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Questioning the Value of Brain MRI in the Evaluation of Children with Isolated Growth Hormone Deficiency

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Background

Isolated growth hormone deficiency (IGHD) is a relatively common disorder. Current protocol requires a brain MRI of the hypothalamus and the pituitary after establishment of the diagnosis, with the aim of identifying structural defects and specifically rule out an underlying space-occupying lesion. An MRI scan is costly and requires general anesthesia in young children. Data on the contribution of brain MRI in evaluation children with IGHD are sparse.

Objectives

To examine the yield of brain MRI in the evaluation of children with IGHD and to define clinical and laboratory parameters that justify its performance.

Methods

A retrospective chart review of all children (<18 years) diagnosed with IGHD at two pediatric endocrinology units between 2008 and 2018 for auxologic, laboratory, and brain MRI findings.

Results

- 129 children (72 boys, 57 girls)
- Median age at diagnosis was 7.7 years (0.8-15.9)
- The mean height SDS at diagnosis was -2.2 ± 0.8
- The mean height deficit SDS (defined as the difference between height SDS at diagnosis and mid-parental height SDS) was -1.7 ± 0.9
- 5 children (3.9%) had pathological MRI: 2 had ectopic posterior hypophysis, 2 had hypoplastic hypophysis and 1 had Rathke cleft cyst
- Six children (4.6%) had incidental findings of Chiari type 1 malformation
- No space-occupying lesion was detected

Clinical Characteristics of Boys vs. Girls

	Boys (N=72)	Girls (n =57)	*P*
Age (years)	6.9 ± 3.7	8.5 ± 3.8	**0.02**
Bone Age Deficit (SDS)	-1.2 ± 1.3	-1.6 ± 1.1	0.06
Height (SDS)	-2.2 ± 0.7	-2.2 ± 0.9	0.93
Weight (SDS)	-1.7 ± 1.3	-1.4 ± 1.5	0.30
BMI (SDS)	-0.1 ± 1.1	-0.1 ± 1.4	0.86
Mid-Parental Height (SDS)	-0.6 ± 0.7	-0.6 ± 1.0	0.93
Height deficit (SDS)	-1.7 ± 0.8	-1.7 ± 1.1	0.83
Peak GH (µg/l)	5.5 ± 1.5	5.7 ± 1.4	0.61
IGF1 (SDS)	-1.6 ± 1.0	-1.9 ± 1.0	0.31

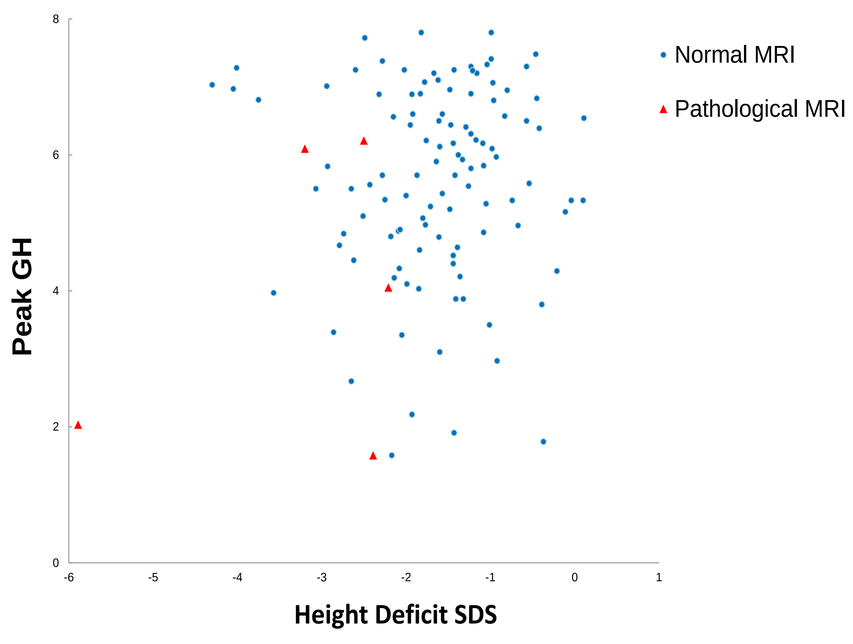
Data is presented as mean and standard deviation

Children with Normal vs. Pathological MRI

	Normal MRI (N=124)	Pathological MRI (n =5)	*P*
Age (years)	7.6 ± 3.8	6.8 ± 4.5	0.64
Bone Age deficit (SDS)	-1.4 ± 1.2	-0.8 ± 0.7	0.39
Height (SDS)	-2.2 ± 0.8	-3.0 ± 1.2	**0.04**
Weight (SDS)	-1.5 ± 1.3	-2.1 ± 2.2	0.36
BMI (SDS)	-0.1 ± 1.3	-0.1 ± 1.2	0.94
Mid-Parental Height (SDS)	-0.6 ± 0.7	-0.6 ± 2.5	0.87
Height deficit (SDS)	-1.6 ± 0.9	-3.4 ± 1.7	**<0.01**
Peak GH (µg/l)	5.6 ± 1.4	4.0 ± 2.5	**0.03**
IGF1 SDS	-1.5 ± 1.0	-1.9 ± 0.6	0.44

Data is presented as mean and standard deviation

Distribution According to Height Deficit and Peak GH



Defining height deficit above 2 SDS and a peak GH level threshold of 6.5 µg/l enables detection of all 5 pathological cases (100% sensitivity, 83% specificity).

Summary

Our preliminary data indicate that most brain MRIs performed for routine evaluation of children with IGHD are not essential for establishing diagnosis. Only the children with extreme height deficit (≥2 SDS) and peak GH ≤6.5 µg/liter had pathological brain MRIs. Further studies with larger cohorts are needed in order to validate this revision of current protocols.

The Authors have nothing to disclose