Cerebellar astrocytoma

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Cerebellar astrocytomas (CA) are one of the most common posterior fossa tumors in children. The vast majority is low grade, and prognosis for long-term survival is excellent.

The most common type of astrocytoma in the posterior fossa is the pilocytic astrocytoma, which is typically benign and slow-growing. However, other types like diffuse astrocytomas can also occur, which may vary in their growth rate and malignancy.

Classification

Cerebellar pilocytic astrocytoma

Cerebellar diffuse astrocytoma

Differential Diagnosis

The differential diagnosis for **cerebellar astrocytoma**, particularly in pediatric or young adult populations, involves considering other cerebellar masses or lesions. These include:

1. **Pilocytic Astrocytoma** (WHO Grade I)

1. Most common astrocytoma in the cerebellum.
2. Typically benign and well-circumscribed.
3. Often cystic with an enhancing mural nodule.

2. **Medulloblastoma**

1. Common in children and arises in the posterior fossa.
2. More aggressive, often presenting with hydrocephalus due to fourth ventricular obstruction.
3. Appears hyperdense on CT and shows restricted diffusion on MRI.

3. **Ependymoma**

1. Typically arises near the fourth ventricle.
2. May cause hydrocephalus and present with calcifications.
3. Displays a heterogeneous enhancement pattern on MRI.

4. **Hemangioblastoma**

1. More common in adults, but can occur in the cerebellum.
2. Often cystic with an enhancing mural nodule.
3. Associated with von Hippel-Lindau disease.

5. **Brainstem Glioma**

1. Can extend into the cerebellum.
2. Presents as a diffusely infiltrative lesion on imaging.

6. **Metastatic Tumors**

1. Less common in children but should be considered in adults.
2. Typically multiple lesions with significant peritumoral edema.

7. **Infectious/Inflammatory Lesions**

1. **Abscess**: Mimics cystic tumors with a ring-enhancing lesion; shows restricted diffusion.
2. **Demyelinating Disease**: Rarely, lesions can appear mass-like with associated cerebellar involvement.

8. **Other Posterior Fossa Tumors**

1. **Choroid Plexus Papilloma**: Often located near the fourth ventricle; enhances homogeneously.
2. **Atypical Teratoid/Rhabdoid Tumor (ATRT)**: Aggressive tumor seen in children, usually younger than 3 years.
3. **Cysticercosis or Parasitic Lesions**: Consider in endemic regions.

Key Radiologic Features for Differentiation

1. **MRI**: Essential for assessing lesion characteristics (solid vs. cystic, enhancement patterns, diffusion, and spectroscopy).
2. **Age and Clinical Presentation**: Help narrow the differential diagnosis.
3. **CT**: Useful for identifying calcifications or acute hydrocephalus.

Clinical Factors

1. **Age**: Pilocytic astrocytomas are more common in children; medulloblastomas are also frequent in the pediatric population, while hemangioblastomas are more common in adults.
2. **Symptoms**: Presenting with headache, ataxia, or signs of raised intracranial pressure.
3. **History**: Family history (e.g., von Hippel-Lindau disease) or recent infections may guide the

diagnosis.

Definitive Diagnosis

1. Requires histopathologic evaluation following surgical resection or biopsy.

Treatment

Surgical resection remains the first-line treatment with complete removal of the tumor the goal. However, even when only subtotal resection has been achieved, there is a significant chance that the tumor will remain stable or will regress spontaneously. Adjuvant chemotherapy is reserved for those tumors that progress despite surgery, and more personalized chemotherapy is being pursued with better understanding of the molecular genetics of this tumor. Radiotherapy has generally not been recommended, but stereotactic radiotherapy and conformal proton beam radiotherapy may be reasonable options in the setting of relapse or progression. In the long term, permanent neurologic deficits, mainly cerebellar dysfunction, are common, but quality of life and cognitive function are generally good [1].

Case series

40 children with low-grade cerebellar astrocytoma, who underwent surgical treatment and 40 healthy controls matched with regard to age and sex. Visuospatial perception were tested using the spatial WISC-R subtests (Block Design and Object Assembly), Rey-Osterrieth Complex Figure, Benton Judgment of Line Orientation Test, PEBL Mental Rotation Task, and Benton Visual Retention Test. To exclude general diffuse intellectual dysfunction, the WISC-R Verbal Intelligence IQ, Performance IQ, and Full-Scale IQ scores were analysed. Post-surgical medical consequences were measured with the International Cooperative Ataxia Rating Scale. Compared to controls, the cerebellar group manifested problems with mental rotation of objects, visuospatial organization, planning, and spatial construction processes which could not be explained by medical complications or general intellectual retardation. The intensity of visuospatial syndrome highly depends on cerebellar lesion side. Patients with left-sided cerebellar lesions display more severe spatial problems than those with right-sided cerebellar lesions. In conclusion, focal cerebellar lesions in children affect their visuospatial ability. The impairments profile is characterized by deficits in complex spatial processes such as visuospatial organization and mental rotation, requiring reconstruction of visual stimuli using the imagination, while elementary sensory analysis and perception as well as spatial processes requiring direct manipulation of objects are relatively better preserved. This pattern is analogous to the one previously observed in adult population and appears to be typical for cerebellar pathology in general, regardless of age [2].

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Bonfield CM, Steinbok P. Pediatric cerebellar astrocytoma: a review. Childs Nerv Syst. 2015 Oct;31(10):1677-85. doi: 10.1007/s00381-015-2719-1. Epub 2015 Sep 9. PubMed PMID: 26351221.
2)
Starowicz-Filip A, Chrobak AA, Milczarek O, Kwiatkowski S. The visuospatial functions in children after cerebellar low-grade astrocytoma surgery: A contribution to the pediatric neuropsychology of the cerebellum. J Neuropsychol. 2015 Dec 7. doi: 10.1111/jnp.12093. [Epub ahead of print] PubMed PMID: 26638981.