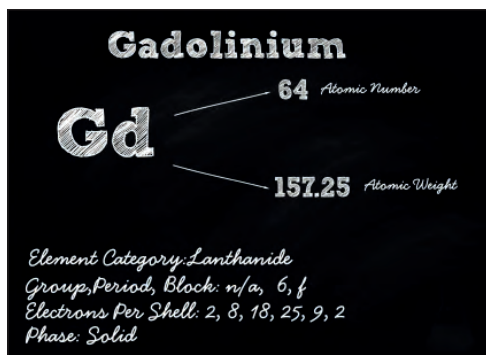


## Did You Know?

# GBCAs: Gadolinium-Based Contrast Agents

### Take-home message

- Gadolinium contrast injections improve diagnostic accuracy in imaging.
- In some cases angio-MRI needs to be carried out using gadolinium contrast.
- New solutions without GBCAs usage should be privileged for patients.



• Gadolinium is a paramagnetic metal ion that moves differently within a magnetic field. Gadolinium-based agent is widely used as contrast media for MRI because of its capacity to alter the relaxivity of nearby water molecules by means of interaction with its unpaired electrons.

Gadolinium-based contrast agents (GBCAs) have been considered safe for many years. The disadvantage of GBCAs was faced by patients with severe kidney disease only and it was linked to the development of Nephrogenic Systemic Fibrosis, or NSF. However, recent reports have shown gadolinium accumulation in neuronal tissues and other tissues, including bone and kidneys. That is why in March 2017 PRAC (Pharmacovigilance and Risk Assessment Committee) has recommended the suspension of four gadolinium agents from the market in Europe.

There are two types of GBCAs:

- linear agents** that have a structure more likely to release gadolinium, which can build up in body tissue
- macrocytic agents** that are more stable and have a much lower propensity for gadolinium storage in the body.



### Side effects of gadolinium:

- NSF caused by GBCAs could lead to skin thickening that can prevent bending and extending the joints.
- Life-threatening allergic reaction and skin reactions, including itching and Quinke's edema.
- Gadolinium deposit in tissues, i.e. brain, kidney, bone, may lead to unknown but potentially severe side-effects.

## In Olea Sphere®?

Olea Sphere® offers several plug-ins to limit or avoid the use of contrast agent.

There are two possibilities:

#### 1- USING GADOLINIUM:

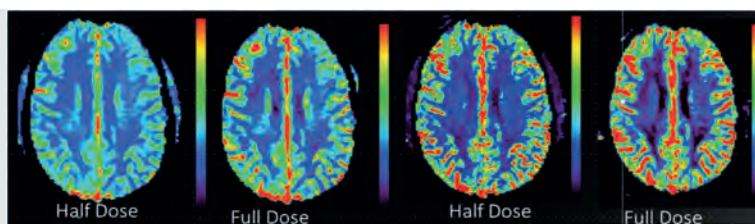
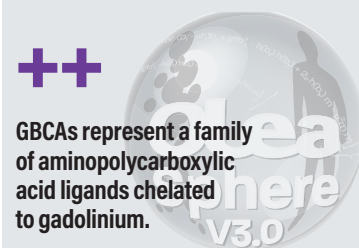
Use of the Bayesian model has shown its ability to allow a reduction of gadolinium dose by half. (Pic.1)

#### 2- WITHOUT THE USE OF GADOLINIUM:

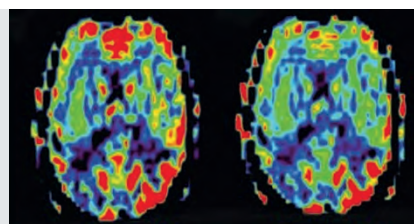
The ASL plug-in: allows to quantify the perfusion without exogenous use of contrast agent. The labeled circulating blood spins act as an endogenous agents. (Pic.2)

Thanks to that, we can compute blood flow and perfusion-weighted maps.

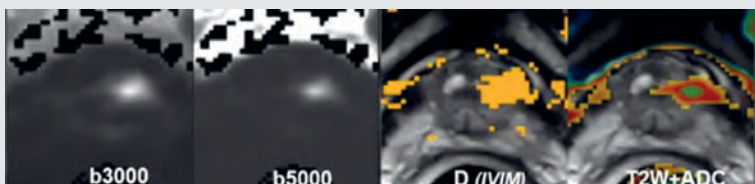
The IVIM plug-in: allows to quantify the tissue micro-perfusion and simultaneously the diffusion using a single multi-b diffusion sequence. (Pic.3)



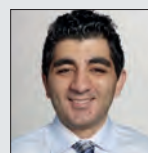
Pic.1



Pic.2



Pic.3



"Our results confirm the theoretic advantages of the Bayesian method over SVD-based deconvolution to achieve a more accurate estimation of DSC perfusion parameters in low-SNR environments" (Ref1)

Sources: Ref [1]. N. Kambiz, Bayesian Estimation of Cerebral Perfusion Using Reduced Contrast-Dose Dynamic Susceptibility Contrast Perfusion 3T, AJNR Am J Neuroradiol 2015 ■ <http://finance.yahoo.com/news/querbet-concurs-prac-recommendations-gadolinium-141700458.html> ■ <http://articles.mercola.com/sites/articles/archive/2014/01/09/gadolinium-mri-contrast-agent.aspx> ■ <http://pubs.rsna.org/doi/pdf/10.1148/radiol.15150025> ■ <https://link.springer.com/article/10.1007/s10534-016-9931-7> ■ <https://www.insideradiology.com.au/gadolinium-contrast-medium/> ■ [https://www.researchgate.net/publication/273920250\\_Advantages\\_of\\_gadolinium\\_based\\_ultrasmall\\_nanoparticles\\_vs\\_molecular\\_gadolinium\\_chelates\\_for\\_radiotherapy\\_guided\\_by\\_MRI\\_for\\_glioma\\_treatment](https://www.researchgate.net/publication/273920250_Advantages_of_gadolinium_based_ultrasmall_nanoparticles_vs_molecular_gadolinium_chelates_for_radiotherapy_guided_by_MRI_for_glioma_treatment) ■ V.A. // B.T. // E.S. // S.F. // K.N.