

Mineralization of the Globus Pallidus as a Function of Age: Are There Major Differences between Caucasians and Chinese?

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Introduction: The standard method to evaluate mineralization in the basal ganglia has been using computed tomography. However, gradient echo imaging is very sensitive to local field inhomogeneities produced by the presence of iron and calcium making it an ideal method to study mineralization in the brain. In a study of more than 150 normal Chinese and 100 elderly Caucasians with susceptibility weighted imaging (SWI), we observed that many Chinese, even young Chinese, exhibited a high degree of mineralization in the globus pallidus. Of the metals found in postmortem analysis of mineralization of the basal ganglia, iron, manganese, copper, and calcium are possible sources of field inhomogeneities that can be detected by SWI(1). This abstract documents the pattern of mineralization in the globus pallidus (GP) using SWI.

Material and Methods: We retrospectively reviewed SWI images for 37 age and gender matched healthy paired subjects (Chinese versus Caucasians, age range 18-74 years). We measured the maximum area of the GP by drawing a region of interest (ROI) outlining the GP in two adjacent slices. Two cutoffs were used to identify areas of mineralization in the phase images: pixels with Siemens phase units (SPU) lower than 1900 and larger than 2200. For the magnitude images, the cutoffs were set at plus or minus three standard deviations of the signal in the unaffected area of the GP. The area of mineralization was calculated for both phase and magnitude images and the percentage cutoff pixels (ROI%) between two groups was compared.

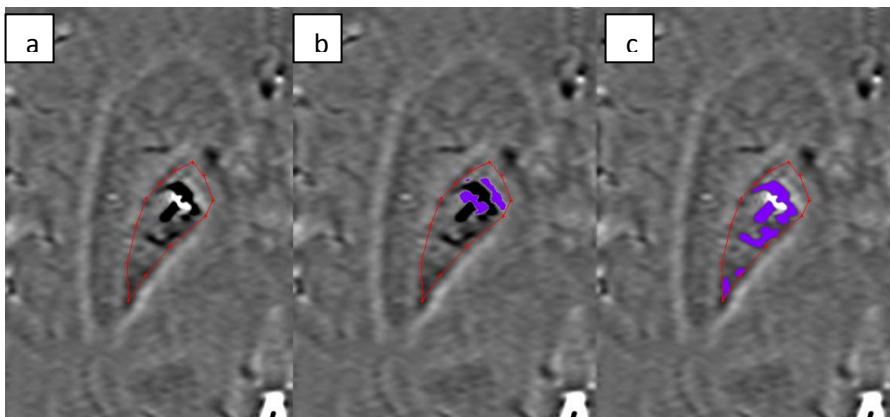


Figure 1: a) The original ROI. b) Pixels thresholded below 1900. c) Pixels thresholded above 2200.

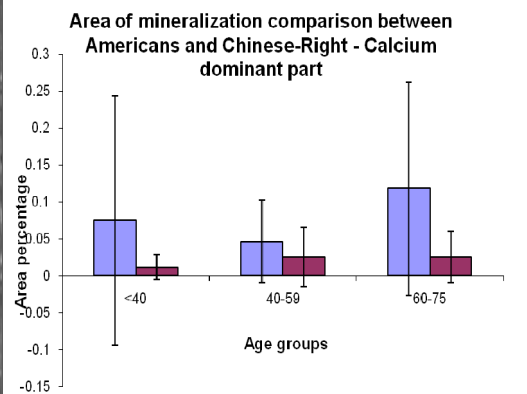


Figure 2: Area of mineralization as a function of age from phase data.

Results: We documented that mineralization increases with age in the GP whether measured with phase or magnitude. For the right globus pallidus, healthy Chinese subjects have a higher percentage of mineralization at any age group while for the left side it tends to grow after age 40. As seen from Figure 2, Chinese have a higher proclivity to develop larger amounts of mineralization than Caucasians. We also found that the signal loss in the magnitude images mimicked the effects seen in the phase data.

Discussion: Cohn *et al* describe the frequency of basal ganglia calcification increasing with age (2). However, the findings of calcification in the basal ganglia of Caucasians is an incidental finding in only 0.33~2.5% of brain CT scans(3). As Harder *et al*'s report had only considered iron as the source of basal ganglia mineralization on SWI (4), our study documents the course and pattern of mineralization, including iron and calcification, in the deep gray matter with age, as determined by SWI in two diverse populations. Its significance at this point in time is unknown, but SWI offers the potential to examine differences in neurodegenerative disease that might correlate with age related variations in mineralization.

References:

1. AJNR Haacke *et al.* in press. 2. Cohn *et al.* Radiology. 134:97;1980. 3. Manuel *et al.* Psychiatry Research 121:59; 2003. 4. Harder *et al.* AJNR. 29:176. 2008.