Case reports

Congenital medulloblastoma: an inquiry into origins

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Abstract. An infant aged 8 h died from cardiorespiratory causes. At autopsy, a microscopic midline cerebellar medulloblastoma was found. Neoplastic cells occurred within the fetal external granular cell layers, with invasion of perivascular spaces as well as the molecular and internal granular cell layers. This extremely rare occurrence lends support to the hypothesis that cerebellar medulloblastoma occurring in older patients originates within retained rests of primitive cells in the fetal external granular cell layer.

Key words: Cerebellar medulloblastoma - Congenital - Primitive neuroectodermal cell rests.

Case report

A full-term boy, weighing 2.2 kg, was delivered by cesarean section because of unfavorable fetal evaluation. APGAR scores were 4 and 6 at 1 and 5 min. Shortly after birth, the patient had a cardiac arrest. Resuscitation was accomplished, but the condition of the child continued to deteriorate with death ensuing at 8 h of age.

Postmortem examination

On external physical examination the body was fully developed, aside from small formed ears and a low birth weight of 2.4 kg. The lungs were congested and atelectatic and showed microscopic interstitial emphysema, hemorrhage, and evidence of intravascular coagulopathy.

The brain weighed 420 g. There was a subtle gross expansion of the vermis. The IV ventricle was normal and no hydrocephalus was noted. There was no visible mass in the cerebellar hemisphere or within the ventricular system.

Light microscopy

Hematoxylin and Eosin sections revealed irregular thickening of the external granular layer ranging from 3 μm to 12 μm over the lateral cerebellar hemisphere and 193 μm in the vermis. The cells were closely packed with darkly staining round to oval nuclei with illdefined cytoplasm. The neoplastic cells formed fingerlike projections, extending from the external granular layer to the molecular and granular layers. Perivascular neoplastic infiltration was seen. Some cells clustered around the blood vessels, but no definite rosettes or neural or glial differentiations were seen. In some areas the tumor seemed to extend into the subpial space (Figs. 1–4).

Discussion

The term “medulloblastoma” is a misnomer coined by Bailey and Cushing [1] and sanctified by 60 years of repetition. Historically, the medulloblast of Bailey and Cushing is related to the “indifferent cells” of Schaper [17], cells which he described as arising from the cerebellum. Obersteiner’s [10] earlier studies suggested that these “indifferent” cells were within the fetal external granular layer.

Stevenson and Echlin [20] proposed that the medulloblastoma arises in remnants of the fetal external granular cell layer, an opinion supported by Rubinstein [15]. Recently, however, Rorke [14] has argued strongly against the external granular cell as the cell of origin of medulloblastoma, pointing out that tumors indistinguishable histologically from medulloblastoma may arise de novo above the tentorium from sites where an external granular cell layer never has been, and that the external granular cells are programmed genetically as neurons, not as primitive multipotential cells.

In 1944, Raaf and Kernohan described their extensive investigations of the fetal external granular cell layer [11, 12]. They concluded that it appeared early in fetal development, attained an average and uniform thickness of 30 μm after birth, and disappeared by 18 to 20 months after birth. Both the molecular layer and the internal granular cell layer increased in thickness after birth until at least 72 months of age. They reported microscopic medulloblastoma in a fetus of 8.5 months and abnormal focal thickness of the external granular cell layer in five other fetuses. They concluded that “the germinal bud from which the external granular layer of the cerebellum arises is situated at the posterior tip of the posterior
Fig. 1. Diffuse subpial spread of medulloblastoma. Note the markedly irregular granular layer that starts to appear as a mass (vermis of an 8-h-old baby). ×54

Fig. 2. Same as in Fig. 1. Medulloblastoma composed of darkly staining cells with hyperchromatic nuclei “rounded or pear-shaped,” and ill-defined cytoplasm. ×160

Fig. 3. Diffuse infiltration of molecular and granular layers. Note: (1) the densely packed field of uniform cells and (2) the whorling pattern of the neoplastic cells. ×160

Fig. 4. Perivascular invasion in midline medulloblastoma. ×190