

# The changing trend of Gadolinium brain deposition among children after implementing a new institutional "macrocytic agent-only" policy:

*Our Experience at Ibn sina hospital (ISH, Kuwait)*

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## Introduction:

Gadolinium deposition in deep brain structures was evaluated in a series of studies worldwide and it has been linked closely to the use of linear gadolinium agents. Beginning from April 2017, and in response to the emerging evidence-based recommendations, all linear gadolinium agents were withdrawn in Kuwait and a new institutional "restricted" policy has been applied at our institution where all contrast-enhanced MR studies were done using macrocytic agents only.

## Purpose:

The aim of the study was to compare the trend of Gadolinium brain deposition in children undergoing contrast-enhanced MR studies at our institution before and after the new policy.

## Patients & Methods:

Recurring pediatric patients (n: 29, mean age: 5.4 ±2.8 years) who had at least one previous contrast-enhanced MR study were identified (from January to March 2018) during their follow up scans and enrolled in the study, then their previous MR scans (median n: 2, maximum n: 10, 95%CI: 1.0 to 4.0) were retrospectively retrieved using our PACS at ISH. The dates, number and frequency of MR studies were also recorded. T1 signal intensity (SI) values were measured at bilateral dentate, globus pallidi, thalami, and in the central pons (figure 1). Spatial SI ratios were calculated as follows: dentate/pons, dentate/thalamus, and globus pallidus/thalamus. Temporal SI ratios were calculated at two separate time points between spatial ratios at the most recent (r) and the oldest (o) available studies at dentate/pons\_r-o, dentate/thalamus\_r-o, and globus pallidus/thalamus\_r-o.

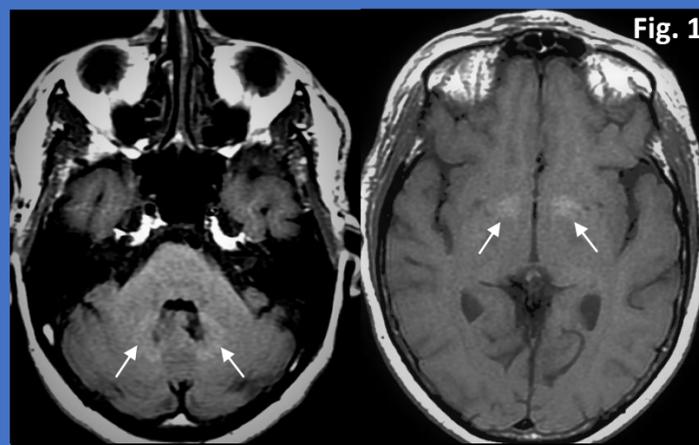
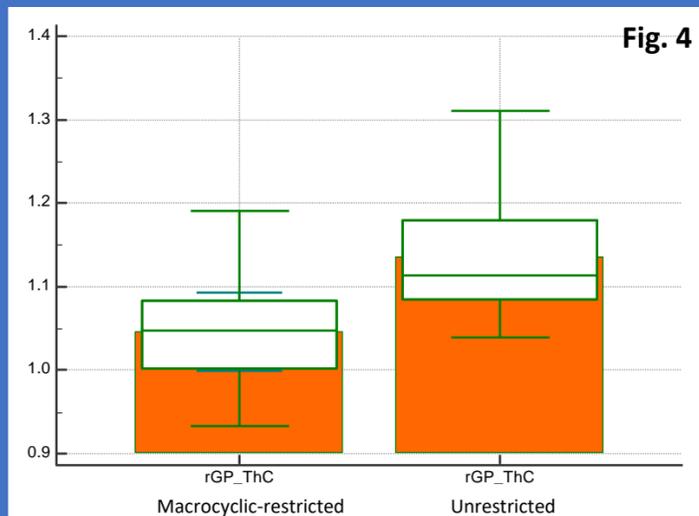
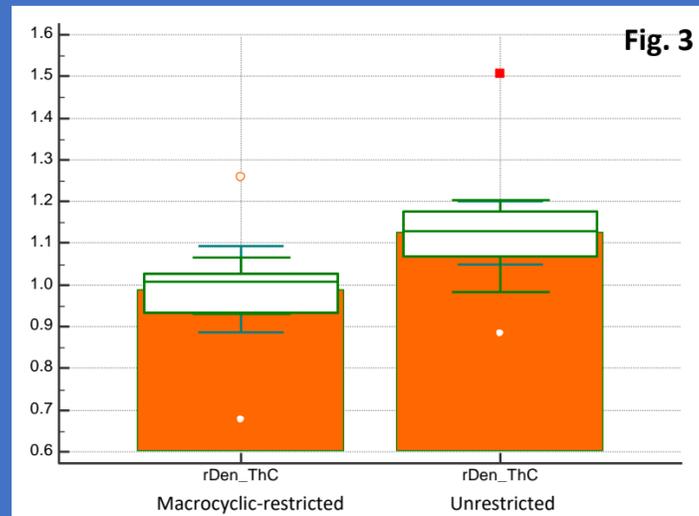
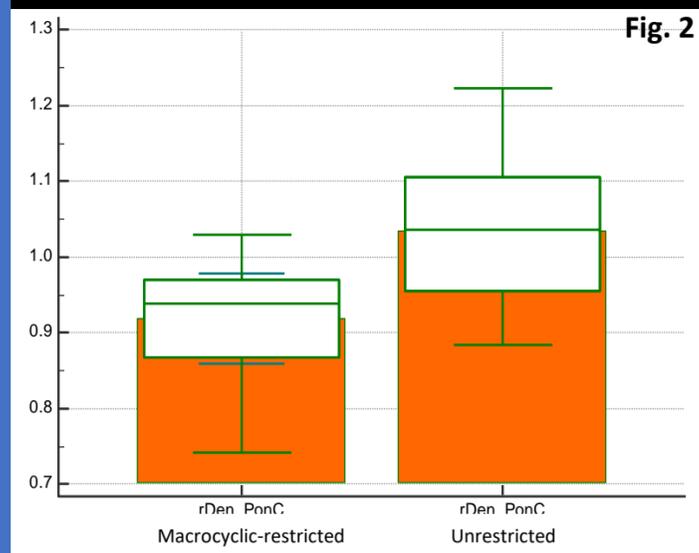


Fig. 1  
Hyperintense signal (arrows) on plain T1W SE axial planes of the brain at the levels of dentate nuclei (left) and globus pallidi (right) in a patient who received 2 previous doses of a linear gadolinium agent.



## Results:

12 patients had their previous MR scans under the "restricted" macrocytic policy while 17 ones had one or more scans according to the old "unrestricted" guidelines. The mean of spatial SI ratios during the "unrestricted policy" period was significantly higher than their mean during the "restricted policy" period at the dentate/pons (fig.2, p= 0.004), dentate/thalamus (fig.3, p= 0.029), and globus pallidus/thalamus (fig.4, p= 0.005) regions. By multiple regression analysis, the frequency "n. of studies/period of time" of contrast administration under "unrestricted" policy was found to be the only variable that predicted a higher SI ratio at affected regions.

## Discussion:

Macrocytic gadolinium chelates are known to be more stable than linear agents due to their thermodynamic stability. They have been found to show less if any retention in deep brain structures compared to linear agents. Although the mechanisms underlying their penetration through blood brain barrier into the intracellular compartment are still incompletely explained, our results support similar studies in the literature. In spite of the unknown clinical ramifications of gadolinium brain retention, a strict macrocytic gadolinium administration policy by radiology service providers seems to be more safe.

## Conclusion:

The implementation of a new institutional policy exclusively using macrocytic agents has significantly changed the retention trend and resulted in less quantitative evidence of gadolinium deposition among children at ISH.

## Further readings:

McDonald, Robert J., et al. "Gadolinium Retention: A Research Roadmap from the 2018 NIH/ACR/RSNA Workshop on Gadolinium Chelates." *Radiology* (2018): 181151.

Bussi, Simona, et al. "Differences in gadolinium retention after repeated injections of macrocyclic MR contrast agents to rats." *Journal of Magnetic Resonance Imaging* 47.3 (2018): 746-752.