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Rare Diffuse Intrinsic Pontine Glioma Metastasis Throughout the Brain and Spine

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Key words
- Diffuse intrinsic pontine glioma
- DIPG
- H3 K27M
- Metastasis
- Pediatric

Abbreviations and Acronyms
DIPG: Diffuse intrinsic pontine glioma

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Diffuse intrinsic pontine glioma with H3 K27M mutation is a rare brain tumor that primarily affects children. It is extremely lethal, and our understanding of the natural course of this disease, and how it progresses, is lacking. We have presented a case that demonstrates how aggressive this disease can be after progression, with remarkable spread throughout the brain and spine despite upfront radiotherapy. Although rarely reported, widespread dissemination of metastatic diffuse intrinsic pontine glioma throughout the brain and spine is possible.

Diffuse intrinsic pontine glioma (DIPG) is a lethal brainstem tumor that commonly occurs in children, with an average life expectancy of <1 year.[1] Therefore, understanding the patterns of progression has been difficult owing to the rapid malignant course of the primary disease, which has often precluded the opportunity to evaluate patients for potential progression. Thus, images of DIPG metastasis throughout the central nervous system have rarely been supplied in contemporary reports. We have presented an image (**Figure 1**) that shows a stereotactic biopsy specimen of the brainstem, which confirmed the diagnosis of H3 K27M-mutant DIPG. The biopsy had not resulted in any intraoperative or postoperative complications. The patient had first presented with a typical single lesion within the pons. However, within a matter of months, the lesion had progressed and metastasized throughout the entire central nervous system, with lesions outlining the ventricles, fornices, pineal recesses, cranial nerves, and hypothalamus and throughout the entire spinal cord.

How exactly these tumor cells aggressively metastasize from the primary pontine site to the rest of the brain and spine is unclear, although a few theoretical possibilities exist. Cerebrospinal fluid seeding, either from the cisternal spaces directly adjacent to the tumor or potential "tumor escape" during surgical biopsy, is the most plausible explanation in our patient because the lesions primarily occurred at locations exposed to the cerebrospinal tracts and pathways.[2] Another possibility is that the tumor cells migrate through the white matter tracts, which have been noted for metastases of other glioma types.[3] Hematological spread is very unlikely in the setting of primary brain tumors. Irrespective of the mechanism, it is likely that DIPG with metastases portends an even poorer prognosis than DIPG without metastases.[4]

In conclusion, DIPG has been very rarely known to exhibit metastatic behavior, with very few cases[4,5] of metastatic disease reported. Images of such metastases have generally been lacking, and these cases have not been reported to show as extensive metastatic spread throughout the brain and spine as the clinical image we have presented.

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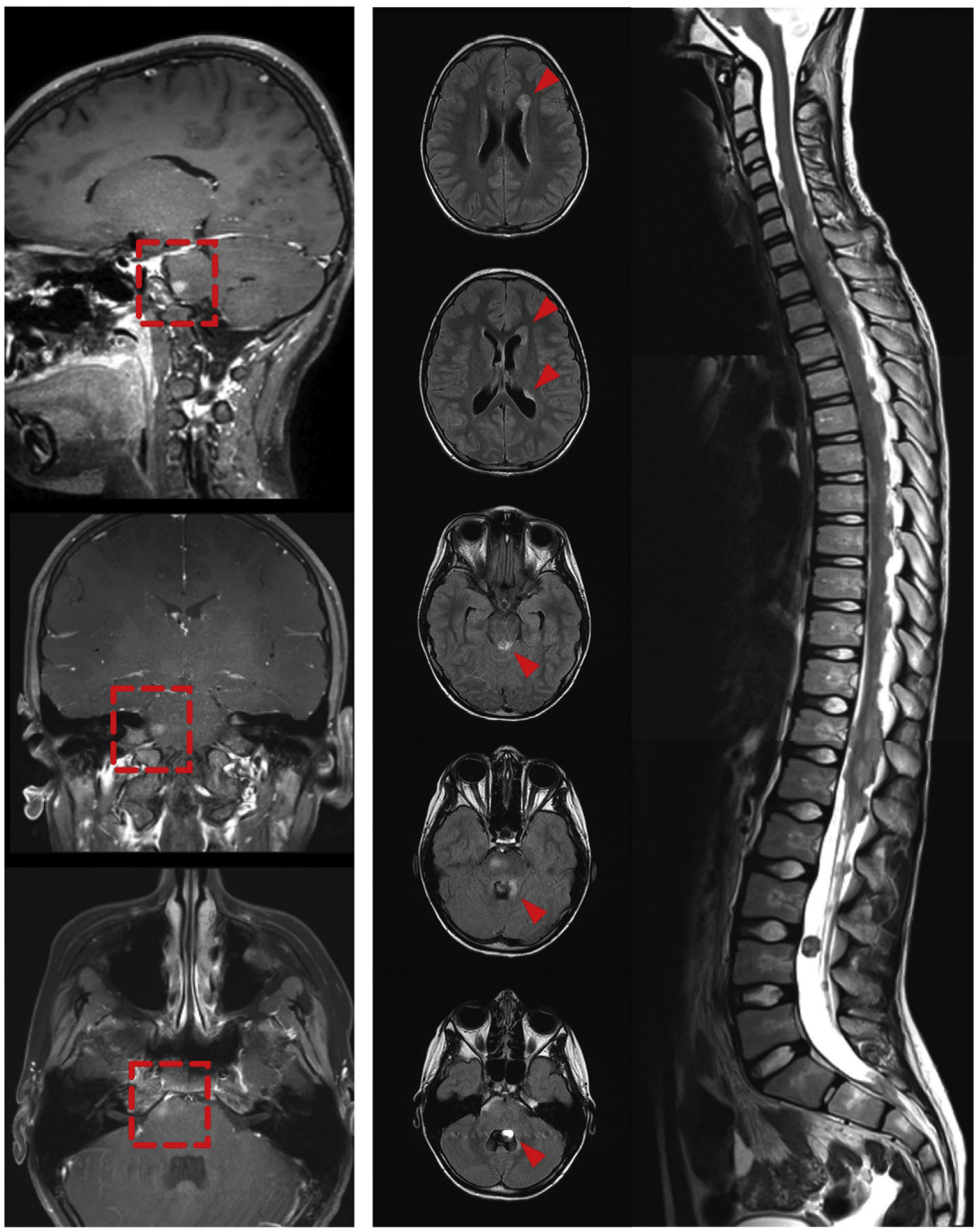

Figure 1. A 9-year-old girl had presented to the clinic with diplopia. She had no history of headaches or seizures, and her family history was negative for tumor. (**A**) Magnetic resonance imaging revealed a single, characteristic pontine lesion (*dotted square*) typical of diffuse intrinsic pontine glioma, with an otherwise unremarkable neuraxis. Stereotactic biopsy confirmed the diagnosis of H3 K27M mutation without complications. The patient underwent radiotherapy without complications, and 2 months later presented with altered mental status. (**B**) Subsequent magnetic resonance imaging revealed widely disseminated disease throughout the brain (*triangle*) and spine. Palliative measures were instituted, and the patient died 2 weeks later (6 months after the initial diagnosis).