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LETTER TO THE EDITOR

James C. Williams Jr

Viewing windows do not alter Hounsfield units in CT scans

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Sir,

The recent publication by Sheir et al. [1] provides some interesting data on the x-ray attenuation values of kidney stones, but the paper leaves the reader with the mistaken impression that one's choice of viewing windows can affect measured Hounsfield units in helical CT scans.

The calculated x-ray attenuation value at any point within the three-dimensional array of a CT image stack can be influenced by the nature of the material being imaged, by choices for the patient scan (such as x-ray tube voltage), and by the image reconstruction calculation (which always contains within it some assumptions about the system). However, the values of x-ray attenuation (Hounsfield units) are *not* affected by the 'window' setting used to view the scan.

Windows—or, more accurately, windows and levels—are the settings used to transform the x-ray attenuation numbers in the reconstructed CT image into grayscale for display on a monitor. The same CT scan can be viewed using any combination of window and level settings, and these viewing settings will allow different features of the scan to be seen.

For example, when one views a scan using abdominal windows, soft tissues appear to be various shades of gray, while stones are uniformly bright white. Alternatively, the same scan can be viewed using bone windows (or even higher settings) and the soft tissues will appear black, while any variation in x-ray attenuation within the stone can be seen as light or dark grays [2, 3].

Sheir et al. present data on Hounsfield units collected using both soft tissue and bone windows, and suggest that the relationship between these was unknown before the data were collected.

Such is not the case. The Hounsfield units of the CT scan are set once the image reconstruction is completed. If one uses a fixed region of interest on a CT image, the same Hounsfield units will be found, regardless of the viewing windows used. Any differences that Sheir et al. found between abdominal and bone windows must have been due to variation in positioning of their regions-of-interest.

Indeed, we have advocated the use of bone windows in viewing CT images of urinary stones so that different minerals in the stones can be visualized [3, 4]. That is, we advocate the use of bone windows so that the region-of-interest measurement of Hounsfield units on a stone can be made appropriately.

Finally, anyone screening CT scans of patient stones on monitors is urged to view these images at more than one window setting. Use abdominal windows to see the location of the stone relative to soft tissue structures, and then click the menu to show bone windows, to view internal structure of the stone. Changing this viewing setting does not affect the Hounsfield units of the stone, and it takes only a few seconds to see if stone structure is visible.

J. C. Williams Jr
Department of Anatomy and Cell Biology,
Indiana University School of Medicine,
635 Bamhill Drive, Indianapolis,
IN 46202-5120, USA
Tel.: +1-317-2747494
Fax: +1-317-2782040
E-mail: williams@anatomy.iupui.edu

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