

## Unusual Radiological Presentation of Intracranial Dermoid Cyst: A Case Series

### Abstract

Intracranial dermoids are rare congenital lesions of the brain that account for <1% of all intracranial tumors. Even though they are rare, typical computed tomography (CT) scan and magnetic resonance imaging (MRI) features along with location allow radiological diagnosis in the majority of patients. Radiologically, dermoid cysts typically appear as nonenhancing low-density masses on CT scan and are hyperintense on T1-weighted (T1-W) MRI sequences with variable signal on T2-W sequences. We describe two cases of dermoid with unusual imaging appearance with the presence of mural nodule in both the cases. The recognition of atypical radiological features can avoid diagnostic pitfalls and is clinically relevant for overall surgical management.

**Keywords:** *Atypical, computed tomography, hyperdense, intracranial dermoid cyst, magnetic resonance imaging, T2-weighted hypointensity, unusual*

### Introduction

Intracranial dermoids commonly occur in cisternal spaces and parasellar location with characteristic imaging appearances. On computed tomography (CT) scan, typically dermoid cysts appear as well defined, low attenuating (−20 to −140) due to their lipid content. The sebaceous lipid material within a dermoid cyst has attenuation and signal intensity characteristics that simulate those of fat on both CT scan and magnetic resonance imaging (MRI), thus giving a characteristic hypodense appearance on CT, and are predominantly T1-weighted (T1-W) hyperintense on MRI.<sup>[1]</sup> Calcifications may be present in the wall. Enhancement after intravenous gadolinium administration is rare. Although not pathognomonic, this classic imaging appearance is usually consistent with the diagnosis of a dermoid cyst. The differential diagnoses to consider for a radiologically typical/classic dermoid cyst are craniopharyngioma, epidermoid cyst, arachnoid cyst, teratoma, and lipoma.<sup>[1]</sup> The treatment of choice is total surgical resection with careful dissection between the cyst capsule and the surrounding neurovascular structure.

Dermoids which appear as hyperattenuating lesions on CT studies are extremely rare and present a diagnostic challenge.

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Dermoids which are hyperdense on noncontrast CT are usually homogeneously hypointense on T2-W MRI. This awareness of unusual/atypical radiological appearance of a benign lesion like dermoid cyst is important among clinicians and radiologists since the surgical strategies often depend on the pathology of the lesion. We report two such cases with atypical radiological features and intra-axial location, which is a rare occurrence.

### Case Reports

#### Case 1

A 30-year-old woman presented generalized tonic-clonic seizures for 1 year. On examination, there were no neurological deficits. MRI [Figure 1a-f] showed an intra-axial lesion in the left basifrontal region measuring 4.2 cm × 5.2 cm × 5 cm (CC × AP × Trans) isointense on T1, homogeneously hypointense on T2-W images (large arrow) with a mural nodule hyperintense on T1, T2 images (small arrow). There is mild rim enhancement of the lesion with heterogeneous enhancement of peripheral nodule. No restricted diffusion and no increased cerebral blood volume were noted within the lesion on perfusion image. Noncontrast CT [Figure 1g] showed a homogeneously hyperdense lesion with an eccentric nodule having calcification

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(arrow). The patient underwent left frontal craniotomy and excision of the lesion. Histopathological examination [Figure 1h] showed keratinized stratified squamous epithelium with pilosebaceous cysts (arrows) suggestive of a dermoid cyst. Postoperative recovery was uneventful.

### Case 2

A 36-year-old woman presented with a history of progressive gait unsteadiness for 3 months. There were no features of raised intracranial pressure. MRI scan [Figure 2a-e] showed an intra-axial lesion in the left cerebellar hemisphere along the left paramedian location approximately measuring 50 mm × 57 mm × 46 mm (AP × ML × CC), predominantly hypointense on T1 and significantly hypointense on

T2-W images (large arrow) with areas of heterogeneous T1 and T2 signal hyperintensities along the peripheral nodule (small arrow). There was no enhancement of lesion on contrast study. No diffusion restriction was noted. Noncontrast CT scan images [Figure 2f] showed homogeneously hyperdense lesion (large arrow) with a peripheral mural nodule containing calcification (small arrow) and mild fat density (curved black arrow). The patient underwent occipital craniotomy and excision of the lesion and histopathological examination showed keratinized stratified squamous epithelium proliferated by pilosebaceous cysts (arrows) consistent with the imaging diagnosis of dermoid cyst. The patient recovered well in the postoperative period.

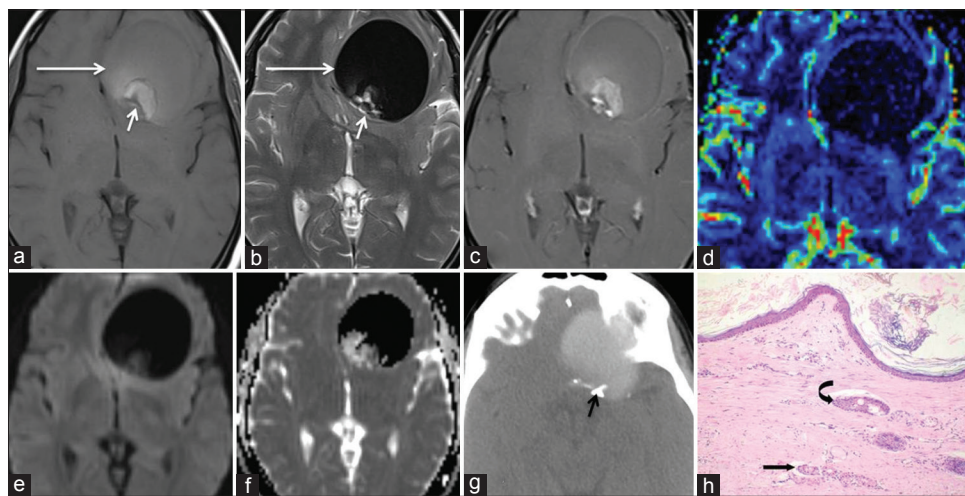


Figure 1: (a-c) Axial T1, T2, postcontrast magnetic resonance imaging showing an intra-axial lesion seen in the left basifrontal region measuring 4.2 cm × 5.2 cm × 5 cm (CC × AP × Trans) isointense on T1, homogeneously hypointense on T2 (large arrow) with peripheral nodular hyperintensity (small arrow) on T1, T2 images. There is mild rim enhancement of the lesion with heterogeneous enhancement of peripheral nodule. (d) No increased cerebral blood volume noted within the lesion on perfusion image. (e and f) Diffusion and ADC (Apparent diffusion co-efficient) images showing no restricted diffusion. (g) Axial noncontrast computed tomography revealing homogeneously hyperdense lesion (large arrow) with eccentric nodule having calcification (small arrow) (H and E, ×100). (h) Paraffin section showing keratinized stratified squamous epithelium and pilosebaceous gland (curved and straight arrows) (H and E, ×100)

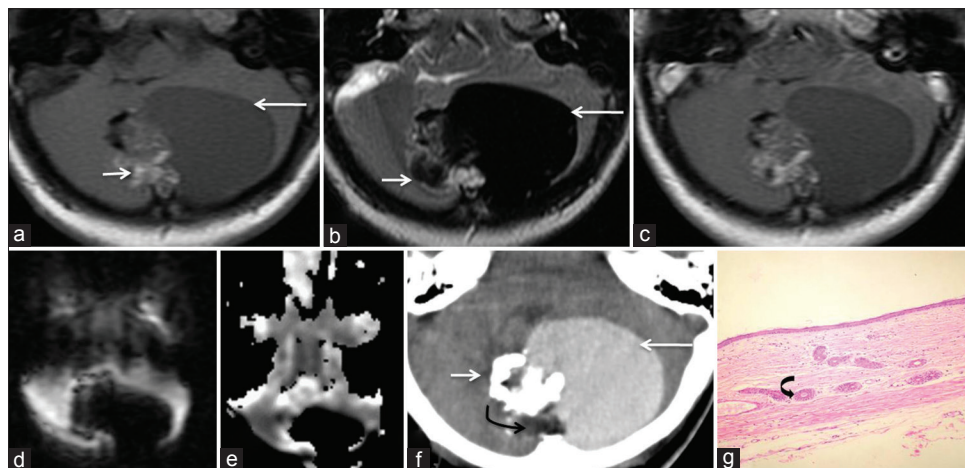


Figure 2: (a-c) Axial T1, T2, and postcontrast T1 magnetic resonance imaging showing a nonenhancing intra-axial lesion in the left cerebellar hemisphere measuring 50 mm × 57 mm × 46 mm (AP × ML × CC). The lesion is hypointense on T1 and significantly hypointense on T2 with peripheral mural nodule which shows heterogeneous signal. (d and e) Diffusion and ADC images showing no restricted diffusion. (f) Axial noncontrast computed tomography images showing homogeneously hyperdense lesion (large arrow) with peripheral nodule with areas of calcification (small arrow) and mild fat density (curved arrow). (g) Paraffin section showing keratinized stratified squamous epithelium with proliferating sebaceous gland (arrow) (H and E, ×100)

## Discussion

Intracranial dermoid cysts are rare benign neoplasms that are commonly located midline and are caused by embryological malformation during the development of the neural tube between the 3<sup>rd</sup> and 5<sup>th</sup> weeks.<sup>[1]</sup> These cysts are lined by squamous epithelium and contain skin appendages such as hair follicles, sebaceous glands, nails, and teeth. The lesion enlarges as a result of its increased content of glandular secretions and epithelial desquamation, and as it grows, many symptoms result secondary to the compressed neural structures.<sup>[1]</sup>

Cyst with a mural nodule tumor (CMNT) is one of the well-known radiological patterns of intracranial tumors. The common tumors that present with CMNT radiological appearance are hemangioblastoma, pilocytic astrocytoma, ganglioglioma, and pleomorphic xanthoastrocytoma.<sup>[2]</sup> Uncommon tumors include tanyocytic ependymoma, intraparenchymal schwannoma, desmoplastic infantile ganglioglioma, and cystic metastasis.<sup>[2]</sup>

Raz *et al.*<sup>[2]</sup> in their study of radiologic–pathologic correlation of intra-axial CMNT of the central nervous system did not encounter any dermoid cyst with CMNT radiological pattern. Similarly, Jacob and Lee<sup>[3]</sup> in their study which evaluated the role of conventional, diffusion tensor, and dynamic susceptibility contrast perfusion MRI in characterizing and differentiating intracranial cystic tumors with the mural nodule did not report any cases of intracranial dermoid with CMNT appearance. However, none of these cysts was homogeneously hypointense on T2-W images (like in our cases).

Literature review shows only seven cases reported in the English language literature, and none had an enhancing mural nodule except the one reported by Brown *et al.*<sup>[4]</sup> Tan *et al.*<sup>[5]</sup> also reported a case of hyperdense dermoid in suprasellar location, but no mural nodule was noted unlike our cases. The common observation was that all these unusual lesions, which were hyperdense on CT, are significantly hypointense on T2-W MRI.

This rare CT hyperdensity in combination with T2-W hypointensity on MRI of the dermoid is thought to be due to combination of saponification of lipid/keratinized debris with secondary microcalcification in suspension, partially liquefied cholesterol, high protein content, and hemosiderin or iron–calcium complexes relating to previous episodes of hemorrhage within the cyst.<sup>[4]</sup> In both our cases, the lesion was hyperdense on CT scan and hypointense on T2-W MRI with only minimal fat density visualized in one of the cases.

On MRI sequences, typically, dermoid cyst appears T1 hyperintense (due to cholesterol components) and is heterogeneous on T2-W images. On CT, typically, they are hypodense with attenuation values equal to that of fat

density. However, this may not always be the reality. By virtue of their pathologic contents, rarely, dermoid cyst can show atypical or unusual appearance. It is important to familiarize with this unusual appearance of dermoid cysts described in our case series for the right preoperative diagnosis and better surgical planning. T1 hyperintense (fat) droplets in the subarachnoid spaces may be visible if there is rupture of dermoid cyst. Such rupture can either be spontaneous or can occur at surgery resulting in chemical meningitis which may be severe leading to vasospasm, infarction, and death.<sup>[6]</sup>

## Conclusion

When a hyperdense lesion on CT shows significant hypointensity on T2-W MRI and has a mural nodule with calcification/fat, even if they are not midline in location, it is rewarding to consider dermoid cyst in the diagnosis. Decreased cerebral blood flow on perfusion helps to confirm the benign nature of the lesion. Knowledge of this atypical radiological appearance of dermoid cyst is essential to avoid diagnostic pitfalls which may have a bearing on the surgical management.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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## Conflicts of interest

There are no conflicts of interest.

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