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Cerebral ganglioglioma

A Golgi study

I. Ferrer[1], T. Ribalta[2], E. Digon[1], and J. Acebes[3]

[1] Unidad de Neuropatología, Depto. Anatomía Patológica y Servicio de Neurocirugía,
[2] Hospital Clínico y Provincial,
[3] C.S. Príncipes de España, Hospitalet de Llobregat, and Cátedra de Anatomía Patológica, Barcelona, Spain

Summary. The morphological characteristics of neurons revealed by Golgi's method are reported in a case of cerebral ganglioglioma.

Spindle-shaped (leptodendritic) neurons and radiated type I neurons form the bulk of this tumour. According to Ramon-Moliner (1968) isodendritic neurons (both leptodendritic and radiate type I) are philogenetically primitive cells and differ greatly from those observed in most of the deep cerebral nuclei of the mammalian's brain.

Key words: Ganglioglioma – Golgi's method – Isodendritic neurons

Introduction

The fine structure of the so-called dysplastic gangliocytoma of the cerebellum as revealed with Golgi's method was studied by Ambler et al. (1969) and by Ferrer et al. (1979). However there are no descriptions of cerebral gangliogliomas using this method. In the present study we report the morphological findings of a cerebral ganglioglioma in a 16 year old girl.

Case report

A 16 year old young women had a right hemiparesis discovered at the age of 14 months, developed generalized seizures when she was 3 year old, together with hemihypotrophy of the right side of the body and poor intellectual performance.

Gestation was referred to as uneventful and delivery was normal. No cerebral injuries, not central nervous system disorders were reported during the first year of life. Right hemiparesis and right hemihypotrophy were slowly progressive. Generalized seizures appeared at the age of 3 years and lasted for a short time, under unknown treatment.

Because the reappearance of a generalized seizures the patient was received in our centre. Axial tomography showed an irregular nodule of tissue medially in the left cerebral hemisphere; the white matter lateral to this mass showed decreased density (Fig. 1). A discrete enhancement of the nodule was observed after contrast; but the white matter remained unchanged. The right lateral ventricle was moderately enlarged and slightly displaced. The left side of the skull was larger than the right, thus suggesting origin of the lesion before the closure of the cranial sutures had occurred.

Offprint requests to: I. Ferrer, Unidad de Neuropatología, Depto. Anatomía Patológica, C.S. "Príncipes de España", Hospitalet de Llobregat, Barcelona, Spain

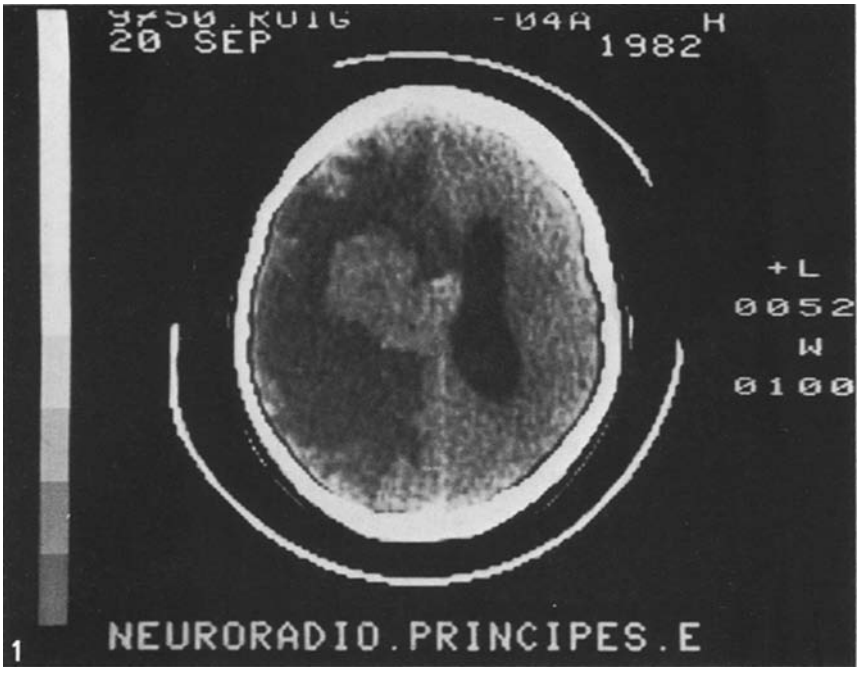

Fig. 1. An irregular nodule of tissue medially in the left cerebral hemisphere. The white matter lateral of this mass shows decreased density

Cerebral arteriography showed displacement of the left midle cerebral artery downwards; of the anterior cerebral artery upwards and the presence of small medially located blood vessels (Fig. 2).

A parietal cranietomy was performed. The cerebral cortex was 3 mm thick. A large cavity occupied most of the cerebral hemisphere which was filled with a clear yellowish fluid. The abnormal nodule was ressected and was the only sample submitted for microscopic study.

Material and methods

The biopsy sample was partly immersed in paraffin and sections were stained with H.E., Luxol Fast Blue-Nissl, and Gross-Bielchowski for routine examination. Multiple sections were processed according to Golgi's rapid method (Ferrer 1982). Basically the samples were immersed in the osmium-bichromate mixture (1% osmium tetraoxide – 3% potassium bichromate: 6/20) for 5–7 days, subsequently washed in a weak silver nitrate solution and incubated for 48 h in 0,75% silver nitrate. Fifty-one hundred micron thick sections were obtained.

Results

In routine sections the tumour was largely composed of adult neurons (ganglion cells) with typical Nissl granules, large nuclei with sparse chromatin and prominent nucleoli (Fig. 3). The cells, although randomly distributed in some fields, were mainly arranged in a coarse fascicular pattern (Fig. 3b). Dormant astrocytes were the main glial cells of the stroma; but a fibrillar

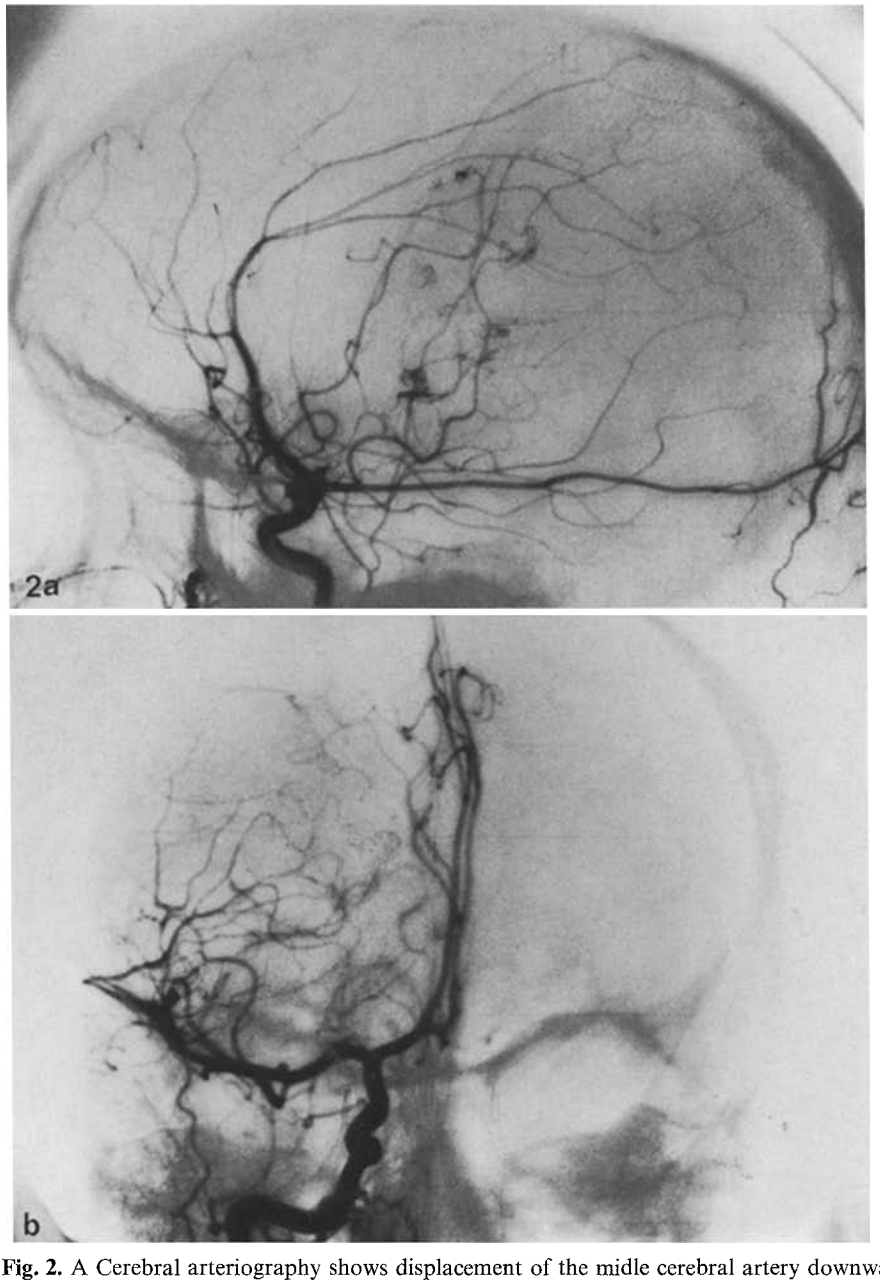

Fig. 2. A Cerebral arteriography shows displacement of the midle cerebral artery downwards, a large avascular telencephalic region and newly formed medial blood vessels corresponding to the mass

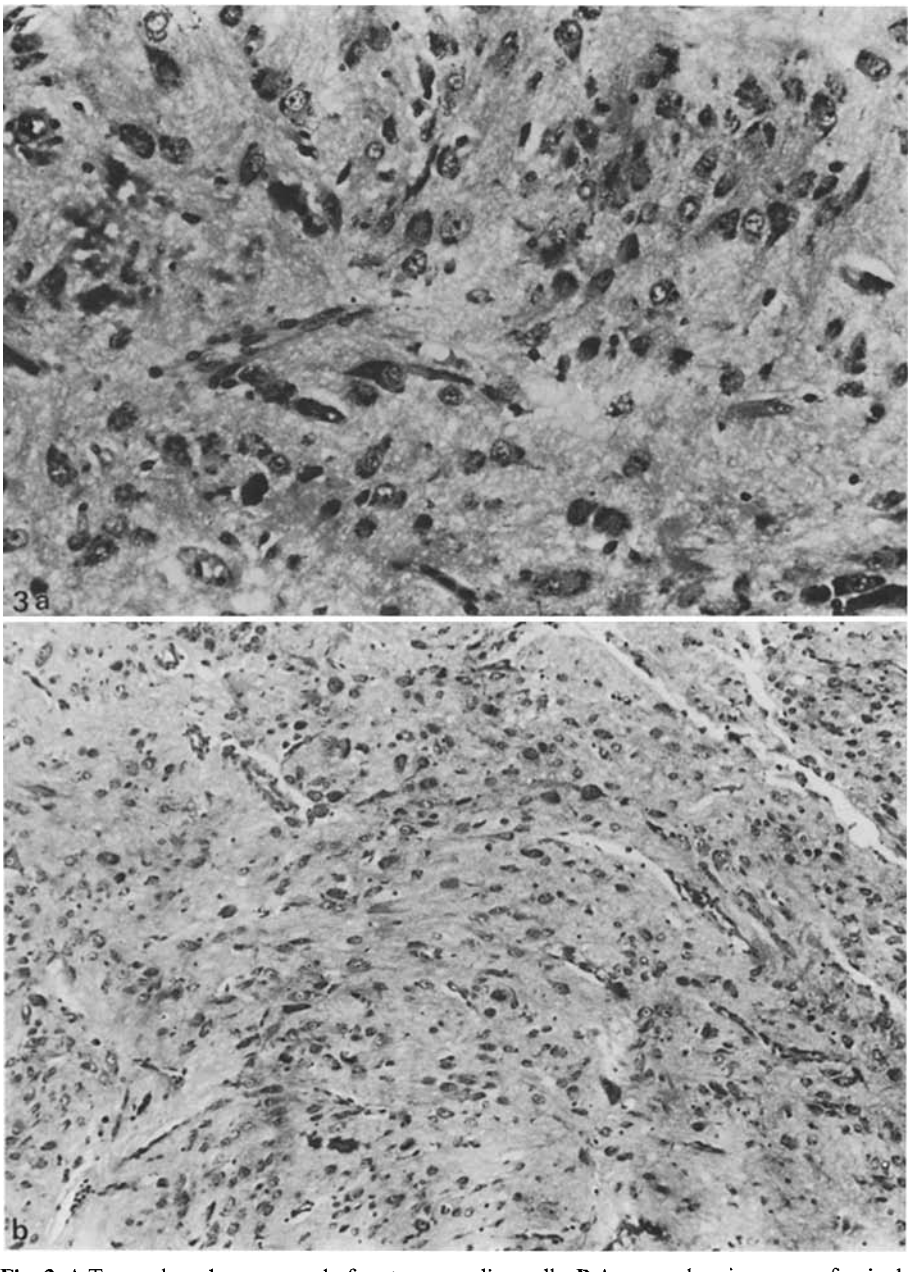

Fig. 3. A Tumor largely composed of mature ganglion cells. **B** An area showing coarse fascicular pattern. Luxol Fast Blue-Nissl **A** × 160; **B** × 63

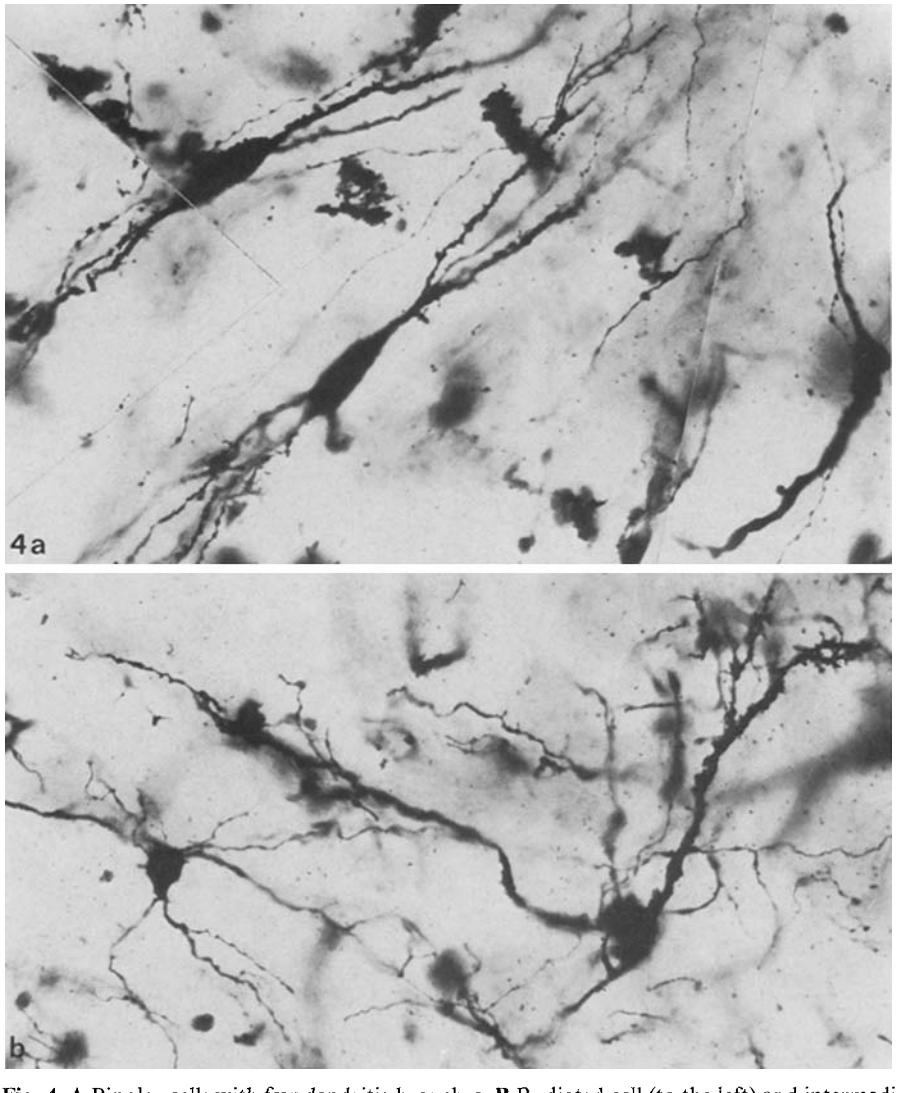

Fig. 4. A Bipolar cells with few dendritic branches. **B** Radiated cell (to the left) and intermediate cell with morphological features of distorted spindle-shaped neuron. Golgi method

astrocytic proliferations was prominent in some areas. These areas mimic a fibrillary astrocytoma of a low grade of malignancy very closely. Because of these associated neoplastic astrocytes the tumour was interpreted as a ganglioglioma (Kalyanaraman and Henderson 1982).

In Golgi's sections, most neurons showed a simple, spindle shaped or fusiform configuration. There were also radiated neurons with fine, long dendrites (Fig. 4a, b). Polymorphic or pyramid-like cells were rarely observed in our samples. Spindle-shaped neurons had long, bipolar dendrites, most of which showed no branching (Fig. 4a and 5). Fibers from other

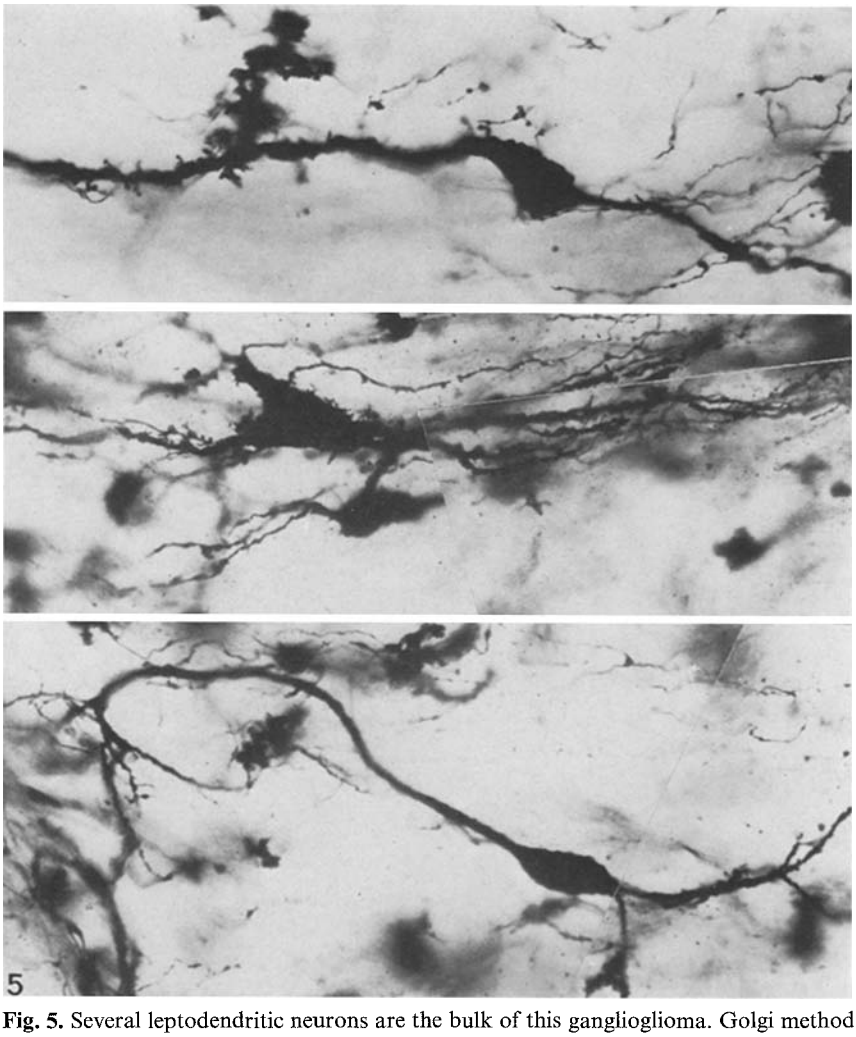

Fig. 5. Several leptodendritic neurons are the bulk of this ganglioglioma. Golgi method

cells running in parallel to the bipolar processes were occasionally observed and axo-dendritic, "en passage" synapses could be suspected on this basis (Fig. 5).

Simple radiate type I neurons were randomly distributed, although in no case could an axon Branching be demonstrated.

Discussion

The morphological features of the ganglion cells observed in our case are those of the isodendritic type defined by Ramon-Moliner (1968). In the vast majority they were spindle-shaped or fusiform (leptodendritic) neurons. Type I radiate neurons were also observed, in smaller numbers.

These neuronal types greatly differ from those observed in brain tissue transplanted into rat brains (Das 1975; Das et al. 1980; Hallas et al. 1980; Jaeger and Lund 1981) in which the original neuronal types may be easily recognized. These cells also differ from those observed in subcortical heterotropias induced in rats after irradiation on the 14th gestational day (the features of which will be detailed in a forthcoming paper). According to Ramon-Moliner (1968), isodendritic neurons, both leptodendritic and radiated, are primitive cells.

Leptodendritic cells are considered to be living fossils within the nervous tissue of mammals. They lie mainly in the periventricular regions of the diencephalon, mesencephalon and rombencephalon. Isodendritic neurons are the core constituents of the reticular formation.

These results indicate that the neurons present in this cerebral ganglioglioma show philogenetically primitive features and differ greatly from those common observed in most of the deep cerebral nuclei.

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