Causes and consequences of thickened pituitary stalk found by MRI in children and adolescents with central diabetes insipidus

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The authors declare that they have no conflict of interest.

Objective:

- We aimed to associate pituitary stalk thickness with the etiology of CDI and hormone deficiencies.

Background:

- Magnetic resonance imaging (MRI) of the hypothalamic-pituitary area is extremely useful in the investigation of patients with central diabetes insipidus (CDI) due to infiltrative processes.

Method:

- Retrospective single-center study of 15 patients with CDI [11 girls (73.3%)/4 boys (26.7%)].
- Median age at diagnosis of CDI: 9.7 years (range 1.3–15.6).
- *Clinical-epidemiological data studied:* Neuro-ophthalmological symptoms, bone age, delayed puberty, other pituitary deficits (GH, TSH, ACTH), and etiological diagnosis.
- *MRI characteristics studied:* Pituitary stalk size at its transversal part and morphology. Thickened pituitary stalk (TPS) was considered as > 3 mm:

Thickened pituitary stalk:
- Mild 3.1-3.9 mm
- Moderate 4-6.5 mm
- Severe > 6.5 mm

Pituitary stalk morphology:
- Normal
- Uniform
- Round
- Pyramid
- V-shaped

Results:

•At the first MRI evaluation (**Figure A**), pituitary stalk enlargement in 7 patients varied from 4 to 30 mm (moderate n=2 and severe n=5). A diagnosis of germinoma was made in 5 of them (TPS severe). Among the 8 patients without TPS, two were diagnosed with Langerhans histiocytosis (LCH) and 6 with idiopathic CDI (ICDI).

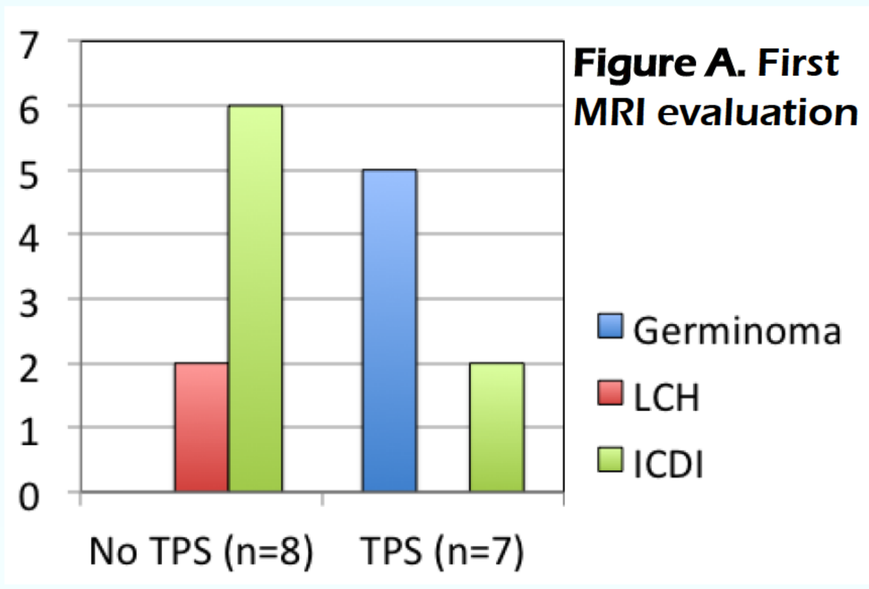

Figure A. First MRI evaluation

•An association was found between TPS at diagnosis and the probability of developing GH deficiency. An association between TPS at diagnosis and the probability of development of additional hormonal deficiencies was also unveiled (**Table I**).

Table I

Thickened Pituitary Stalk					
Hormone Deficiency	Normal (n = 8)	Moderate (n = 2)	Severe (n = 5)	Total (n = 15)	P
Type					
ADH	8	2	5	15	
GH	1	2	5	8	< 0.05
TSH	2	1	5	8	> 0.05
ACTH	2	0	4	6	> 0.05
LH and FSH	0	1	3	4	> 0.05
Total number					
1	5	0	0	5	< 0.05
2	1	1	0	2	
3	2	0	1	3	
4	0	1	2	3	
5	0	0	2	2	

- Follow-up MRI was performed in 8 patients without etiological diagnosis. Stalk increase was demonstrated in 4 of them (moderate n=3, severe n=1) in a median time interval of 2.98 years (range 2.08-11.24). They were diagnosed with germinoma (n=3) and ICDI (n=1).

- Stalk morphology (**Figure B**) was heterogeneous in patients with germinoma (normal=1, uniform=1, pyramid=2, V-shaped=2, round=2), uniform in LHC, and normal in half of the patients with ICDI.

- Two patients had GH deficiency and 8 patients had combined pituitary hormone deficiency (germinoma=7). Patients with increased thickening of the pituitary stalk showed a higher number of associated deficiencies (D) (**Figure C**).

- Definitive etiology of CDI was: germinoma (n=8), LCH (n=2), and idiopathic (n=5).

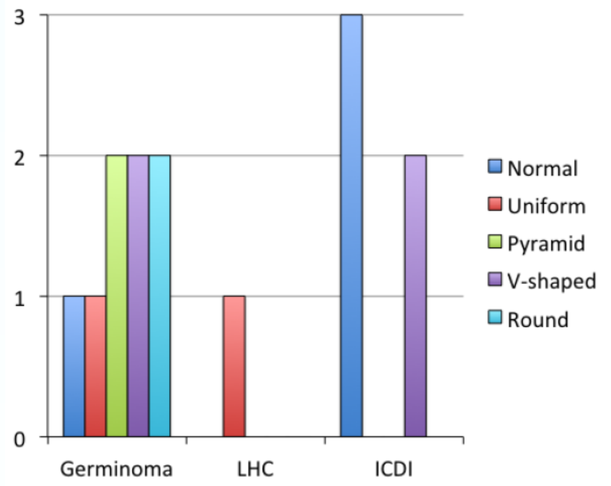

Figure B. Stalk morphology

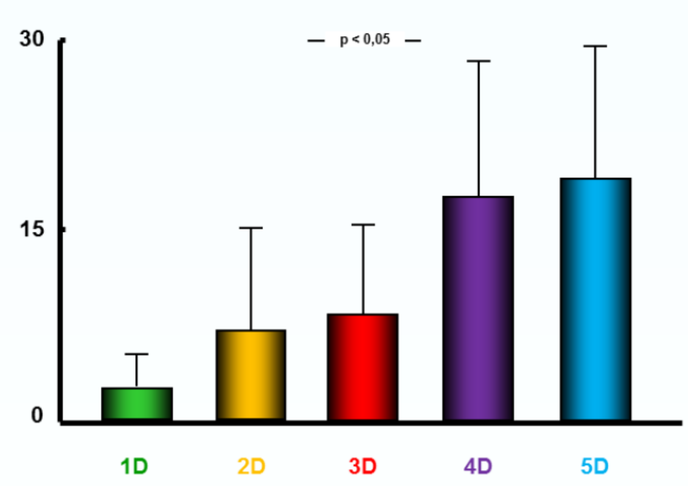

Figure C. Pituitary associated deficiencies

Conclusions:

1) Germinoma is the most common cause of CDI during childhood and adolescence.
2) The greatest degree of pituitary stalk thickness is associated with combined hormone pituitary deficiency.

DOI: 10.3252/pso.eu.54espe.2015
Poster presented at: ESPE 2015 BARCELONA