The Ideal Contrast Agent?

Gadolinium is distinctly paramagnetic for a number of reasons:

- It is one of four elements that can be magnetized at room temperature, with a ferromagnetic Curie point of 20°C.
- Gd donates its 6s² and 5d¹ electrons for bonding, leaving its seven 4f electrons intact and unpaired even when bound in a stable complex.
- It has a magnetic moment of 7.9 B.M., higher than other transition metal ions.
- Gadolinium complexes have a higher degree of symmetry and therefore greater ability to slow proton relaxation rates than those made with other lanthanides like dysprosium, despite the fact that Dy³⁺ has higher magnetic moment.

Both cyclic and linear eight-coordinated complexes are possible, but the cyclic configuration offers more effective protection and binding strength.

Trigonal tricapped geometry is adopted by many lanthanide chelates, yielding two “wrapping isomers” that interchange rapidly. This creates a pseudo mirror plane and increases proton relaxation rates.

Contrast dyes are eliminated through the kidneys with an approximate half-life of 1.5 hours. In patients with pre-existing renal problems, the half life of can be extended up to 30 hours. Accumulation of the metal complex in the body is linked to nephrogenic systemic fibrosis, a condition characterized by uncontrollable formation of scar tissue and ectopic ossification, or formation of new bone in tissues which do not normally ossify. It has also been shown to worsen symptoms in patients with MS.

References