record is consistent with these data, since the initial chest X ray failed to show any lesion and only later demonstrated a well-limited lung tumor. The endocrine nature of these tumors was advocated over 15 years ago [4]. At that time, the concept of the dispersed neuroendocrine system (APUD) evolved based on the discovery that closely related or identical biogenic amines and peptide hormones could be found in the central nervous system and in epithelial cells of numerous organs and tissues [5]. More recently, it became apparent that the bronchopulmonary tract has a rich and complex component of neuroendocrine cells. Gould and Chejfec [6] were able to demonstrate catecholamine activity associated with two large-cell, 'undifferentiated' carcinomas that contained dense-core granules. Furthermore, bronchopulmonary components and pheochromocytoma are considered to be neoplastic lesions arising from the dispersed neuroendocrine system [5,7]. In pheochromocytoma, the incidence of neuropsychiatric symptoms ranged from 22 to 43% [8]. Moreover, a wide variety of cerebrovascular complications has also been reported [8]. Our patient's behavioral change occurred during his stroke course. An early vascular screening failed to demonstrate any cause. There is a possible link between the neurological event and catecholamine production as the complete removal of the tumor resulted in cessation of mental and vasomotor disturbances and urinary catecholamine returned to a normal value.

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