Intracranial schwannomas of the brain are rare and account for 8% of all primary brain tumours in adults, with most cases being acoustic neuromas, intraparenchymal schwannomas of the brain are rare. Gibson et al. (1) reported the first English-language account of an intraparenchymal intracerebral schwannoma in 1966. Since then, several other cases of this neoplasm have been reported (2, 3). We present a case of an unusual intracranial intraparenchymal schwannoma and discuss the clinical and neuroradiological aspects of this tumor.

Case Report

A 51-year-old woman was admitted to our hospital with complaints of intermittent headaches on June 27, 2007. Upon admission, the neurological examination was normal with no specific signs or specific familial history. The patient’s skull X-ray was normal; however, a contrast enhanced axial CT scan revealed a 1.3 cm sized homogeneous enhancing mass in the left parietal lobe, without a cystic component (Fig. 1). A pre-enhanced CT scan showed no internal calcification. An MRI (Fig. 2) revealed that the mass exhibited slight hypointensity on the T1-weighted image and hyperintensity on the T2-weighted image with minimal perilesional edema. The Gd-enhanced T1-weighted image showed homogeneous enhancement with no calcification or cystic component. The patient underwent a complete tumor removal on June 28. The tumor was pathologically confirmed to be a schwannoma.

Discussion

Intraparenchymal schwannomas of the brain are rare tumours, but have several characteristic features which serve to classify them as a separate entity from their far more common vestibular counterparts. Intraparenchymal schwannomas show no female predominance, unlike vestibular schwannomas, with the majority of cases occurring in children and young adults. In contrast, vestibular schwannomas rarely occur in children unless they are associated with neurofibromatosis of type 2. The most common signs and symptoms include...
headache, seizures and focal neurologic deficits.

Radiologically, peritumoral edema with or without gliosis, in either a superficial or deep periventricular location, is believed to be characteristic of intraparenchymal schwannomas, as reported in previous case studies (3). However, perilesional edema has only been shown in supratentorial intracerebral schwannomas and not infratentorial schwannomas (2). Although cyst formation and calcification are also believed to be characteristic of intraparenchymal schwannomas (3), the lesion in this report did not present either. This patient had minimal perilesional edema. The cause of the perilesional edema is uncertain. Vascular endothelial growth factor (VEGF) messenger RNA expression has been implicated in edema formation around some meningiomas and may be an important etiologic factor explaining the peritumoral edema in other benign neoplasms (4). However, the presence of VEGF in intracerebral schwannomas has not been confirmed and its role in edema formation requires further investigation. Chronic edema can result in the degeneration of white matter and gliosis, which may explain the frequent association of these findings (5).

The characteristic pathologic and imaging features of intraparenchymal schwannomas include calcification, cyst formation, peritumoral edema and gliosis, as well as superficial or periventricular location. Calcification, which is believed by some to be a characteristic finding in intracerebral schwannomas (6), was not observed radiologically nor confirmed histopathologically in this

![Fig. 1](image1)

**Fig. 1.** A pre-enhanced (A) and contrast enhanced (B) axial CT scan reveals a 1.3 cm sized intra-axial homogeneous enhancing mass in left parietal lobe without a cystic component. There was no internal calcification.

![Fig. 2](image2)

**Fig. 2.** For the magnetic resonance imaging, the intra-axial mass showed a slight hyposignal intensity on a T1-weighted axial image (A) and hypersignal intensity on a T2-weighted axial image (B) with minimal perilesional edema. A Gd-enhanced T1-weighted coronal image (C) shows homogeneous enhancement.
Calcification has only been documented in 6 cases in a review (3). Cystic formation, which is another characteristic feature which has been frequently observed in intracerebral schwannomas, was also not observed in this case.

The MRI findings of intracerebral schwannomas are variable. DiBiasi et al. (7) reported a 1.5-cm well-circumscribed mass located within the superficial frontal lobe and showing a hypointense T1 signal and a hyperintense T2 signal that was intensely and homogenously enhanced. In addition, a 5-cm cystic frontal lobe mass with a solid, homogeneously enhancing component has also been reported (6). The solid portion showed T1 hypointensity and mixed T2 hypointensity and hyperintensity.

The origin of intracerebral schwannomas is uncertain; however, a few hypotheses exist. The first hypothesis is that intracerebral schwannomas arise from the proliferation of schwann cells in the perivascular perineural nerve plexus (8). Another hypothesis states that intracerebral schwannomas arise from ectopic schwann cells, which are derived from the neural crest, or from schwann cells converted from mesenchymal cells which are capable of multipotential differentiation in the pia matter of the meninges (2). However, the first hypothesis is more widely accepted and is also the most supported theory in spinal intramedullary schwannomas.

The differential diagnosis of these lesions includes gangliomas, meningiomas, pilocytic astrocytomas, pleomorphic xanthoastrocytomas, and tuberculomas. Gangliogliomas are extremely similar in appearance, but are actually rare neuronal tumors that happen to be most commonly found within the temporal lobes. Cysts, contrast enhancement, and calcification may also be present (9). Meningiomas were also considered in the possible radiological differential diagnoses. These generally have a well-defined dural attachment, a 50% incidence of calcification, and a 12% incidence of cyst formation. Pilocytic astrocytomas are the most common solid-cystic tumors in the supratentorial compartment in children. Unlike intracerebral schwannoma cases, surrounding edema is rarely present. Pleomorphic xanthoastrocytoma is a typically benign, supratentorial astrocytoma, which occurs primarily in children and young adults at an equal sex ratio. The MR imaging characteristics are variable, with both the T1 isointensity and hypointensity and mixed T2 isointensity and hyperintensity (10). Similar to intracerebral schwannomas, cysts and mild to moderate edema are common. This neoplasm is also located superficially and involves the cortex and leptomeninges, which may be firmly attached to the dura; however, calcification is rarely seen on CT scans or histopathological assessments, which may help differentiate pleomorphic xanthoastrocytomas from intracerebral schwannoma. Tuberculomas are possibly the most common lesions in this part of South Asia, but those in the supratentorial compartment are often multiple, located at the grey-white junction and hyperdense on the non-contrast CT scan with ring enhancement. They uncommonly calcify and in the non-necrotic form rarely generate vasogenic edema.

In conclusion, a rare manifestation with a frontal lobar, intraparenchymal homogeneous enhancing solid mass, with minimal perilesional edema, without calcification or cyst formation has been presented in this report. Although usual intracerebral schwannoma is a rare, benign neoplasm, which is characterized by cyst formation, calcification, as well as perilesional edema or gliosis.

References

expression with peritumoral vasogenic cerebral edema in meningiomas. *J Neurosurg* 1996;85:1095-1101


