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CASE REPORT

Intracranial Masson tumor: case report and literature review

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Abstract Intravascular papillary endothelial hyperplasia (IPEH) or Masson tumor has only been reported intracranially in 20 cases and can present as a congenital finding. This pathologic entity is an important diagnostic consideration when evaluating an infant with a congenital intracranial mass. We report a third case of a neonate who presented with the appearance of a metastatic brain tumor involving the orbit, sella, and cerebellum that was ultimately proven to be IPEH. A thorough literature review of IPEH is presented and we discuss this clinical entity and its management.

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Introduction

Intravascular papillary endothelial hyperplasia (IPEH) is considered a benign tumor defined as an unusual, exuberant form of nonneoplastic endothelial proliferation found in organizing intravascular thrombi and, uncommonly, in extravascular hematomas [1]. Intracranial examples are very rare and often fail to show an associated vessel or vascular malformation [2]. Only 20 cases have been reported to date. We report a patient who presented shortly after delivery with marked proptosis and multiple intracranial masses.

Case report

The patient presented as a neonate who was born via cesarean at a gestational age of 35 weeks and 4 days to a 23-year-old gravida four para two mother. Apgar scores were 4 at 1 min and 9 at 5 min. The infant demonstrated no significant distress and was noted to have a tense anterior fontanelle measuring 7.5 cm wide. The suture on the vertex was open and extended to the posterior fontanelle. The palate was intact. Significant left proptosis with a grossly normal contralateral right eye was noted. He had normal male features including Tanner 1 genitalia, patent anus, and small sacral dimple. The only skin manifestation was a small blue–grey firm nodule on the anterior left thigh less than 1/4 cm in diameter, thought to be a nevus. No other abnormalities were noted.

Magnetic resonance imaging (MRI) showed a heterogeneous, lobulated, contrast-enhancing suprasellar mass measuring 3.2 × 3.9 × 3.9 cm^3. This mass extended along the left optic nerve into the left orbit causing significant proptosis (Fig. 1). The mass extended into the anterior cranial fossa with involvement of the left supraorbital fissure, Meckel cave, and left cavernous sinus. A second contrast-enhancing, heterogeneous mass in the right cerebellum measured 1.8 × 2.0 × 2.0 cm^3 with poor formation of the cerebellar vermis and cystic dilation of the fourth ventricle (Fig. 1). MRI of the spine was normal. These findings were suggestive of an aggressive malignant congenital neoplasm.

The initial operation included placement of a right ventriculoperitoneal shunt and biopsy. Orange–brown tumor tissue was obtained from a biopsy through a left supraorbital incision. Histologically, the lesion consisted of fibroblasts and macrophages in a collagen- and vascular-rich stroma. There was no convincing evidence of a neoplastic process identified. Given the radiologic multifocal appearance of the tumor, it was felt that this initial biopsy may not have been a representative specimen and additional biopsy was considered. However, the patient's family chose not to pursue aggressive therapy or further medical procedures given the expected poor prognosis with the clinical information available. The patient was discharged from the hospital to the care of home hospice without a histopathological diagnosis.

At 9 months of age, the infant was developing significantly better than anticipated. He had only mild delays in growth and development. He was not able to sit on his own or tripod but was able to roll over independently and babble. Repeat imaging revealed that the initial suprasellar mass and orbital component was significantly decreased in size (Fig. 2). Remarkably, the cerebellar "metastasis" had nearly resolved (Fig. 3). Given the clinical course, the patient was referred to oculoplastic surgery for diagnostic tumor excision of the orbit. Ophthalmic examination revealed massive proptosis of the left eye with severe keratinization and opacification of the cornea. Severe chemosis with injection and dessication of the conjunctiva were also present. Examination of the right eye demonstrated normal globe anatomy with nystagmus and subnormal acuity, presumptively secondary to the intracranial pathology. Enucleation with debulking of the orbital tumor was offered to improve comfort and reevaluate the histopathologic findings. Because the suprasellar portion of the mass continued to involve the left cavernous, clinoid, and supraclinoid portions of the internal carotid artery, proximal left middle cerebral artery, and bilateral anterior cerebral artery branches, it was deemed prudent not to attempt surgical removal of the intracranial portion of the lesion with the surgery. Findings at the time of surgery included a grossly small eye with opaque microcornea and firm intraconal orbital tumor.

The neuropathologist (JB) performed standard histopathological slides, and additional immunocytochemistry to conclude that this mass was an IPEH. As seen in Fig. 4, the mass was composed of fibrovascular tissue with numerous large, anomalous blood vessels. Towards the center of the tissue were areas of increased cellularity rimmed by thickened walls of larger blood vessels, suggesting that the proliferation is predominantly within larger vascular structures. In areas, distinct finger-like papillary structures

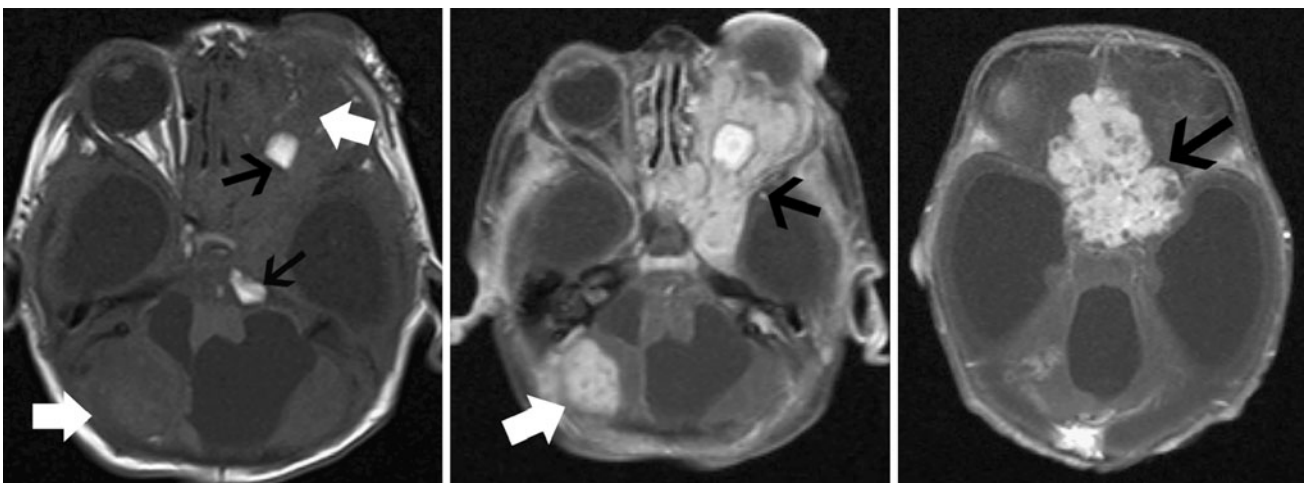

Fig. 1 Three-day-old male born with bulging fontanelle and left eye proptosis. **Left** Axial T1 without contrast demonstrates an isointense mass within the orbit and right cerebellar hemisphere (*white arrows*). There are areas of T1 hyperintensity within the orbital tumor suggesting hemorrhage (*black arrows*). **Middle** Axial T1 with contrast demonstrates intense enhancement of the orbital mass (*black arrow*) and right cerebellar mass (*white arrow*). There is extension through the optic canal and invasion of the cavernous sinus. **Right** Axial T1 with contrast demonstrates intense enhancement of the suprasellar component of the mass (*black arrow*)

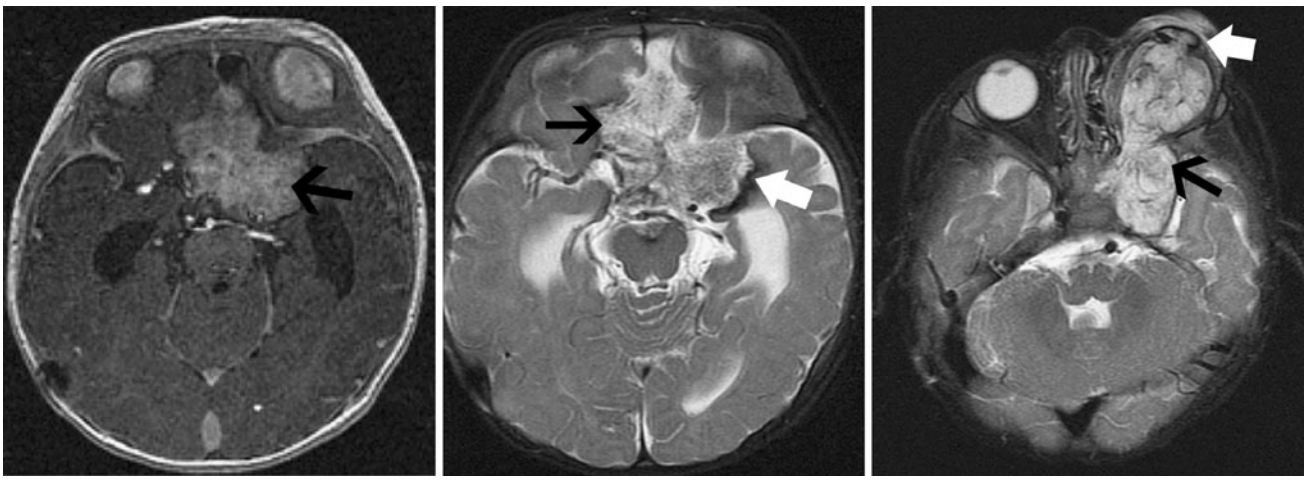

Fig. 2 Nine-month followup MRI with only ventriculoperitoneal shunt placement. **Left** Axial T1 with contrast demonstrates less intense enhancement with reduction in size of the suprasellar component (*black arrow*). **Middle** Axial T2 demonstrates the retracted suprasellar tumor with internal T2 hypointense material (*black arrow*) and hemosiderin staining of the adjacent parenchyma (*white arrow*). **Right** Axial T2 at the level of the orbit shows T2 hyperintense tumor with internal T2 hypointense architecture (*black arrow*). The proptotic left globe has severely atrophied (*white arrow*)

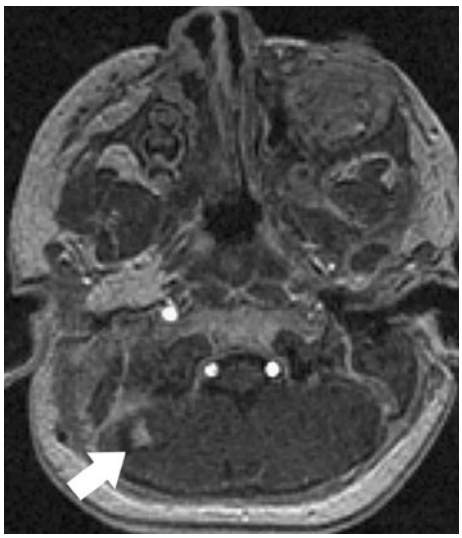

Fig. 3 Nine-month followup MRI with only ventriculoperitoneal shunt placement. Axial post contrast T1 demonstrates dramatic interval reduction of the enhancing right cerebellar lesion (*white arrow*)

were seen with a thin endothelial lining and dehyalinized cores. Staining for CD34 and CD31 highlighted endothelial cells lining innumerable small vascular channels within the larger blood vessels. There is increased Ki-67 labeling within the cellular areas. Numerous scattered cells within the tissue showed positive staining for factor XIIIa. Stains for CD56, cytokeratin, and myogenin are negative.

Progress after enucleation and tumor debulking was uneventful. The child appeared more comfortable and the anophthalmic socket was fitted for a prosthetic. As the lesion appeared nonmalignant, aggressive intracranial excision of tumor was not offered. The clinical plan was serial monitoring of the intracranial lesion with MRI. Lesions remained stable. The patient progressed well until sudden death occurred approximately 6 months later. Autopsy was refused by the family. Acute intracranial hemorrhage from the intracranial lesion was suspected as the cause of death.

Discussion

First recognized by Pierre Masson [3] in 1923, intravascular papillary endothelial hyperplasia was believed to represent a true endothelial neoplasm. The diagnosis of IPEH has been documented in the literature to be found in a variety of locations such as the lung, liver, uterus, urethra, gastrointestinal tract, etc. Extracranial IPEH usually presents as a slow-growing nodule that may be somewhat painful. Although the pathogenesis of IPEH continues to be debated, this growth is often associated with thrombosis, either in a normal vessel or in a preexisting vascular lesion. As in our case, IPEH may sometimes be confused clinically and radiologically with a neoplastic process. The lesion histologically consists of an intravascular proliferation of numerous papillae that are composed of a core of connective tissue and an endothelial surface with no malignant features.

IPEH presenting as an intracranial lesion is very rare, with approximately twenty cases reported in the literature (Table 1) [2, 4–17]. This is the third case reported in a neonate, and the clinical and diagnostic findings illustrate the difficult diagnostic course as well as the importance of differentiating IPEH from a malignant neoplastic lesion. From a review of the literature, there appears to be a female

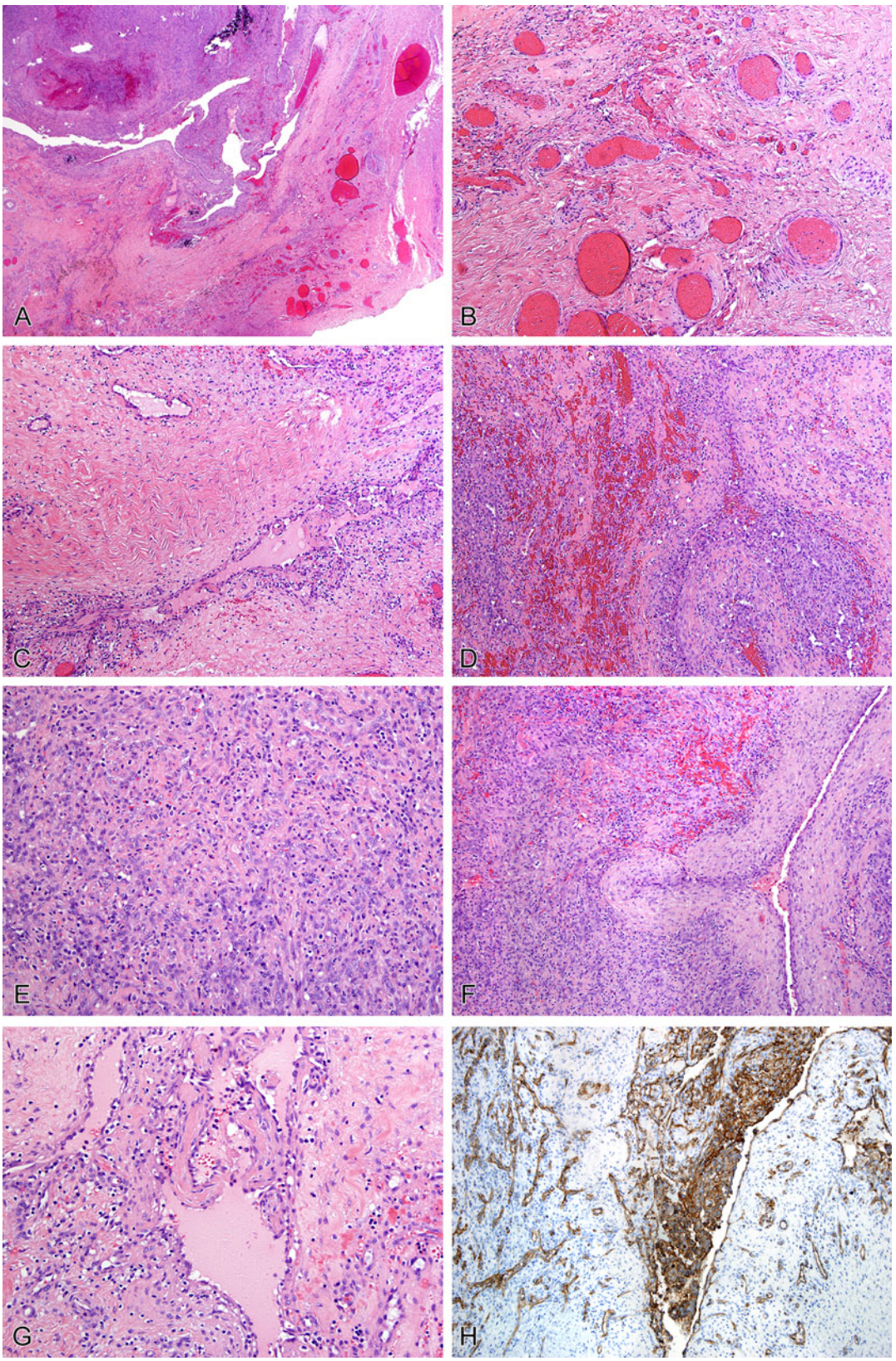

Fig. 4 Intravascular papillary endothelial hyperplasia (Masson tumor). Anomalous vascular channels, fibrosis, and reactive endothelial proliferation; H&E (**A, B, C**). Florid intravascular and extravascular endothelial proliferation; H&E (**D, E, F**). Intravascular papillary endothelial hyperplasia; H&E (**G**), and CD31 immunohistochemical stain (**H**)

Table 1 Summary of intracranial IPEH reported in literature

Authors	Age, sex	Clinical Presentation	Location	Surgery	Outcome
Nagib et al. (1982) [11]	16 y, F	Neurocutaneous disseminated form, seizures	CT: multiple intracranial enhancing supratentorial lesions	Subtotal	Reoperation 19 months later; 9 years recurrence-free
Chen and Kuo (1984) [7]	3.5 mos, F	Increased ICP, seizures	CT: frontal, large enhancing lesion	Biopsy	Died 6 months later
Izukawa et al. (1987) [9]	55 y, F	Hemianopsia, sensory dysphagia, hemiparesis, seizures	CT: parietaooccipital mass of mixed density, no enhancement	Complete	No followup avail
Sickler and Langford (1990) [13]	12 day, F	Increased ICP	CT: large temporal mass, no enhancement MRI: areas suggestive of hemorrhage	Subtotal	Recurrent mass 2 months later; treated by chemotherapy and stabilized
Wen et al. (1991) [16]	15 day, F	Increased ICP	MRI: small enhancing process w/in confluens sinum	Subtotal	No progression for 6 months
Patt et al. (1992) [12]	27 y, F	Unilateral deficit of CNs III, V, & VI; headache	CT & MRI: small enhancing lesion of the orbital fissure	Complete	No evidence of recurrence for 6 months
Tsuji et al. (1994) [15]	18 y, F	Seizures; hemiparesis	CT & MRI: intracerebral hemorrhage	Complete	No evidence of recurrence for 2 years
Kristof et al. (1997) [10]	70 y, F	Transient diplopia	MRI: small enhancing sellar mass	Subtotal	Enlargement of residual mass at 3 months; shrinkage of mass after irradiation over 3.5 years
	51 y, F	Diplopia	MRI: small enhancing sellar mass	Subtotal	Small residual mass 3 months later
	24 y, F	Intermittent diplopia	CT & MRI: small enhancing sellar mass	Complete	Inconspicuous for 4 months
Baylor et al. (1998) [5]	27 y, F	Rt facial nerve paresis	CT: no mass lesion MRI: enhanced T2 hypo to isointense mass	Complete	No followup available
Avellino et al. (1999) [4]	75 y, F	Ear pain, facial nerve paresis, dysphagia	CT: enhanced mass MRI: enhanced mass	Subtotal	Radiotherapy after first and second operation; recurrence at 9 years
Stoffman et al. (2003) [14]	54 y, F	Headache, speech difficulty	MRI: extradural partially hemorrhagic lesion in lt petrous apex and Meckel cave	Subtotal	Residual mass at 10 months postop
Duong et al. (1997) [8]	51 y, F	Headache, lt visual field defect	CT: multiple slightly hyperdense, enhanced masses with edema; MRI: T1 hypointense, enhanced, T2 hyperintense masses surrounded by hemosiderin rim and edema	Complete	No evidence of recurrence for 6 months
Lesley et al. (2000) [2]	46 y, F	Rt ear pain extending into rt side of face and neck	MRI: T1 hypodense, T2 hyperintense mass	Complete	No evidence for recurrence at 1 year
Cagli et al. (2004) [6]	16 y, F	Uniliateral deficit of CN III and VI	MRI: small enhanced lt intracavernous mass	Subtotal	Residual intracavernous mass at 3 years
	18 y, F	Unilateral deficit of CN VI	MRI: small enhanced rt intracavernous mass	Subtotal	Residual intracavernous mass at 3 years
	28 y, F	Unilateral deficit of CNs III, V, VI	MRI: strongly enhanced lt intracavernous mass	Complete	No recurrence at 2 years
	24 y, F	Seizure	MRI: enhanced let parietal mass	Complete	No recurrence at 2 years
Zhang et al. (2005) [17]	49 y, F	Loss of hearing and facial palsy on left side	MRI: enhanced lt petrous mass	Subtotal	No followup avail
Shih et al. (2011)	2 day	Proptosis	MRI: supracellar, orbital and cerebellar	Subtotal	Resection at 9 months, died 6 months later

DOD died of disease; *NED* no evidence of disease; *DOC* died of complications; *CN* cranial nerve; *CT* computed tomography; *ICP* intracranial pressure; *MRI* magnetic resonance imaging; *y* years old; *mos* months old; *F* female; *M* male; *day* days old; *lt* left; *rt* right

predominance (female/male ratio, 18:3). However, intracranial IPEH does not seem to be associated with a specific age group; the age of presentation ranged from 2 days to 75 years. Our case was only one of three males reported with intracranial IPEH. Additionally, only two other cases have been reported to present in the neonatal period. Increased intracranial pressure led to the diagnosis in all three cases. The mass in our patient was quite extensive and precluded adequate surgical resection. In addition, our case also suggests that some of these lesions may spontaneously regress over time.

Signs and symptoms of intracranial IPEH are location dependent and typical of an intracranial space-occupying lesion. Clinical findings are commonly nonspecific as are radiographic findings. Hemorrhage is commonly present. Most cases of IPEH show enhancement on CT or MRI mimicking high-grade tumors. In our case, T1 with contrast demonstrates intense enhancement of the orbital mass and right cerebellar mass (see Fig 1). This imaging appearance is difficult to distinguish from an aggressive malignant neoplasm of the brain. Congenital brain tumors of the central nervous system include highly aggressive malignant tumors such as atypical teratoid rhabdoid tumors (ATRT), malignant teratomas, and benign or malignant astrocytomas. The clinical presentation and MRI or CT imaging may not adequately distinguish a benign tumor from a malignant tumor, especially where IPEH is considered in the differential diagnosis. Because the imaging appearance of congenital tumors can be quite variable and misleading, obtaining appropriate diagnostic tissue can be the key to the correct diagnosis and management.

When diagnostic tissue is obtained, histologic appearance of IPEH is that of microscopically short blunted papillary projections with a hyalinized core. The projections may be associated with thrombotic material and are covered by a single layer of plump endothelial cells that lack anaplasia, pleomorphism, or significantly elevated mitotic activity. The benign appearance of the endothelial cells differentiates IPEH lesions from angiosarcomas. [13] Immunohistochemistry plays an essential role in establishing the vascular nature of IPEH, but may not play a major role for differential diagnosis among other vascular tumors.

In general, IPEH is considered a benign nonrecurring process, and the literature suggests that it can often be cured with complete surgical excision. However, lesions within the cranium can be difficult to remove in their entirety. In patients with residual disease or recurrence, the role of radiation or chemotherapy is unclear. It is interesting to note that the cerebellar lesion in our patient showed marked regression without treatment, suggesting that this vascular tumor may involute over time in some instances.

In reviewing the literature (Table 1), 57% (12) had subtotal resection or biopsy and 43% (9) achieved complete resection. Of the patients who achieved complete resection, no recurrences were reported. For those with subtotal resection, 42% (5) had recurrence or progression of tumor. However, all but two were still alive with a combination of surgery, radiation, and/or chemotherapy. Although complete resection is preferred, many patients achieve significant long-term survival with subtotal resection. Recurrences can occur late and have been reported 9 years after initial treatment.

In conclusion, we present a case of IPEH presenting as a congenital intracranial tumor with evidence of spontaneous regression. The radiological appearance often appears malignant. Although intracranial IPEH is extraordinarily rare, it should be considered in the differential as prognostic implications differ significantly from malignant congenital tumors. Intracranial IPEH should be considered a "benign" tumor, and complete surgical resection seems to afford the best prognosis. In patients where complete resection is not possible, close observation with serial imaging may be indicated as lesions may stabilize or regress spontaneously without adjuvant therapy. In cases of progression or recurrence, postoperative radiotherapy or radiosurgery should be considered as the main adjuvant therapy for patients and may be effective. Although chemotherapy has been utilized, its clinical effect remains unclear and should be reserved for recurrent or refractory cases, following radiotherapy. Extended long-term followup should be advocated in all patients.

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