Cerebral Intraventricular Neoplasms

A. B, 5th Year Medical Student
Case History

• 25 year-old female

Presenting complaint
• Left-sided headache two days duration with one episode of vomiting seven days earlier (August 2009)
• No other significant history

Examination findings
• Physical examination normal
• No focal neurological signs

Investigations
• Lab data (May 2009) Hb 10.6g/dl, haematocrit 31.8%
• MRI (August 2009)
Diagnosis

- Patient returned to Osaka for treatment, therefore follow-up not possible
- Central neurocytoma most likely diagnosis
Cerebral intraventricular neoplasms

- Cerebral intraventricular neoplasms are a rare but important group of neoplasms

- They arise from periventricular structures such as the walls of the ventricular system, the septum pellucidum and the choroid plexus
## Differential diagnosis

<table>
<thead>
<tr>
<th>Ventricular wall and septum pellucidum</th>
<th>Choroid plexus</th>
<th>Other neoplasms</th>
<th>Non-neoplastic lesions</th>
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</thead>
<tbody>
<tr>
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<td>• Primitive neuroectodermal tumour</td>
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### Most common lesions

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Ependymoma

- Common neoplasms
- Arise from differentiated ependymal cells
- Well-circumscribed lesions
- Fill ventricular lumen and may extend into brain
- Mean age 6yrs (4th ventricle tumours), 18-24yrs for supratentorial lesions
- Histology shows rare mitotic figures, perivascular pseudorosettes and ependymal rosettes
Ependymoma radiological findings

CT appearance:
- Usually isoattenuated
- Calcification in 40-80% of lesions
- Enhancement usually intense but variable

MRI appearance:
- Usually heterogeneous
- Isointense on T1WI
- Hyperintense on T2WI
Ependymoma in a 16-month-old child. A: Axial CT image shows 4th ventricular mass, slightly hyperattenuated compared with surrounding cerebellum. Focal calcification (arrow) is noted. B: Axial T1W MR image shows the mildly heterogeneous mass, slightly hypointense compared with the cerebellum. (AFIP, 2002, 22: 1473-1505)
Subependymoma

- Arise from subependymal glial cells
- More common in males
- Most cases >15yrs old
- Well circumscribed lesions
- Histology shows a dense fibrillary matrix interrupted by numerous small cysts and nests of isomorphic nuclei that resemble subependymal glia
Subependymoma radiological findings

CT appearance:
- Iso- to hypoattenuated
- Hydrocephalus in 85% of cases
- Calcification in 31% of cases
- Focal enhancement

MRI appearance:
- Hypointense on T1WI
- Hyperintense on T2WI
- Variable enhancement
Subependymoma in a 53-year-old man. A: Axial CT image shows a right frontal horn mass that is predominantly isoattenuated compared with the brain parenchyma. Calcification (arrow) is seen. B: Axial T1W MR image shows isointensity within the mass, compared with the white matter. (AFIP, 2002, 22: 1473-1505).
C: Axial T2 W MR image shows heterogeneous hyperintensity within the mass.
D: Contrast-enhanced axial T1 W MR image shows scattered heterogeneous enhancement within the mass. (AFIP, 2002, 22: 1473-1505).
Central neurocytoma

- Arise from septum pellucidum or ventricular wall
- 50% found in the lateral ventricles
- Most commonly present from 20-40yrs of age
- Tumours are typically friable, often containing calcification or haemorrhage
- Histology shows round cells having round or oval nuclei
Central neurocytoma radiological findings

CT appearance:
- Hyperattenuated
- Many small cyst-like areas
- Calcification in 50% of cases

MRI appearance:
- Hyperintense on T1WI
- Solid portions hypointense and cysts hyperintense on T2WI
Central Neurocytoma. A: Axial CT image shows a hyperattenuated mass with focal calcification (arrowhead) centred near the Foramen of Monro. B: Axial T1 W MR image shows mild heterogeneity within the mass. The septum pellucidum is displaced toward the contralateral side and the ipsilateral ventricle is clearly enlarged. (AFIP, 2002, 22: 1473-1505).
C: Coronal T2 W MR image. The mass shows a heterogeneous appearance. 

D: Contrast-enhanced coronal T 1W MR image shows patchy enhancement within the mass. (AFIP, 2002, 22: 1473-1505).
Subependymal giant cell astrocytoma

- Arise in lateral ventricle near foramen of Monro
- Occasionally extend into 3rd ventricle
- Associated with tuberous sclerosis
- Mean age 11yrs
- Histology shows a mixed glioneuronal pattern with a low proliferative index, corresponding to slow growth
Subependymal giant cell astrocytoma radiological findings

CT appearance:
- Calcified nodule near foramen of Monro
- Intense enhancement

MRI appearance:
- Hypointense on T1WI
- Heterogeneously hyperintense on T2WI
Subependymal giant cell astrocytoma in a 16-year-old boy. A: Axial T1 W MR image shows bilateral masses (arrows) near the foramen of Monro. The masses are slightly hypointense compared with the white matter. B: Axial T2 W MR image. The masses are slightly hyperintense compared with the white matter. (AFIP, 2002, 22: 1473-1505).
Choroid plexus papilloma

- 50% occur in lateral ventricle, 40% in 4th ventricle, 5% in 3rd ventricle
- 5% occur in more than one location
- Lateral ventricle tumours more common <10yrs
- 4th ventricle tumours evenly distributed among patients 0-50yrs
- Histology shows fibrovascular connective tissue surrounded by columnar cells without significant mitotic activity
Choroid plexus papilloma radiological findings

CT appearance:
- Iso- to hyperattenuated, lobulated mass typically centred in atria of lateral ventricle
- Calcification in 24% of cases
- Intense enhancement

MRI appearance:
- Iso- to hypointense on T1WI
- Variably hyperintense on T2WI
Choroid plexus papilloma in a 34-year-old man. **A:** Axial CT image shows a heterogeneous, partially calcified soft-tissue mass within the 4th ventricle.  **B:** Coronal T1 W MR image shows the heterogeneous mass, which is slightly hypointense compared with the cerebellum. (AFIP, 2002, 22: 1473-1505).
Intraventricular meningioma

- Rare: only 0.7% of all meningiomas
- Peak age 30-60yrs
- More common in females
- Trigone of lateral ventricle most common site
- May arise in 3rd or very rarely 4th ventricle
- Arises from arachnoidal cap cells trapped within choroid plexus, tela choroidea, or velum interpositum
Intraventricular meningioma radiological findings

**CT appearance:**
- Hyperattenuated atrial mass
- Calcification in 50% of cases
- Intense enhancement

**MRI appearance:**
- Iso- to hypointense on T1WI
- Iso- to hyperintense on T2WI
- Intense enhancement
Intraventricular meningioma in a 16-year-old girl. **A:** Axial T2 W FLAIR image shows a lobulated, hypointense mass (arrow) within the atrium of the right lateral ventricle. **B:** Contrast-enhanced axial T1 W MR image shows intense enhancement of the mass. (AFIP, 2002, 22: 1473-1505).
## Summary

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<th>Patient age</th>
<th>CT appearance</th>
<th>MRI appearance</th>
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<td><strong>Ependymoma</strong></td>
<td>6yrs (4th ventricle) 18-24yrs (supratentorial lesions)</td>
<td>Isoattenuated; calcification in 40-80%; enhancement intense</td>
<td>Heterogeneous; T1WI-isointense; T2WI-hyperintense</td>
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<td><strong>Subependymoma</strong></td>
<td>82% &gt;15yrs</td>
<td>Iso- to hypoattenuated; hydrocephalus in 85%; focal enhancement</td>
<td>T1WI-hypointense; T2WI-hyperintense; variable enhancement</td>
</tr>
<tr>
<td><strong>Central neurocytoma</strong></td>
<td>20-40yrs most common</td>
<td>Hyperattenuated; many small cyst-like areas; calcification in 50%</td>
<td>T1WI-hyperintense; T2WI-solid portions hypointense, and cysts hyperintense</td>
</tr>
<tr>
<td><strong>Subependymal giant cell astrocytoma</strong></td>
<td>Children</td>
<td>Calcified nodule near foramen of Monro; intense enhancement</td>
<td>T1WI-hypointense; T2WI-heterogeneously hyperintense</td>
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<td><strong>Choroid plexus papilloma</strong></td>
<td>50%&lt;10yrs (lat.ventricle); 0-50yrs (4th ventricle)</td>
<td>Iso- to hyperattenuated; lobulated mass; calcification in 24%; intense enhancement</td>
<td>T1WI- iso- to hypointense; T2WI-variably hyperintense</td>
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<td><strong>Intraventricular meningioma</strong></td>
<td>Adults 30-60yrs most common</td>
<td>Hyperattenuated atrial mass; calcification in 50%; intense enhancement</td>
<td>T1WI- iso- to hypointense; T2WI- iso- to hyperintense; intense enhancement</td>
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Conclusion

- Case presented of a 25 year-old female with a probable diagnosis of central neurocytoma

- Central neurocytoma is one of a large number of differential diagnoses for cerebral intraventricular neoplasms

- Using clinical, demographic and imaging findings it is possible to limit the differential diagnosis for the most common intraventricular neoplasms