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Unexpected Discovery of Cerebral Calcifications: CT Findings and Review

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Abstract **Case Report**

The discovery of cerebral calcifications, particularly when incidental, requires a rigorous diagnostic approach to determine their underlying cause. While they are often physiological and age-related, their topography, morphology, and bilaterality are key clues in guiding the diagnosis towards pathological origins such as metabolic or genetic disorders (like Fahr's disease), past infections, vascular issues, or tumors. The non-contrast CT scan remains the gold standard for their detection, but its analysis must be supplemented by an MRI to characterize the adjacent brain parenchyma and, crucially, by a metabolic workup (calcemia, phosphoremia, PTH) to identify or rule out an underlying systemic condition and to guide appropriate patient management.

Keywords: Intracerebral calcifications, CT scan, Fahr's disease, metabolic disorders, bilateral, lentiform nuclei.

INTRODUCTION

Intracerebral calcifications, frequently encountered in clinical practice on non-contrast computed tomography (CT) brain scans, consist of calcium deposits within the brain parenchyma. Their discovery, the prevalence of which increases with age, can be incidental and physiological or may signify an underlying pathology. CT remains the gold standard examination for their precise detection and characterization. A meticulous analysis of their topography and morphology is a crucial step in guiding the diagnostic process and determining their etiology.

CASE REPORT

We report the case of a 44-year-old male with a known history of treated juvenile epilepsy, who presented to the emergency department following a sharp object injury to the right eye.

A non-contrast computed tomography (CT) scan of the orbits was performed to evaluate for a radiographically detectable intraocular foreign body.

Imaging Findings

While the non-contrast orbital CT scan was performed to assess a penetrating injury to the left eye, successfully identifying a hyperdense (142 HU) metallic foreign body measuring 2 x 1.8 mm within the anterior chamber, the study revealed a far more significant and unexpected finding: extensive bilateral and symmetrical calcifications within the deep brain parenchyma.

These calcifications were notably located in the deep white matter, periventricular regions, and involved key structures such as the lentiform nuclei, caudate nuclei, and were also present in both supra- and infratentorial compartments.

This incidental discovery of widespread neurocalcification is highly atypical for a traumatic presentation and is of greater clinical concern than the ocular foreign body itself, as it suggests a potential underlying systemic, metabolic, or genetic disorder that necessitates a comprehensive neurological and metabolic workup.

Figure 1: non-contrast orbital CT scan showing a hyperdense (142 HU) metallic foreign body measuring within the anterior chamber (White arrows)

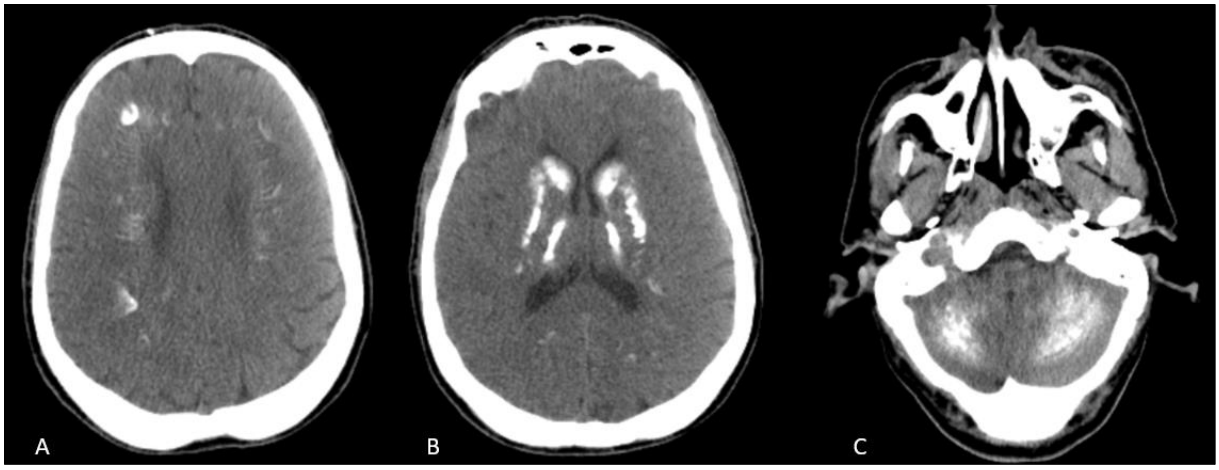

Figure 2: Plain axial CT scan of brain showing bilateral and symmetrical calcifications in the deep white matter (A), periventricular regions, and involved key structures such as the lentiform nuclei, caudate nuclei (B), and cerebellum (F)

DISCUSSION

The diagnostic strategy integrates key radiological and clinical tools. Non-contrast CT is the primary modality for detecting and characterizing calcifications. MRI complements this by assessing the surrounding parenchyma. Crucially, these imaging findings must be correlated with clinical history and a mandatory metabolic workup (calcium, phosphorus, PTH) to establish a definitive etiology.

1. Physiological Calcifications

- Clinical: Incidental discovery, perfectly asymptomatic. Very common with age, without any pathological significance.
- Radiological Aspects:
- Pineal gland: Punctate, midline calcification, in relation to the velum interpositum. Often the first site to calcify [1].
- Choroid plexus: Symmetrical and bilateral calcifications within the lateral ventricles, often larger than the pineal gland [1].
- Falx cerebri / Tentorium cerebelli: Linear hyperdense images, located on the dural structures [1].

2. Metabolic & Genetic Calcifications (Bilateral and Symmetrical)

- Clinical: May present with seizures, cognitive disorders, abnormal movements (parkinsonian syndrome) or signs of hypocalcemia (cramps, tetany).
- Radiological Aspects:
- Fahr's disease / Calcium-phosphorus disorders: Characteristic location: basal ganglia (globus pallidus, putamen, caudate nucleus), dentate nuclei of the cerebellum, and periventricular white matter. Bilateral, symmetrical, and often confluent appearance. Non-contrast CT is the key examination for diagnosis [2, 3].

3. Infectious Calcifications

- Clinical: History of infection or origin from an endemic area. Epilepsy is a frequent complication of infectious sequelae.
- Radiological Aspects:

- Neurocysticercosis (calcified stage): Punctate calcifications (≤ 1 cm) intraparenchymal, often single or multiple, may contain a central hyperdense point (the calcified scolex). It is a major cause of acquired epilepsy worldwide [4].
- Tuberculoma: "Target" or annular calcification with peripheral enhancement after contrast injection [5].

4. Vascular Calcifications:

- Clinical: Incidental discovery or in a context of stroke or focal neurological deficit.
- Radiological Aspects:

- Atherosclerosis: Linear or "tram-track" parietal calcifications, following the course of large arterial trunks (carotid siphon, basilar artery) [1].
- Cavernous malformation (Cavernoma): Punctate "popcorn-like" calcifications within a well-limited lesion, often associated with blood degradation products of different ages ("popcorn" appearance on MRI) [6].

5. Tumor Calcifications

- Clinical: Discovery in a context of intracranial hypertension or progressive focal neurological deficit.
- Radiological Aspects:

- Oligodendroglioma: Ribbon-like, curvilinear, or nodular calcifications within a cortical or subcortical tumor, often infiltrating [7].
- Meningioma: Global, homogeneous or "plaque-like" calcifications within an extra-axial mass with a broad dural implantation base [7].
- Craniopharyngioma: Characteristic "eggshell" calcifications on the periphery of a cystic component of the suprasellar lesion [7].

6. Dystrophic / Sequelae Calcifications

- Clinical: Known history of head trauma, surgery, or radiotherapy.
- Radiological Aspects:

- Hematoma sequelae: Peripheral, irregular areas of calcification within a zone of encephalomalacia (scarring gliosis) [1].
- Post-radiotherapy: Diffuse and multifocal calcifications within the radiation field, often associated with cerebral atrophy and leukoencephalopathy [8].

CONCLUSION

The discovery of brain calcifications, especially in a young patient with a history of epilepsy, requires rigorous analysis of their topography, morphology, and bilaterality to guide the diagnosis. Non-contrast CT is the first-line examination, often supplemented by MRI to characterize the adjacent brain parenchyma and search for other lesions. A metabolic workup (calcemia, phosphoremia, PTH) is systematically indicated in the presence of basal ganglia calcifications.

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