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GANGLIONEUROBLASTOMA OF THE CEREBELLUM

Neuroimaging and pathological features of a case

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ABSTRACT - *Objective:* To report a case of ganglioneuroblastoma of cerebellum, with emphasis to the neuroimaging and pathological findings. *Case report:* A one year and eight-month-old girl presented with a two-month history of hypoactivity and tremor in the legs. The MRI showed an enhancing cerebellar mass hypointense on T1 and hyperintense on T2-weighted images. The patient underwent a craniotomy with resection of the lesion. The histological and immunohistochemical studies defined the diagnosis of ganglioneuroblastoma. *Conclusion:* The MRI findings of our case showed no features which could help in the differentiation between ganglioneuroblastoma and the other common types of posterior fossa neoplasms in the pediatric population.

KEY WORDS: ganglioneuroblastoma, magnetic resonance, cerebellum.

Ganglioneuroblastoma no cerebelo: achados de neuroimagem e patologia em um caso

RESUMO - *Objetivo:* Relatar um caso de ganglioneuroblastoma no cerebelo, com ênfase aos achados de imagem e patologia. *Relato do caso:* Paciente feminino de um ano e oito meses apresentou-se com hipoatividade e tremor nas pernas há dois meses. A RM demonstrou uma massa cerebelar hipercaptante, com hipossinal em T1 e hipersinal em T2. A paciente foi submetida a craniotomia com ressecção da lesão. Os exames histológicos e imuno-histoquímicos definiram o diagnóstico de ganglioneuroblastoma. *Conclusão:* Os achados de RM deste caso não demonstraram padrões que pudessem auxiliar na diferenciação entre ganglioneuroblastoma e os demais tumores que comumente acometem a fossa posterior de crianças.

PALAVRAS-CHAVE: ganglioneuroblastoma, ressonância magnética, cerebelo.

Neuroblastoma, ganglioneuroblastoma (GNB), and ganglioneuroma are tumors of varying histological maturity, derived from primordial neural crest cells that form the sympathetic nervous system. The presence of immature tissue in neuroblastoma and GNB indicates malignant or potentially malignant behavior of these tumors. These neoplasms arise wherever sympathetic tissue exists and may be seen in the neck, posterior mediastinum, adrenal gland, retroperitoneum, and pelvis[1,2]. Central nervous system neuroblastomas and GBN are uncommon. Most cases occur before the age of two years, but older children and young adults are also affected. Signs and symptoms of cerebral neuroblastic tumors are related to the site of origin, and include seizures, disturbances of consciousness, increased intracranial pressure, and motor deficit. Usually these tumors are located in the cerebral hemispheres[2,3], but there are reports of cases in the pineal gland[4] and the spinal cord[5]. GNB occurring in the cerebellum is even rarer, being only one case reported in the medical literature in 1968[6].

We present a case of ganglioneuroblastoma of the cerebellum, emphasizing the histological and MRI findings.

CASE

A one year and eight-month old girl presented with a two-month history of hypoactivity and tremor in the legs. There are no complications during the pregnancy or delivery. The neurological examination revealed mild psychomotor development delay, global cerebellar ataxia and papilledema.

The MRI demonstrated a midline posterior fossa lobulated mass in the superior portions of the cerebellum, which was compressing the straight sinus and the fourth ventricle. The lesion measured approximately 8x8x6 cm and

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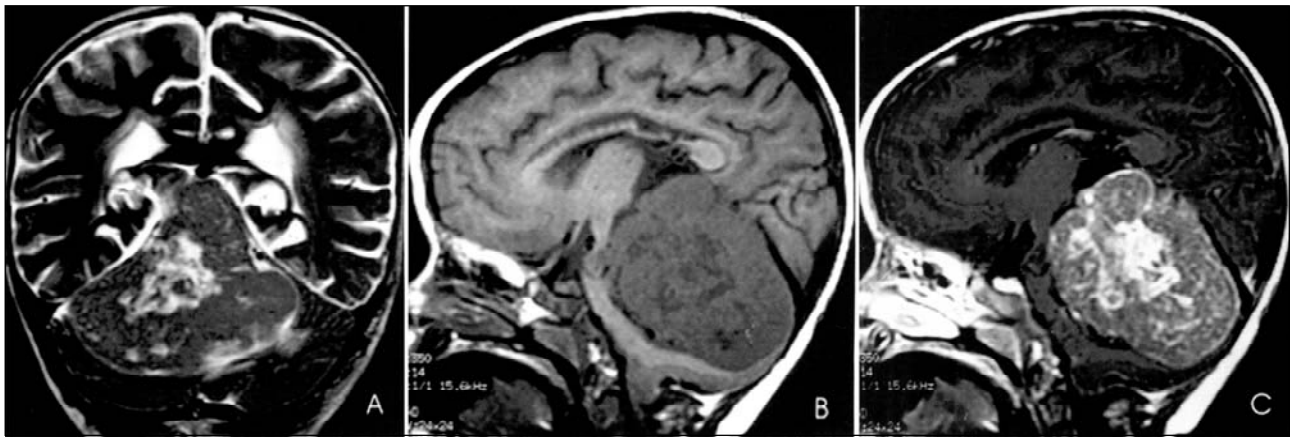

Fig 1. (A) Coronal T2-weighted MRI shows a midline posterior fossa mass in the superior portion of the cerebellum, with heterogeneous high signal. (B) Pre and (C) post-contrast T1-weighted MRI demonstrate the compression on the fourth ventricle and straight sinus, as well as heterogeneous enhancement of the lesion.

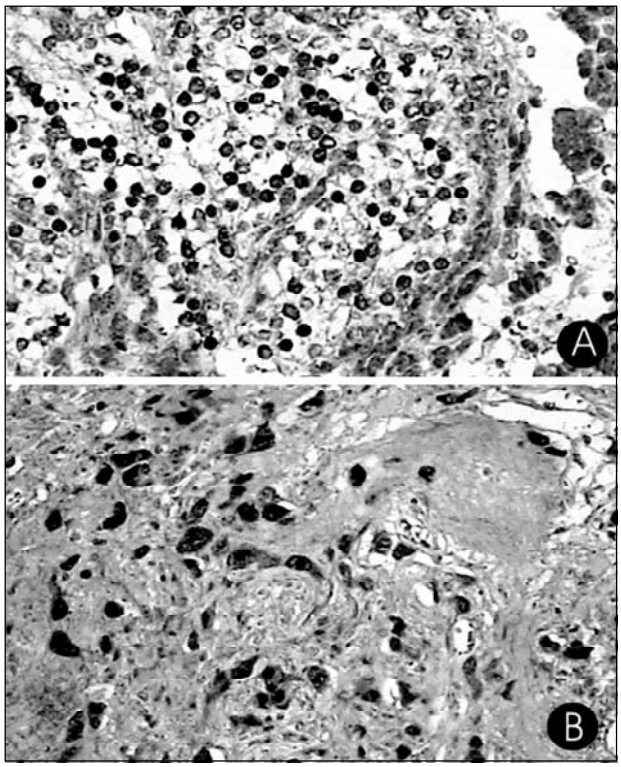

Fig 2. (A) In this field, embryonal cells with round or oval nucleus and scanty cytoplasm are seen. These cells are immunonegative for Neu N. (Toluidin Blue x40). (B) In this area the tumor is less cellular, and the cells were irregularly shaped and poor defined, as well as positive for Neu N. (Toluidin Blue x20).

showed heterogeneous low signal on T1-weighted images. On T-2-weighted images, the signal was also heterogeneous, predominantly intermediary, with central areas of high signal. After intravenous gadolinium administration, the lesion enhanced intensively and heterogeneously (Fig 1). The findings on the remaining MRI sequences were unremarkable. The patient was submitted to a spinal MRI, which demonstrated areas of meningeal enhancement at the cervical and thoracic regions, as well as at the cauda equina.

The patient underwent an occipital craniotomy, which revealed a reddish hard lesion in the subcortical region of vermis and right cerebellar hemisphere. The lesion was totally resected, and the histological examination showed a varied aspect from field to field. In some areas the tumor was highly cellular, composed of embryonal cells with a round or oval hyperchromatic nucleus and scanty cytoplasm. These cells were immunonegative for neuronal and glial markers. In other areas the tumor was less cellular, and the cells were irregularly shaped and poorly defined. Most of these cells were synaptophysin and Neu N positive. Finally, in some areas, intermingled with the latter, clusters of mature ganglion cells were present in a mixoid matrix (Fig 2). There was no necrosis or endothelial proliferation. The mitoses were abundant, mainly in the more undifferentiated areas. These aspects defined the diagnosis of ganglioneuroblastoma of the cerebellum.

Post-operative adjuvant chemotherapy (etopside and carboplatina followed by 6 cycles of topotecan) was performed. One year and a half later the patient underwent craniospinal axis radiotherapy (30 Gy) plus posterior fossa boost (25 Gy). Currently, three years after the surgery, the patient remains stable, presenting only mild ataxia at the neurdological examination. In addition, the present follow-up MRI showed only post-surgical findings, with mild cerebellar atrophy, mainly at the right hemisphere. Also, the areas of meningeal enhancement in the spinal cord were not identified in the most recent MRI.

Written informed consent for the publication of the case was obtained at that time from the parents.

DISCUSSION

Cerebral embryonal tumors are classified into three categories: supratentorial primitive neuroectodermal tumor (PNET), cerebral neuroblastoma and cerebral ganglioneuroblastoma[1]. Supratentorial PNET

is composed of poorly differentiated neuroepithelial cells with potential to neuronal and glial differentiation. Depending on the level of neuronal differentiation, the other cerebral embryonal tumors that present a distinct neuronal feature are classified either as neuroblastoma or ganglioneuroblastoma[3]. The neuroblastoma is a more undifferentiated tumor, and the GNB is a tumor that has both mature ganglion cells and neuroblasts together with intermediate forms[4]. Similarly, the histological examination of the present case of GNB showed highly cellular areas, composed of embryonal cells, intermingled with less cellular areas and clusters of mature ganglion cells.

The most common sites of origin of GNB are the adrenal medulla, extra-adrenal retroperitoneum, and posterior mediastinum. Less common sites are the neck and pelvis[2]. Although rare, the GNB may also occur at the central nervous system, mainly involving the cerebral hemispheres[2,3]. To our knowledge, the only case of GNB of the cerebellum reported in the medical literature was presented by Durity et al.[6] in 1968. They reported the case of a three year-old girl who became irritable and lethargic since six months before the presentation, and progressively developed vomiting, occipital headache and incoordination. The patient was investigated with skull radiographs, which showed separated sutures, and ventriculography, which confirmed the presence of a posterior fossa mass. A suboccipital craniotomy was performed, showing an encapsulated tumor in the right cerebellar hemisphere, which was totally removed. The histological examination defined the diagnosis of ganglioneuroblastoma and the patient was submitted to craniospinal radiotherapy. After that, she was discharged asymptomatic from the hospital, and remained stable during the clinical follow-up.

The most common posterior fossa tumors in the pediatric patients include medulloblastomas, astrocytomas and ependymomas. These neoplasms share several imaging characteristics, making the differential diagnosis difficult in some cases[7]. All these tumors were considered in the differential diagnosis of the present case. The brain MRI of our patient showed a midline posterior fossa tumor compressing the straight sinus and the fourth ventricle, which had low signal on T1 and high signal on T2 weighted images, demonstrating strong heterogeneous enhancement after gadolinium administration.

In conclusion, although extremely rare, ganglioneuroblastoma should be included in the differential diagnosis of posterior fossa tumors in children. The MRI findings of our case showed no features which could help in the differentiation between this tumor and the other common types of posterior fossa neoplasms in the pediatric population.

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