



MRI of the Brain



PIC QUESTION OF THE WEEK: 9/3/07

Q: What is the association between gadolinium-based contrast media and nephrogenic systemic fibrosis?

A: Iodine-based contrast agents often produce nephrotoxicity and acute renal failure. Because of the increased use (approximately 23 million procedures in 2005) of magnetic resonance imaging (MRI) studies during the past several years, it became apparent that safer contrast media would have to be developed. Gadolinium possesses excellent properties for use in contrast studies including its rare association with renal toxicity. Although gadolinium is a toxic heavy metal, it has been considered biologically inert when administered as a *chelate*. Five gadolinium-based contrast agents (GBCAs) are currently available for use in MRI studies. Recently, the use of GBCAs has been associated with the development of a newly identified condition known as nephrogenic systemic fibrosis (NSF). The disorder, also known as nephrogenic fibrosing dermopathy (NFD), has usually been observed in patients with moderate to advanced renal insufficiency. The development of NSF appears to be more common in patients who have been previously exposed to GBCAs, had recently been treated with erythropoietin stimulating factors, or have a history of hypothyroidism or deep vein thrombosis. Others suggest that NSF may be attributed to surgical and vascular procedures that increase levels of circulating fibrocytes. In patients with NSF, enhanced fibrocyte activity may result in fibrosis of normal tissue. Some believe that free gadolinium is an actual stimulus to enhanced fibrocyte activity. A recent report suggests that mobilization of iron in some renal patients may contribute to alteration of the chelate and enhanced levels of free gadolinium. NSF is characterized by thickening, hardening, and tightening of the skin as well as subcutaneous edema. In addition to renal complications and skin changes, NSF has been demonstrated to affect other organs such as the heart, lungs, liver, and skeletal muscle (thus the name change to NSF to indicate *systemic* involvement). As of December 25, 2006, 90 cases of NSF had been reported to the FDA MedWatch program. Signs and symptoms of NSF appear to occur a few days to several months after exposure to GBCAs. Unless the benefits of using a gadolinium-based contrast agent greatly outweigh the risk, it is advisable to avoid their use in patients with renal insufficiency. In the event a patient on dialysis must receive a GBCA, it is recommended the dose be adjusted accordingly and hemodialysis performed immediately after the contrast study. NSF must be considered in all patients receiving GBCAs, especially those with some degree of renal impairment.

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