Radiation therapy for children with medulloblastoma: Growth and thyroid sequelae

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BACKGROUND: Medulloblastoma is the most common malignant paediatric brain tumour. Although survival has improved with oncological therapy, late effects such as endocrine consequences are common, especially growth failure and thyroid dysfunction.

METHODS: A longitudinal study was conducted in a pediatric university hospital. First step: We enrolled children diagnosed with medulloblastoma from 2004 to 2014. Second step: We studied the appearance of endocrine sequelae from diagnosis to 2019. Statistical analysis was performed to estimate the effect of radiotherapy (RT) on growth and thyroid disorders (STATA[15]).

RESULTS

PATIENTS n=56 (39=males) Age of diagnosis: 5.3 years (*IQR*: 3-8.1)

11 passed away
2 missed data

ENDOCRINE ASSESSMENT n=43

Follow-up: 3.5 years (*IQR*:0.6-7.*3*)

14 passed away
7 adult center
7 home center

CURRENT FOLLOW-UP n=14

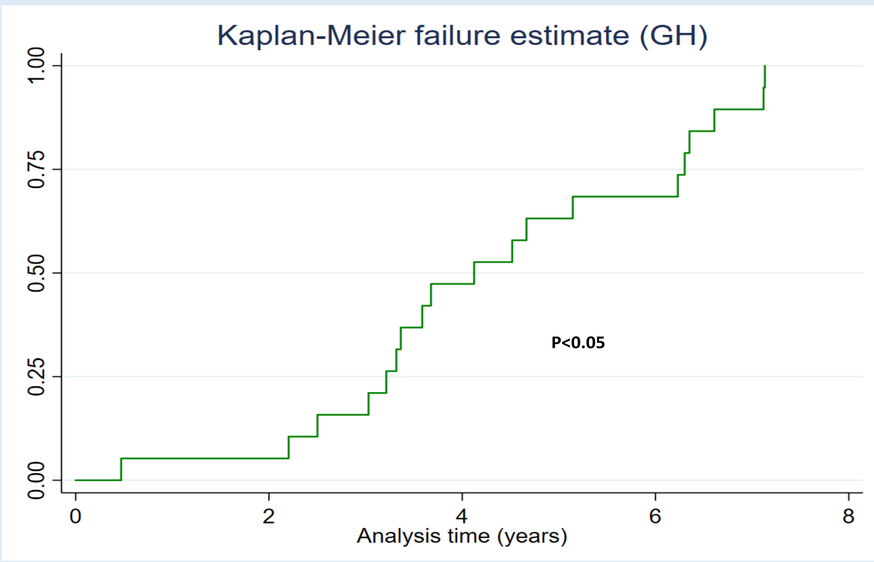
Endocrine sequelae (ES)	Type of treatment	Association between radiotherapy & ES	Time from radiotherapy to ES
GH deficiency n=21	S,C,R=17 S,C,R,T=4	0.03*	3.7 years (*IQR*: 3.0-5.8)
Hypothyroidism Primary n=14 Secondary n=5	S,C,R=15 S,C,R,T=4	0.01*	3.0 years (*IQR*: 1.5-5.1)
Hypocortisolism n=6	S,C,R=4 S,C,R,T=2	0.17	3.1 years (*IQR*:2.4-3.6)
Hypogonadism Hypogonadotropic n=2 Hypergonadotropic n=3	S,C,T=1 S,C,R,T=4	0.11 *Linked to transplant (p=0.01)*	-

S= Surgery, C= Chemotherapy , R= Radiotherapy, T= bone marrow transplant

Thyroid ultrasound

Type of patients	Volume (SDS)	Echostructure alteration
Hypothyroidism	-1.6 SDS (IQR:-2.6; 0.0)	47% (1º 50% / 2º 40%)
Without hypothyroidism	-0.6 SDS (IQR: -1.4; 0.8)	30%

Kaplan–Meier analysis: GHD & hypothyroidism appearance from diagnosis



GH deficiency n=21

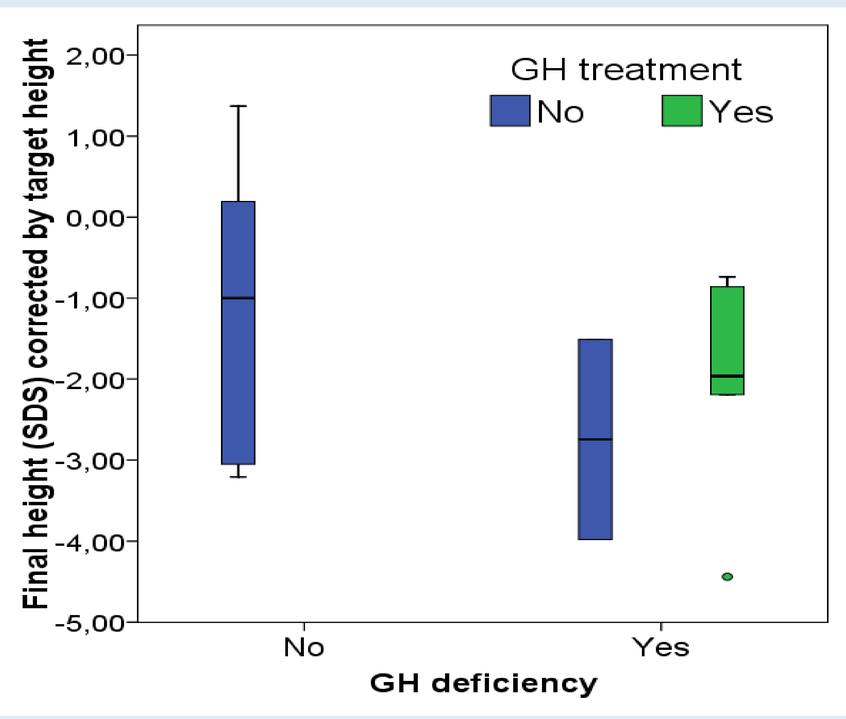
Started 3.2 years (*IQR*: 2-5) after finalizing oncological treatment

GH treatment n=12

Dropped out due to cancerophobia =2
Data missing = 1

Final height achieved n=6

Tanner Stage	Bone age	Growth velocity pre-treatment	Growth velocity first year	Growth velocity second year	Growth velocity third year
I (n=5)	7 (IQR: 6-11)	- 4.3 SDS (IQR:-4.4, -2.7)	+ 1.9 SDS (IQR:1.0, 2.8)	-1.3 SDS (IQR:-1.7,-0.9)	+ 1.1 SDS (IQR:0.9,1.4)
II (n=3)	12.5 (IQR:9.6-13)	- 4.2 SDS (IQR:-4.6, -3.7)	+ 0.0 SDS (IQR:-3.6, 2.8)	+ 1.3 SDS (IQR:-1.3, 1.8)	-1.3 SDS
III (n=1)	12	0. 7 SDS	- 0.3 SDS	N/A	N/A
Levels of IGF-1 (SDS)		Pre-treatment	First year	Second year	Third year
		-2.5 (IQR:-3.8,-1.7)	+0.4 (IQR:0.1,-1.2)	+0.1 (IQR:0.0,0.4)	+0.1 (IQR:-0.1,1.1)



CONCLUSIONS:

1. Radiotherapy is significantly linked to hormonal deficiencies. Long-term follow up is essential especially in the first years.
2. Hypothyroidism is correlated to radiotherapy and the volume of the gland is reduced in almost half of these patients.
3. Not only radiotherapy may have a role in incomplete catch-up growth, but also other oncological therapies.

58ESPE P2-239
Pituitary, neuroendocrinology and puberty
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Poster presented at: ESPE 2019 VIENNA
PosterSessionOnline.com