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Case Report

Calciphylaxis and Metastatic Brain Calcification in End-Stage Renal Disease

Jesus Pérez-Nellar[1] and Calixto Machado[2]*

[1]*Stroke Unit, Service of Neurology, Hermanos Ameijeiras Hospital, Havana, Cuba*

[2]*Institute of Neurology and Neurosurgery, Havana, Cuba*

***Corresponding Author**: Calixto Machado, Institute of Neurology and Neurosurgery, Havana, Cuba.

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Abstract

Brain calciphylaxis is an uncommon but potentially serious complication in end-stage renal disease. Some authors have described calciphylaxis using the term "metastatic calcification" to explain that calcium-phosphate crystals form with calcium and phosphate concentration increments. Nonetheless, further research indicates that vascular calcification is not passive mineral precipitation but the result of an active cellular process. Calciphylaxis is characterized by multiple ischemic lesions in the skin of the hands, feet, penis, and brain and is associated with high mortality. We present here a patient who suffered a right middle cerebral artery (MCA) infarct and a CT scan showed an extensive intracranial arterial calciphylaxis within the right MCA territory. In conclusion, brain calciphylaxis is an uncommon but potentially serious complication in end-stage renal disease; neurologists should consider this diagnosis when a patient complains of renal disease or is under a dialysis program.

***Keywords**: Calciphylaxis; Metastatic Calcification; Brain; Stroke; Renal Failure*

Introduction

Brain calciphylaxis is an uncommon but potentially serious complication in end-stage renal disease [1,2]. Selye first described calciphylaxis in 1962, describing induction of soft-tissue calcification in experimental models [3]. However, soon after that, calciphylaxis in human beings was described [1,4-6].

Some authors have described calciphylaxis using the term "metastatic calcification" to explain that calcium-phosphate crystals form with calcium and phosphate concentration increments [7]. Nonetheless, further research indicates that vascular calcification is not passive mineral precipitation but the result of an active cellular process.

Calciphylaxis is characterized by multiple ischemic lesions in the skin of the hands, feet, penis, and brain and is associated with high mortality [5,8-11]. Female gender, hyperphosphatemia, high alkaline phosphatase, and low serum albumin are the main risk factors for calciphylaxis [12-14].

We present here a patient who suffered a right middle cerebral artery (MCA) infarct, and a CT scan showed an extensive intracranial arterial calciphylaxis within the right MCA territory,

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A 52-year-old man with a history of hypertension and renal failure, who was under hemodialysis during the last eight years, presented a left hemiparesis of acute onset. CT scan showed a right MCA infarct and calciphylaxis of intracranial arteries within the right MCA territory (Figure 1). He also complained of secondary hyperparathyroidism (Parathyroid Hormone level = 717 ng/liter). His focal neurological impairment improved, remaining a light hemiparesis.

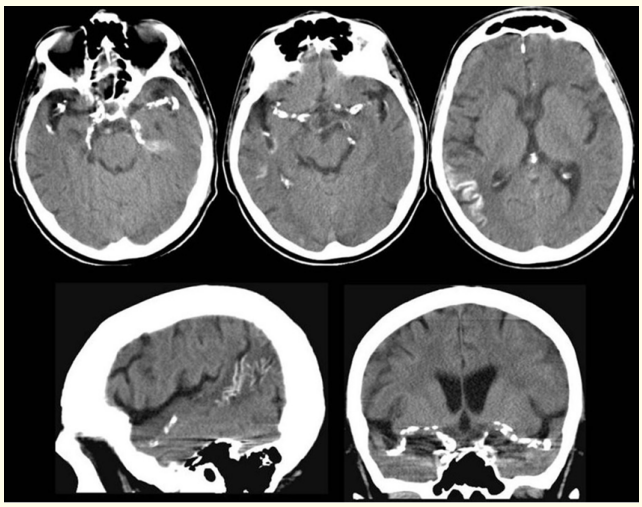

Figure 1: *CT scan shows a brain infarct with extensive intracranial arterial calciphylaxis and metastatic calcification delineating cortical sulci within the right MCA territory.*

Discussion and Conclusion

Calciphylaxis [1,15-17] within the central nervous system is infrequent. Du., *et al*. provided pathologic confirmation that the punctate calcifications in the brain images correspond to the fatal shower of calcific emboli from mitral annular calcification. These authors histologically described embolic calcific material in a subarachnoid artery [18].

Hans Selye published calciphylaxis, which described the induction of soft-tissue calcification in rodents [4,19]. Soon after, reports of calciphylaxis in human beings were published. Selye's provided a definition of calciphylaxis ("a condition of induced systemic hypersensitivity in which tissues respond to appropriate, challenging agents with a precipitous, though sometimes evanescent, local calcification") [19]. Actual reports in dermatology describe calciphylaxis under the heading of "Metastatic calcification" and indicate that calcium-phosphate crystals form when calcium and phosphate concentrations are increased [20].

Calcium is a silvery white metal that accounts for 3% of the earth's crust and 2% to 3% of human body weight. Of the body's calcium, 98% is stored in bone. The remaining 2% exists as free ions or is bound to proteins, phosphate, other ions, or insoluble complexes and is found in plasma, extracellular fluid and within cells [21-24]. Cellular and extracellular calcium levels are maintained within a narrow range and relatively minor deviations may have life-threatening consequences. Diseases renal failure is the most relevant disease that affects calcium and phosphate status in calciphylaxis [21,25].

However, extensive research indicates that vascular calcification results from an active cellular process, not passive mineral precipitation. Furthermore, observation of de novo bone formation (inappropriate osteogenesis) adjacent to calcium deposits in cutaneous arterioles challenges the theory of passive calcium deposition in the pathogenesis of calciphylaxis. Cutaneous arteriolar stenosis and vascular (thrombotic) occlusion are required to produce the clinical lesion of calciphylaxis. However, vascular stenosis and vascular thrombosis in calciphylaxis are chronologically, clinically, and etiologically distinct. Vascular stenosis occurs via medial arteriolar calcification and subintimal fibrosis, progressing insidiously and usually without clinical recognition. In contrast, vascular thrombosis develops acutely and is characterized clinically by painful ischemic purpura. Recognition of the differences between vascular calcification and thrombosis is essential when determining appropriate interventions for the prevention and treatment of calciphylaxis [23,26-29].

However, numerous other disorders that cause calcium-phosphate imbalance also should be considered when evaluating patients with calciphylaxis because these disorders may occur with or without concurrent renal failure, like parathyroid hormone (PTH) secretion is stimulated by low levels of serum calcium and is initiated by calcium-sensing receptors on parathyroid cells [21,30,31].

In conclusion, brain calciphylaxis is an uncommon but potentially serious complication in end-stage renal disease [1,2] neurologists should consider this diagnosis when a patient complains of renal disease or is under a dialysis program [32].

Disclosures

None.

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