Indian Journal of Pediatrics (July 2021) 88(7):641–642
https://doi.org/10.1007/s12098-021-03812-7

EDITORIAL COMMENTARY

MRI in Pituitary Iron Overload: Current Perspective and Future Directions

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Received: 6 May 2021 / Accepted: 12 May 2021 / Published online: 22 May 2021

Magnetic resonance imaging (MRI) and serum ferritin have emerged as the dominant noninvasive markers for estimation of iron overload in patients receiving chronic blood transfusions for hemolytic anemia. The values of T2, T2* and rate constants derived from them (R2 and R2*, respectively) are calculated, based on the physical principle of inhomogeneity in magnetic field produced by susceptibility effects of iron in body tissues. Liver iron concentration (LIC) estimates from R2 and R2* have been validated early on and are in routine clinical use [1]. Similarly, left ventricular function has been shown to correlate with cardiac T2* measurements [2], which is used as a biomarker for preclinical iron accumulation.

The endocrine effects of iron excess have thus far been studied extensively in the pancreas. Pancreatic iron overload serves as a marker for excess circulating non–transferrin-bound iron (NTBI); and not only relates to glucose dysfunction, but is also an indicator of imminent cardiac dysfunction and hypogonadotropic hypogonadism. A pancreatic R2* threshold of 100 Hz has been suggested for risk stratification [3].

Both short stature (SS) and hypogonadism in thalassemia are the result of a complex interplay of multiple factors including direct gonadal toxicity of iron and chronic anemia among others. Pituitary iron overload leading to endocrine failure is yet another cause. The article by Nayak and colleagues [4] discusses this relatively less explored domain. They estimated pituitary volume (PV) and iron concentration on 3T MRI in 57 cases and 30 controls. The authors derived the correlation of pituitary T2*, R2, and volume with other surrogates of iron overload, and found that pituitary R2, like pancreatic R2 has a significant negative correlation with cardiac T2*. Patients with hypogonadism had significantly lower PV (mean 180.27 mm^3 versus 285.04 mm^3) and T2* value (8.18 ms versus 16.48 ms) compared to controls; the former was also observed in those with SS (mean 231.59 mm^3 versus 307.36 mm^3). However, since reduced PV and iron overload are not the only reasons for SS in these children, hormone assay is essential to establish causality.

It would have been useful if the authors had established age- and gender-based nomograms for PV and R2 using a larger number of controls for the Indian population. Such reference data would enable estimation of z score, as used in prior studies [5], which is a more meaningful predictor of outcome than a single value cutoff.

The authors have demonstrated the feasibility of using a 3T MRI system; however, any advantages or limitations over 1.5T systems have not been analyzed. This is particularly important as air in sphenoid sinus and pituitary iron may create extensive artifacts due to susceptibility effect (higher in 3T systems) and hamper adequate planimetry for volume calculation.

Thus, this study highlights an important concern of pituitary iron overload causing growth deficiency and pubertal defect, which must be considered while planning iron chelation therapy. However, prior to using pituitary R2 or volume as biomarkers for therapy, larger trials with objective assessment of benefit analysis need to be performed to determine risk thresholds.

Declarations

Conflict of Interest None.

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