5th Joint Meeting on Adolescence Medicine

10th - 12th November 2011

Aula Consiliare e Sala dei Concerti, Palazzo de Nobili, Catanzaro (Italy)

Note 39:

lights and shades… and derogations

(*La nota 39: luci, ombre e....deroghe*)

SPEAKER - S. Bertelloni

M.A.G.A.M. Mediterranean and Middle East Action Group for Adolescent Medicine

Società Italiana di Pediatria

A.C.S.A. & S.T.E. ONLUS Associazione Catanzarese per gli Studi Auxologici e per lo Studio delle Talassemie ed Emoglobinopatie

ALAPE Comité de Adolescencia de Asociacion Latinoamericana de Pediatria

Sociedad Española de Medicina de la Adolescencia

ASP

sima

Spediz. abb. post. - art. 1, comma 1
Legge 27-02-2004, n. 46 - Filiale di Roma

GAZZETTA UFFICIALE
DELLA REPUBBLICA ITALIANA

Agenzia Italiana del Farmaco
AIFA

18-11-2010: Serie generale - n. 270

NOTE 39: Growth Hormone (GH, somatotropin)

- ***Prescription of GH by Italian National Health System (SSN) is possible in specialized centres, University Departments, Hospitals, Scientific Research Institutes (IRCCS) identified by the Regions and the autonome Districts of Trento and Bolzano.***
- ***Prescription is limited to some specific conditions, individuated according to specific diagnostic criteria for age.***

Spediz. abb. post. - art. 1, comma 1
Legge 27-02-2004, n. 46 - Filiale di Roma

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NOTE 39: Growth Hormone (GH, somatotropin)

Considered periods of life:

1. Neonatal period;
2. Childhood;
3. Transition phase;
4. Adulthood.

Note 39: (1) Neonatal Period

- Evidence (MRI) of malformations/lesions of hypothalamus-pituitary region, plus clinical and laboratory data suggesting the diagnosis of congenital isolated or multiple hypopituitarism.
- GH treatment should be administered for at lest 2 years; then, after no more than 3-month stop, auxological and laboratory parameters should be re-evaluated to determine if GH treatment should be continued and the therapy scheme.

Clinical & neuroradiological findings in infants with early onset GH deficiency

Data at birth	n	%
Sex	9M/7F	–
Signs of pituitary disfuntion*	5/16	31
IGHD	9/16	56
MPHD	7/16	44
MRI abnormalities	11/12	92
Lenght, SDS	-2.1±1.1	70%°
Weight, SDS	-1.0±1.1	12%°

*hypoglicemia, micropenis, cryptorchidism, prolonged jaundice.

° % below -2.0 SDS.

De Luca F, et al. Acta Paediatr. 84(1995)

Note 39: (2) Childhood

- Short stature due to GH deficiency,
- Turner syndrome (certainty by karyotype),
- Short stature in chronic renal insufficiency,
- Prebubertal individuals with Prader-Willi syndrome (certainty by genetics; BMI < 95° centile; normal respiratory function; no sleep apnea);
- Children born small for gestational age.

Addendum: Italian GU (AIFA): n. 42 (*21-02-2011*)

- Short stature in individuals with SHOX gene insufficiency (certainty by DNA analysis).

GH Treatment: Pediatric International Indications

European Medicine Agency (*Europe*)

- Growth hormone deficiency.
- Chronic kidney disease.
- Turner syndrome.
- Small-for-gestational age infants (who fail to catch up to the normal growth percentiles).
- Prader-Willi syndrome.
- SHOX gene haplo-insufficiency.

US Food & Drug Administration (*USA*)

- Growth hormone deficiency.
- Chronic kidney disease.
- Turner syndrome.
- Small-for-gestational age infants (who fail to catch up to the normal growth percentiles by 2-4 years).
- Prader-Willi syndrome.
- Idiopathic short stature (height >2.25 SD below the mean who are unlikely to catch up in height).
- SHOX gene haplo-insufficiency.
- Noonan syndrome.

Richmond & Rogol, Endocr Dev. 2010

GH Treatment in Childhood

Licensed Indications By Manufacturers

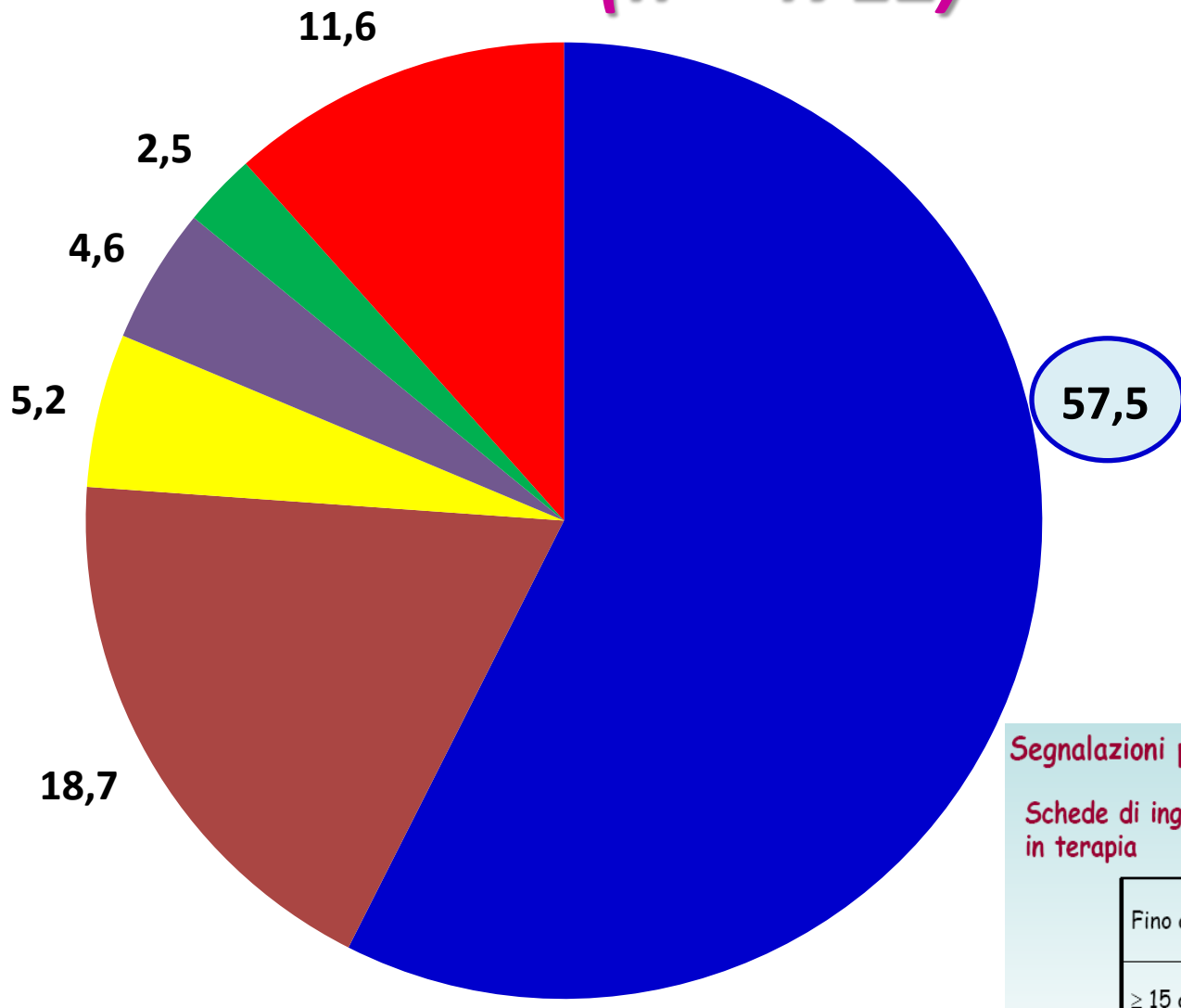
Manufact.	GH Defic.	Turner s.	CRI	Prader-Willi s.	SGA	SHOX
Eli Lilly	Yes^	Yes	Yes	–	Yes	Yes
Ferring	Yes	Yes	–	–	–	–
Ipsen	Yes^	Yes	Yes	–	–	–
NovoNordisk	Yes^	Yes	Yes	–	Yes	–
Pfizer	Yes^	Yes	Yes	Yes	Yes	–
MerckSerono	Yes^	Yes	Yes	–	Yes	–
Sandoz*	Yes^	Yes	Yes	Yes	Yes	–

*Biosimilar GH (reference product: Pfizer)

^Licensed for treatment of GHD also in adulthood

UK GH-treated Patients

(n = 4712)



Kirk, AJDC 2011

Segnalazioni pervenute al Registro (ISS, 2011)

Schede di ingresso in terapia

	Femmine	Maschi	Totale
Fino a 15 anni	1730	2211	3941
≥ 15 anni	100	330	430
	1830	2541	4371

Note 39 - GH Treatment: Growth Hormone Deficiency

I - Clinical parameters:

a. stature < -3 SD or stature < -2 SD plus growth velocity (GV)/year < -1 SD vs normal mean for age and sex; GV should be measured at least 6 months apart with the same procedures;

or

b. GV/year < -2.0 SD or < -1.5 SD after 2 consecutive years, also without short stature; in the first 2 years of life may be adequate (sufficient) a progressive decrease of GV (due to the inadequate literature data to calculate SD in this age period);

or

c. Hypothalamic-pituitary malformations/lesions demonstrated by neuroradiological techniques (MR, TC) or multiple pituitary defects associated with GH deficiency assessed by a modality of point (II).

Consensus in the Management of GH-Treated Patients: Knowledge, Attitudes, Beliefs, and Practices Survey

- n = 207 US MD involved in GH prescription;
- Mean age, yrs 52 (range 31 -77);
- Specialty: Pediatric endocrinologists 95%;
- Years in practice > 15: 58%.
- Initial evaluation of a short children should occur at the height*:
  - ≤ – 2.0 SDS (82%);
  - ≥ 1.5 SDS below midparental height SDS (87%).

*entry height for children in the US National Cooperative Growth Study (n = 55.000 children) was ≤ 2.0 SDS in 75% (mean -2.6 SDS)

Miller et al, Int J Pediatr Endocrinol 2010)

Note 39 - GH Treatment: Growth Hormone Deficiency

II - Laboratory parameters:

a. GH peak < 10 µg/L after two pharmacological tests performed in different days (*GH peak* > 10 µg/L *in one test exclude the diagnosis of GH deficiency*);

or

b. GH peak < 20 µg/L if one test is represented by GHRH + arginine or GHRH + piridostigmine.

- IGF1?

Height velocity & IGF-I assessment in the diagnosis of childhood onset GH insufficiency

	Sensitivity, %	Specificity , %
GH peak > 10 µg/L	100	57
GH peak > 7 µg/L	66	78
IGF1, < -1.9 SDS°	73	95
GV, < 25° centile	82	43
IGF1 plus GV	95	96

°after excluding malnutrition and chronic illness

Cianfarani et. al. Clin Endocrinol, 2002

Consensus in the Management of GH-Treated Patients: Knowledge, Attitudes, Beliefs, and Practices Survey

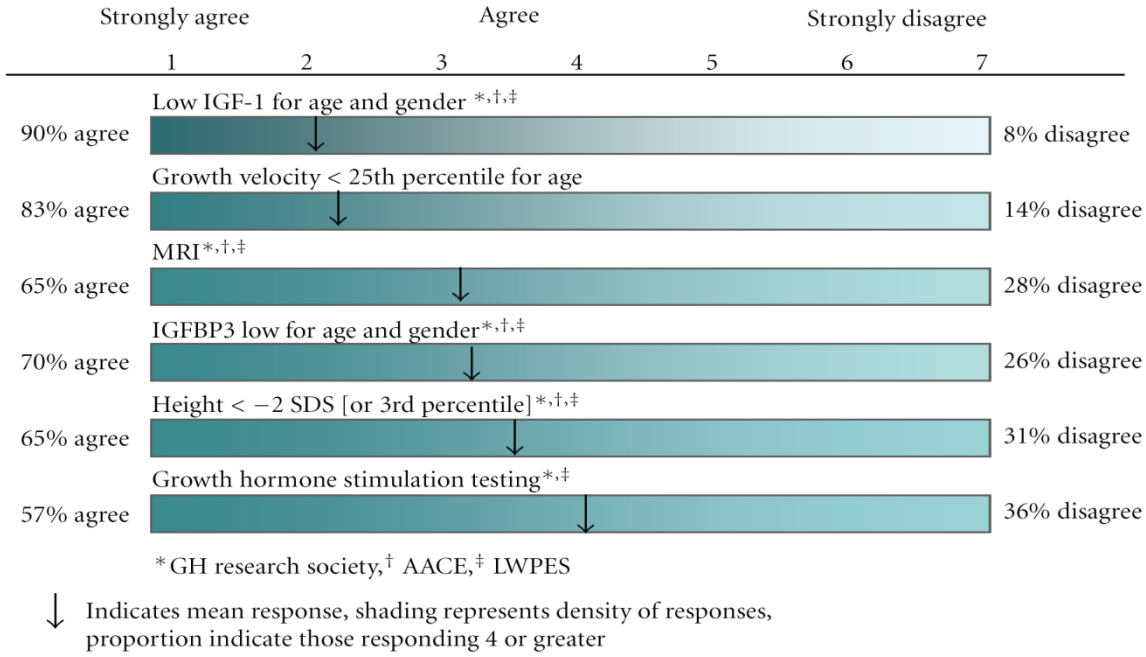
Use of GH stimulatory tests and IGF-1 testing

	All years $N = 51,909$	2000–2005 $n = 16,481$
Stimulation test performed, %	70	53
Stimulation testing only performed, %	50	18
Stimulation testing performed with IGF-1, %	20	35
IGF-1 test performed, %	24	41
IGF-1 test performed in absence of stimulation testing, %	4	6
Stimulation test performed with insulin, %	29	20

GHST: growth hormone stimulation test; IGF-1: insulin-like growth factor 1; NCGS: National Cooperative Growth Study.

Responses to the survey question:

"Assuming stimulation testing **is *not required by payers***, *the following are necessary to make* a diagnosis of GHD."



Miller et al, Int J Pediatr Endocrinol 2010

Clinical Chemistry 57:4
555–559 (2011)

Special Reports

Consensus Statement on the Standardization and Evaluation of Growth Hormone and Insulin-like Growth Factor Assays

David R. Clemmons,[1*] on behalf of the conference participants

- Considerable differences exist between the currently available assays with respect to the results of GH (and IGF-I) measurements.
- The lack of GH (and IGF-I) assay standardization has led to major differences in the values of hormone concentrations obtained with different assays.
- Currently, not all GH assays are calibrated to a common international reference preparation.

Note 39: (2) Childhood

- Short stature due to GH deficiency,
- Turner syndrome (certainty by karyotype),
- Short stature in chronic renal insufficiency,
- Prebubertal individuals with Prader-Willi syndrome (certainty by genetics; BMI < 95° centile; normal respiratory function; no sleep apnea);
- Small for gestational age children;

Addendum: Italian GU (AIFA): n. 42 (*21-02-2011*)

- Short stature in individuals with SHOX gene insufficiency (certainty by DNA analysis).

Am J Med Genet A. 2004 Jan 15;124A(2):158-64.

Unexpected death and critical illness in Prader-Willi syndrome: report of ten individuals.

Stevenson DA, Anaya TM, Clayton-Smith J, Hall BD, Van Allen MI, Zori RT, Zackai EH, Frank G, Clericuzio CL.

Department of Pediatrics, University of New Mexico, Albuquerque, New Mexico, USA. david.stevenson@hsc.utah.edu

Abstract

Individuals with Prader-Willi syndrome (PWS) generally survive into adulthood. Common causes of death are obesity related cor pulmonale and respiratory failure. We report on a case series of eight children and two adults with unexpected death or critical illness. Our data show age-specific characteristics of PWS patients with fatal or life-threatening illnesses. Under the age of 2 years, childhood illnesses in general were associated with high fever and rapid demise or near-demise. Hypothalamic dysfunction likely plays a role in exaggerated fever response, but also perhaps in central regulation of adrenal function. Below average sized adrenal glands were found in three children, which raises the possibility of unrecognized adrenal insufficiency in a subset of individuals with PWS and emphasizes the vital role of autopsy. The tub drowning death of an adult patient could be related to central hypersomnia, which has been reported in PWS. We suggest that increased risk for critical illness be considered in the discussion of anticipatory guidance for the care of infants with PWS. Since a number of children died while hospitalized, particularly close observation of PWS children who are ill enough to warrant hospital admission is recommended.

High Prevalence of Central Adrenal Insufficiency in Patients with Prader-Willi Syndrome

Roderick F. A. de Lind van Wijngaarden, Barto J. Otten, Dederieke A. M. Festen, Koen F. M. Joosten, Frank H. de Jong, Fred C. G. J. Sweep, and Anita C. S. Hokken-Koelega

Conclusions: Strikingly, 60% of our PWS patients had CAI. The high percentage of CAI in PWS patients might explain the high rate of sudden death in these patients, particularly during infection-related stress. Based on our data, one should consider treatment with hydrocortisone during acute illness in PWS patients unless CAI has recently been ruled out with a metyrapone test. (*J Clin Endocrinol Metab* 93: 1649–1654, 2008)

The Relationship between Central Adrenal Insufficiency and Sleep-Related Breathing Disorders in Children with Prader-Willi Syndrome

Roderick F. A. de Lind van Wijngaarden, Koen F. M. Joosten, Sandra van den Berg, Barto J. Otten, Frank H. de Jong, C. G. J. (Fred) Sweep, Al W. de Weerd, and Anita C. S. Hokken-Koelega

Conclusions: In children with PWS, the central apnea index increased significantly after metyrapone administration, particularly in those with CAI during stress. In addition, children with CAI had a higher central apnea index compared to those without several months before the metyrapone test. (*J Clin Endocrinol Metab* 94: 2387–2393, 2009)

J Clin Endocrinol Metab. 2010 Dec;95(12):E464-7. Epub 2010 Sep 1.

Normal cortisol response on low-dose synacthen (1 microg) test in children with Prader Willi syndrome.

Nyunt O, Cotterill AM, Archbold SM, Wu JY, Leong GM, Verge CF, Crock PA, Ambler GR, Hofman P, Harris M.

Department of Pediatric Endocrinology, Mater Children's Hospital, South Brisbane, Queensland 4101, Australia. ohn.nyunt@mater.org.au

CONCLUSIONS: Our result suggests that CAI is rare in children with PWS.

Note 39: (2) Childhood

- Short stature due to GH deficiency,
- Turner syndrome (certainty by karyotype),
- Short stature in chronic renal insufficiency,
- Prebubertal individuals with Prader-Willi syndrome (certainty by genetics; BMI < 95° centile; normal respiratory function; no sleep apnea);
- Small for gestational age children.

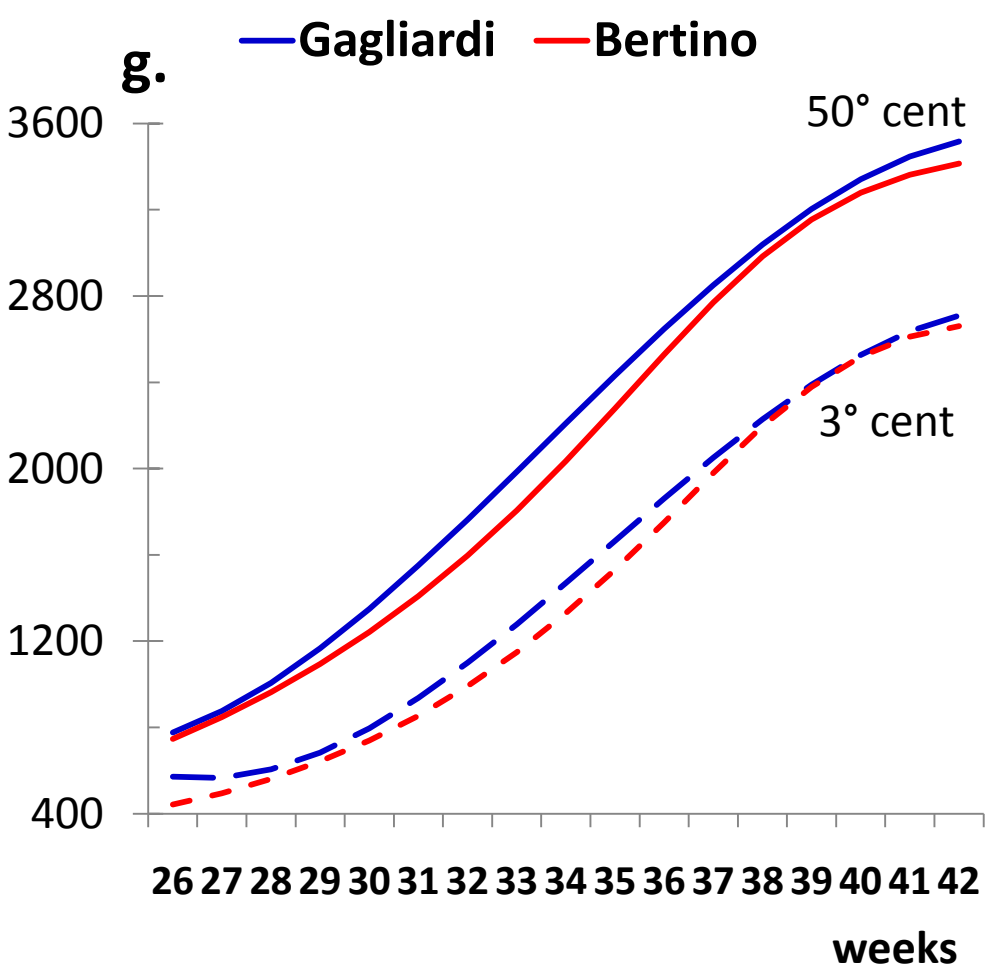
Addendum: Italian GU (AIFA): n. 42 (*21-02-2011*)

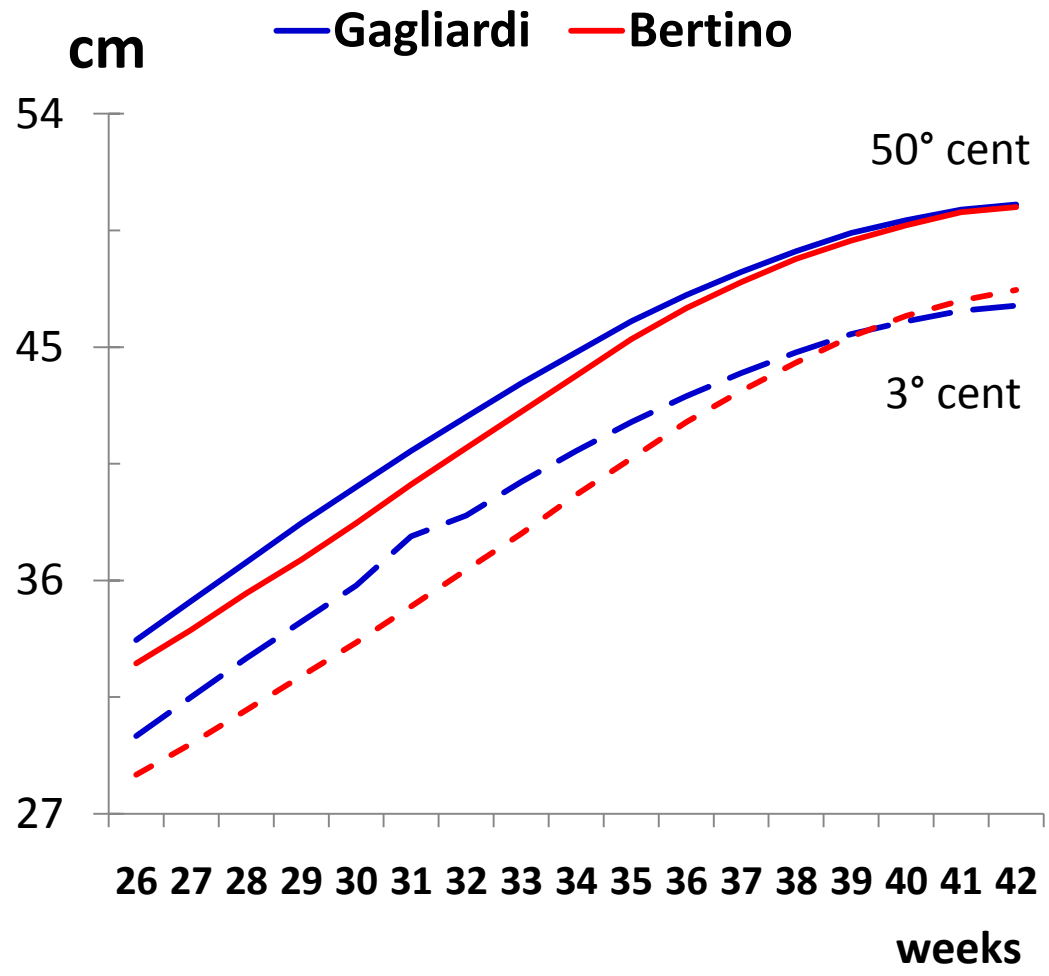
- Short stature in individuals with SHOX gene insufficiency (certainty by DNA analysis).

Note 39: Small for gestational age children

- GH prescription is permitted when:
- Chronological age is ≥ 4 years;
- Birth weight ≤ -2 SD (< 3° percentile) for gestational age by using Gagliardi tables (IJP 25: 159-69, 1999) and < g. 2500;
- Height ≤ -2.5 SDS and GV < 50° centile;
- Permission (for 2 years) by Regional Commissions on GH treatment (or National Commission on GH treatment).

Gagliardi (1999) vs Bertino (2010) Females Neonatal Growth Curves





Gagliardi et al, Riv It Pediatr. 25: 159-169, 1999
Bertino et al, J Pediatr Gastroenterol Nutr. 51: 353-361, 2010

Note 39: (2) Childhood

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- Small for gestational age children.

Addendum: Italian GU (AIFA): n. 42 (*21-02-2011*)

- **Short stature in individuals with SHOX gene insufficiency** (certainty by DNA analysis).

Note 39: (3) Transition phase (age at Final Height to 25 yrs)

At final height, GH treatment must be discontinued in:

- Turner syndrome;
- CRI;
- SGA;
- SHOX;
- Prader Willi syndrome (?).

Horm Res Paediatr. 2011;75(6):403-11. Epub 2011 Jan 27.

The GH/IGF-I axis and pituitary function and size in adults with Prader-Willi syndrome.

van Nieuwpoort IC, Sinnema M, Castelijns JA, Twisk JW, Curfs LM, Drent ML.

Section of Endocrinology, Department of Internal Medicine, VU University Medical Center and Neuroscience Campus Amsterdam, Amsterdam, The Netherlands. ic.vannieuwpoort @ vumc.nl

Abstract

BACKGROUND: In adults with Prader-Willi syndrome (PWS), limited information is available about pituitary function, more specifically the prevalence of growth hormone deficiency (GHD). The aim of this study was to gain more insight into endocrine function in PWS adults, with emphasis on GH secretion.

METHODS: 15 randomly selected adult PWS individuals were included and 14 healthy brothers and sisters served as a control group. Main outcome measures were IGF-I, IGFBP-3 and peak GH level after a combined GHRH-arginine test. Other pituitary hormone deficits are diagnosed based on serum levels of the concerning hormones. The size of the pituitary gland was measured on MRI images.

RESULTS: In PWS adults, IGF-I levels were low and IGFBP-3 levels normal when compared to healthy controls. GHD was diagnosed in 8-38% of the PWS patients, depending on the criteria used. Hypogonadism was present in 87% of the patients. Hypothyroidism and adrenal insufficiency could also be demonstrated. Anterior pituitary size was lower in PWS individuals when compared to healthy controls.

CONCLUSION: In this study, pituitary hormone deficiencies are demonstrated in a considerable number of adults with PWS, hypogonadism and GHD being most prominent. Furthermore, the anterior pituitary is smaller in comparison with healthy controls.

Horm Behav. 2011 Apr;59(4):444-50. Epub 2011 Jan 8.

The relationship between IGF-I concentration, cognitive function and quality of life in adults with Prader-Willi syndrome.

van Nieuwpoort IC, Deijen JB, Curfs LM, Drent ML.

Department of Internal Medicine, Section Endocrinology, VU University Medical Center and Neuroscience Campus Amsterdam, Amsterdam, The Netherlands. ic.vannieuwpoort@vumc.nl

Abstract

Mental retardation is one of the clinical characteristics of Prader-Willi syndrome (PWS) and in part of the patients growth hormone deficiency is demonstrable. Cognitive function seems to be influenced by insulin-like growth factor I (IGF-I); however, little is known about cognitive function in relation to IGF-I levels in PWS adults. The aim of the present study was to evaluate cognitive function in adult PWS patients in comparison to healthy siblings and to investigate whether there is a correlation between cognitive function and IGF-I levels. Anthropometric measurements, IGF-I levels, quality of life (QoL), Appetite Assessment Score, IQ (GIT and Raven) and cognitive function (by four subtests of the Cambridge Neuropsychological Automated Testing Battery, CANTAB) were evaluated in PWS patients and their healthy siblings served as control group. PWS patients had significantly lower IGF-I levels, IQ and QoL when compared to controls. Reaction times were longer and performance was worse on CANTAB subtests in PWS adults. IGF-I on one hand and IQ, Appetite Assessment Score and cognitive performance on the other hand seem to be correlated in PWS patients. In conclusion, IGF-I levels, IQ and QoL are significantly lower in PWS subjects when compared to healthy siblings. In PWS adults, temporal as well as prefrontal cognitive functions are impaired. Higher IGF-I levels appear to be related to better intellectual skills and faster temporal memory processing in PWS patients.

Note 39 (3): Transition phase (age at Final Height to 25 yrs)

At final height, GH treatment can be continued without any re-evaluation in:

- GH deficiency due to proven genetic mutation;
- Multiple pituitary deficiency with involvment of at least 3 pituitary hormones.

Note 39 (3): Transition phase (age at Final Height to 25 yrs)

At final height, GH treatment **can be continued** if after at least 1 month from rGH discontinuation the patient shows:

- a GH peak <6 µg/L after insulin tolerance test (ITT);

  or

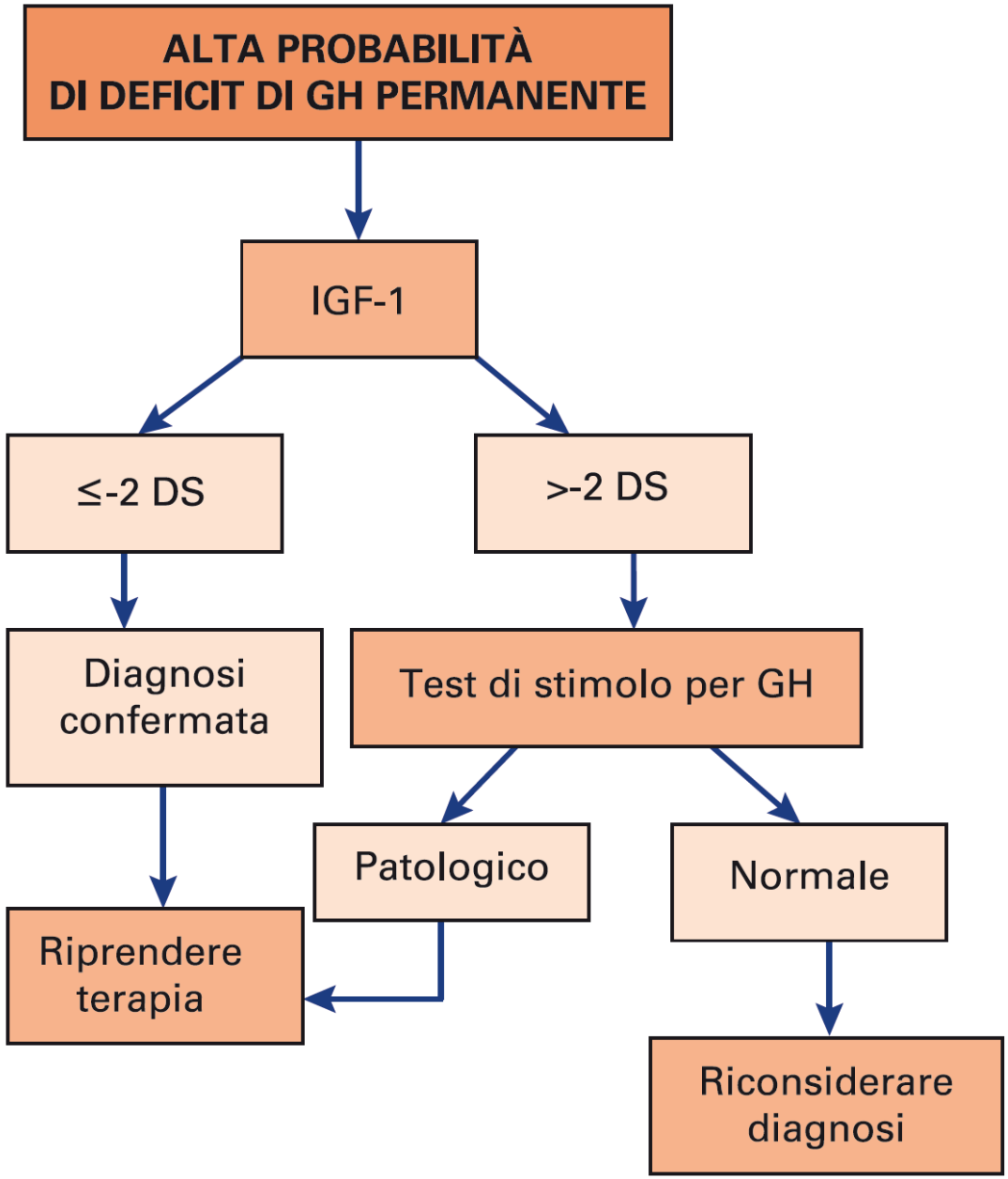
- a GH peak <19 µg/L after GHRH + Arginine test.

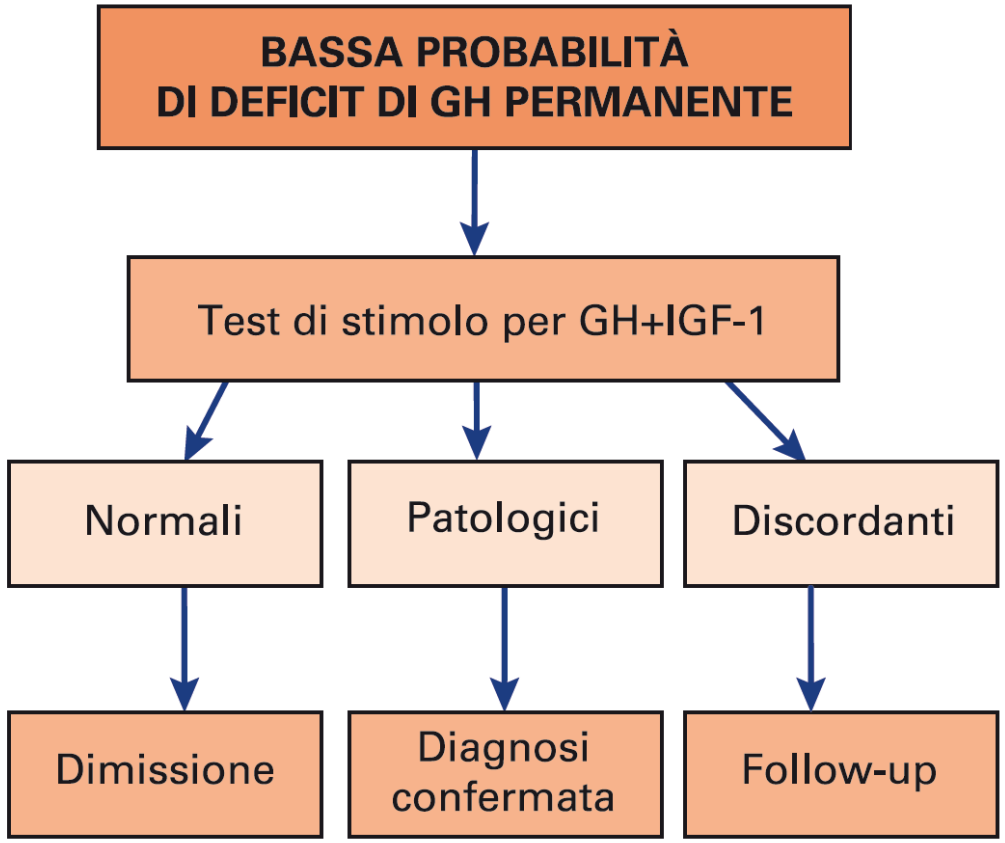
GH Retesting in Transition Phase: Cut-off Values

ITT	Sensitivity, %	Specificity , %
GH peak < 5.0 µg/L	?	?
GH peak < 5.1 µg/L	96	92
GH peak < 5.62 µg/L	?	?
GH peak < 6.1 µg/L	96	100
GHRH + arginine	**Sensitivity, %**	**Specificity , %**
< 9 µg/L	?	?
< 19 µg/L	100	97

Cianfarani, Garofalo et al., Il Pediatra 2011

GH Deficiency: ESPE Algorithim for Transition Phase





Cianfarani, Garofalo et al., Il Pediatra 2011

Note 39: Conclusions

- Note 39 regulates GH prescription in Italy.
- Note 39 recognizes the indications for GH treatment in the European Union countries.
- Some clinical and laboratory items of Note 39 should be implemented according to literature data, clinical practice and international guidelines.

Height velocity & IGF-I assessment in the diagnosis of childhood onset GH insufficiency

	Sensitivity, %	Specificity , %
GH peak > 10 µg/L	100	57
GH peak > 7 µg/L	66	78
IGF1, < -1.9 SDS	73	95
GV, < 25° centile	82	43
IGF1 plus GV	95	96

Cianfarani et. Al. Clin Endocrinol, 2002

TABLE 2. Italian Neonatal Study charts: 3rd, 50th, and 97th centiles and S and L functions of BW, BL, and HC distribution in firstborn neonates

	Girls															Boys													
	Weight					Length					Head circumference					Weight					Length					Head circumference				
GA wk	3rd	50th	97th	S	L	3rd	50th	97th	S	L	3rd	50th	97th	S	L	3rd	50th	97th	S	L	3rd	50th	97th	S	L	3rd	50th	97th	S	L
23	348	508	666	0.166	1.035	25.2	29.2	33.0	0.0707	1.320	18.3	20.7	23.1	0.0621	1.166	370	531	690	0.160	1.037	25.7	29.7	33.5	0.0695	1.332	18.7	21.1	23.5	0.0610	1.172
24	371	578	783	0.189	1.027	26.3	30.4	34.3	0.0697	1.333	19.0	21.5	24.0	0.0613	1.175	395	603	808	0.182	1.029	26.8	30.9	34.8	0.0685	1.345	19.4	21.9	24.4	0.0603	1.181
25	402	657	909	0.205	1.023	27.4	31.6	35.6	0.0687	1.349	19.8	22.4	24.9	0.0605	1.187	431	686	939	0.197	1.024	27.9	32.1	36.1	0.0675	1.362	20.2	22.8	25.3	0.0595	1.193
26	443	746	1047	0.215	1.021	28.5	32.8	36.9	0.0675	1.369	20.7	23.3	25.9	0.0597	1.203	474	779	1081	0.207	1.022	29.1	33.4	37.5	0.0663	1.383	21.1	23.7	26.3	0.0586	1.210
27	495	848	1198	0.220	1.020	29.7	34.1	38.3	0.0663	1.396	21.5	24.2	26.8	0.0587	1.226	532	885	1235	0.211	1.022	30.3	34.7	38.8	0.0651	1.411	21.9	24.6	27.2	0.0577	1.234
28	561	963	1362	0.221	1.021	31.0	35.5	39.7	0.0650	1.432	22.3	25.1	27.8	0.0576	1.258	603	1006	1406	0.212	1.022	31.6	36.0	40.2	0.0638	1.448	22.8	25.6	28.3	0.0566	1.268
29	643	1094	1541	0.218	1.022	32.3	36.8	41.1	0.0636	1.482	23.3	26.1	28.8	0.0564	1.305	688	1142	1591	0.210	1.024	32.9	37.4	41.7	0.0624	1.500	23.8	26.6	29.3	0.0554	1.316
30	739	1242	1740	0.214	1.025	33.6	38.2	42.5	0.0619	1.552	24.1	27.0	29.7	0.0551	1.372	791	1297	1797	0.206	1.027	34.3	38.9	43.2	0.0608	1.573	24.6	27.5	30.2	0.0541	1.386
31	854	1409	1957	0.208	1.031	35.0	39.7	44.0	0.0601	1.651	25.1	28.0	30.8	0.0535	1.467	914	1472	2023	0.200	1.033	35.6	40.3	44.6	0.0590	1.675	25.6	28.5	31.3	0.0525	1.484
32	991	1597	2194	0.200	1.040	36.4	41.1	45.4	0.0580	1.789	26.1	29.0	31.7	0.0516	1.595	1060	1668	2266	0.192	1.044	37.1	41.8	46.1	0.0569	1.819	26.6	29.5	32.2	0.0506	1.618
33	1149	1806	2449	0.191	1.057	37.8	42.5	46.7	0.0555	1.978	27.0	29.9	32.6	0.0494	1.762	1225	1886	2532	0.184	1.062	38.5	43.2	47.4	0.0544	2.017	27.6	30.5	33.2	0.0484	1.793
34	1330	2035	2719	0.181	1.087	39.3	43.9	48.0	0.0526	2.229	28.0	30.8	33.4	0.0469	1.962	1417	2125	2811	0.174	1.094	40.1	44.7	48.8	0.0516	2.280	28.6	31.4	34.0	0.0459	2.002
35	1532	2279	2994	0.170	1.135	40.7	45.3	49.2	0.0494	2.539	28.8	31.6	34.1	0.0442	2.174	1631	2380	3095	0.163	1.146	41.5	46.0	49.9	0.0484	2.607	29.4	32.2	34.7	0.0432	2.226
36	1750	2529	3260	0.158	1.207	42.1	46.5	50.2	0.0460	2.889	29.6	32.3	34.7	0.0415	2.359	1864	2642	3371	0.151	1.224	42.8	47.2	50.9	0.0449	2.979	30.2	32.9	35.3	0.0405	2.423
37	1979	2770	3499	0.145	1.294	43.3	47.5	51.0	0.0425	3.228	30.3	32.9	35.2	0.0389	2.467	2099	2893	3621	0.139	1.321	44.1	48.3	51.8	0.0414	3.341	31.0	33.5	35.8	0.0380	2.541
38	2197	2984	3700	0.133	1.371	44.4	48.4	51.7	0.0392	3.475	31.0	33.4	35.6	0.0367	2.458	2329	3116	3829	0.127	1.407	45.3	49.2	52.4	0.0381	3.613	31.6	34.0	36.2	0.0358	2.537
39	2379	3155	3861	0.124	1.396	45.4	49.1	52.2	0.0363	3.551	31.5	33.8	35.9	0.0351	2.328	2522	3295	3995	0.118	1.437	46.2	49.9	53.0	0.0353	3.705	32.1	34.4	36.5	0.0341	2.404
40	2519	3279	3982	0.118	1.350	46.2	49.7	52.7	0.0341	3.413	31.7	34.0	36.1	0.0339	2.111	2670	3425	4120	0.112	1.389	47.1	50.5	53.4	0.0331	3.570	32.5	34.7	36.8	0.0329	2.177
41	2612	3362	4071	0.115	1.259	46.8	50.1	53.0	0.0326	3.091	32.0	34.2	36.3	0.0333	1.862	2768	3512	4213	0.109	1.290	47.7	50.9	53.7	0.0315	3.236	32.7	34.9	37.0	0.0323	1.915
42	2661	3414	4140	0.115	1.166	47.2	50.4	53.3	0.0317	2.669	32.2	34.4	36.5	0.0331	1.629	2819	3566	4284	0.109	1.187	48.1	51.2	54.0	0.0306	2.790	32.8	35.0	37.1	0.0321	1.669

The values of L and S are required to compute standard deviation scores (SDS) with the expression $SDS = [(y/M)^{L} - 1]/(L \times S)$, y being the value of the anthropometric trait and M the value of the 50th centile. BL = Birth crown-heel length; BW = birth weight; GA = gestational age; HC = head circumference. GA is approximated to the nearest week.

Bertino et al., JPGN 51; 2010

Gagliardi (Ga; 1999) vs Bertino (Be; 2010) Neonatal Growth Curves

GIRLS	Lenght, cm			Weight, g		
weeks	Ga	Be	Δ%	Ga	Be	Δ%
26	33.7	32.8	2.7	776	746	4.0
32	42.3	41.1	2.9	1763	1597	10.4
42	49.9	49.7	–	3341	3279	
BOYS	**Lenght, cm**			**Weight, g**		
weeks	Ga	Be	Δ%	Ga	Be	Δ%

5th Joint Meeting on Adolescence Medicine

Note 39:

Lights, shades… and derogations

Piernicola

Garofalo

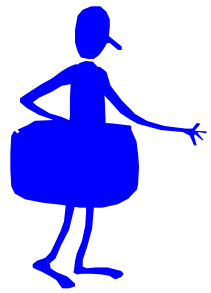
Stefano

Cianfarani

CD SIMA

SIMA SOCIETÀ ITALIANA di MEDICINA dell'ADOLESCENZA

SIRPed Società Italiana di Ricerca Pediatrica



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