CT Brain Findings in a Patient with Elevated Brain Cesium Levels

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SUMMARY – *We describe the CT findings in the brain of a woman with pathologically proven elevated levels of blood and tissue cesium. The 42-year-old woman had been receiving cesium chloride as a non-mainstream treatment for metastatic breast carcinoma. She presented to hospital following a seizure, and died 48 hours after admission. A brain CT performed on hospital admission showed a diffuse increase in attenuation of brain parenchyma. Autopsy revealed elevated levels of cesium in blood and solid organs including the brain. We hypothesize that the imaging findings are attributable to the abnormally elevated level of brain cesium at the time of the CT scan. To our knowledge, this is the first reported case of this imaging finding.*

Introduction

We describe the CT imaging findings in the brain of a woman who was undergoing cesium chloride therapy for metastatic breast cancer.

Case Report

A 42-year-old woman presented to the emergency department following a generalized seizure. She had a history of metastatic breast adenocarcinoma including a known solitary right cerebellar brain metastasis. She had been receiving non-mainstream treatment for her cancer, which included the administration of intravenous cesium chloride. Prior to her presentation she had been unwell for three days with nausea, vomiting and diarrhea.

A non-contrast brain CT scan (GE CTi, Milwaukee, USA) performed on hospital admission showed a right cerebellar mass consistent with the known brain metastasis. When the images were initially viewed on PACS (Agfa-Gevaert, Morstel, Belgium) with brain display settings (Window 80, Level 40), the brain parenchyma was of diffusely increased attenuation requiring re-windowing to enable assessment of brain parenchyma.

The patient developed sepsis and suffered

multiple further seizures. She died in hospital 48 hours following admission. Post mortem examination found widespread metastatic disease and evidence of diffuse Staphylococcus infection. Toxicology assessment revealed elevated levels of cesium in liver (1400 mg/kg), kidneys (1200-1400 mg/kg), brain (780 mg/kg) and preserved ante-mortem blood samples (990 mg/L).

Discussion

The use of alternative therapies either in lieu of or as an adjunct to mainstream therapy is becoming increasingly apparent. Although based on scant evidence, the 'high pH cancer therapy' regime involves the administration of cesium and vitamins, with the proposed mechanism of action relating to an increase in tumor cell pH and subsequent cell death¹. Administration of high doses of cesium has been reported to result in cardiac arrhythmia, hyperkalemia and seizures²⁻⁷.

In this case, the toxicology results demonstrate elevated cesium concentrations in all tested solid organs, blood and serum. Based on a normal brain cesium level of 0.004 mg/kg⁷, findings indicate our patient had a brain cesium concentration of 195000 times normal.

The CT scan of our patient showed a diffuse

Figure 1 Images from the patient with elevated brain cesium (top row) and a 39-year-old woman scanned for headache (bottom row). Images were obtained on the same day from the same CT scanner using the same scan protocol. Paired images on the right are displayed at W75L35, and on the left at W80L40. Images from the patient with elevated brain cesium (top row) demonstrate a diffuse increase in parenchymal attenuation, particularly noticeable in the deep grey nuclei.

increase in brain parenchymal attenuation (Figure 1). Region of interest (ROI) measurements showed average tissue attenuation of 50 Hounsfield units (HU) for deep white matter and 61 HU for deep grey nuclei. Normal reported average values are 30-31 HU for white matter and 33-37 HU for deep grey nuclei^{8,9}. We subsequently performed a CT scan of a solution of 780 mg/L cesium chloride. The measured attenuation of this sample was 38 HU.

We hypothesize that the patient's imaging findings are attributable to the abnormally elevated level of brain cesium at the time of the

CT scan. To our knowledge, this is the first reported case of this imaging finding.

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