Growth Hormone Secretion in Subjects with Ovarian Dysgenesis and Turner's Syndrome

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Short stature is one of the major disabilities for people with ovarian dysgenesis and Turner's syndrome. There have been contradictory reports of the plasma growth hormone level in children with these conditions in whom this estimation has been made (Fraccaro, Gemzell, and Lindsten, 1960; M. Davidson, 1967, personal communication). Therefore, in the present studies growth hormone secretion has been assessed in 15 such patients following stimulation by insulin-induced hypoglycaemia.

Material and Methods

The patients were aged from 5½–17 years. Their height was well below the 3rd centile. Two-thirds had webbing of the neck as well as short stature (Turner's syndrome in the female). The remainder of the patients did not have webbing of the neck but were of short stature (ovarian dysgenesis; for nomenclature see Polani (1961)).

Previous chromosomal analysis had shown them to have 45 chromosomes with an XO sex chromosome complement. Mosaicism was excluded as far as this was feasible by counting and analysing a large number of cells of blood lymphocytes and skin fibroblast cultures (Miss R. Angell).

Blood specimens were obtained after intravenous infusion of insulin, 0.1 unit/kg. Blood glucose was estimated by the automated ferricyanide method (Whichelow *et al.*, 1967) and the growth hormone by a modified radio immunoassay method (Hartog *et al.*, 1964).

Six of the patients, all over the age of 15 years, had cyclical oestradiol and norethisterone therapy which was stopped 10 days before the test.

Results

Of the 15 patients, 14 showed a rise of plasma growth hormone levels during the test (Table). Hypoglycaemia was most marked within the first 30 minutes after insulin injection, but maximal

growth hormone levels usually occurred later in the test. Case 6 was inadvertently not given insulin; however, despite the absence of hypoglycaemia blood levels of growth hormone increased during the test, while Case 13 had persistent low growth hormone levels despite a marked hypoglycaemic response to insulin.

Discussion

The rises in blood growth hormone levels found in this study (see Fig.) are comparable to those reported in a series of children of short stature without hypopituitarism (Stimmler and Brown, 1967).

They found that an increase of growth hormone to 10 ng./ml. in response to insulin was adequate to exclude hypopituitarism. Occasionally children who are not thought to be hypopituitary fail to reach this level of secretion despite provocation, and Case 13 may be in this category. The results in

FIG.—Mean and range of plasma growth hormone response in the insulin test in 15 patients with ovarian dysgenesis and Turner's syndrome.

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TABLE

Plasma Growth Hormone (GH) (ng./ml.) and Blood Glucose (mg./100 ml.) Levels after Insulin, in 15 Children with Ovarian Dysgenesis and Turner's Syndrome

Case No.	Age (yr.)		Fasting	10	20	30	40	60	80 min.
1	10½	GH	3	60	25	8	38	—	3
		Glucose	79	57	34	—	57	—	73
2	10	GH	3	6	15	17	10	13	17
		Glucose	62	36	18	16	39	39	47
3	7½	GH	15	15	10	13	25	75	—
		Glucose	76	50	33	56	66	64	—
4	5½	GH	12	8	9	—	23	8	14
		Glucose	65	32	29	41	42	45	52
5	8	GH	10	15	18	10	13	8	—
		Glucose	71	54	23	29	36	—	—
6	10	GH	21	—	39	11	13	—	7
		Glucose	78	—	83	79	74	—	82
7	16½	GH	7	6	10	12	35	88	11
		Glucose	73	50	20	26	42	51	64
8	14	GH	1	6	6	4	10	3	2
		Glucose	68	67	60	56	55	54	55
9	13½	GH	6	5	4	6	5	13	11
		Glucose	65	59	36	31	42	63	89
10	16	GH	1	2	11	—	19	—	25
		Glucose	—	—	—	—	—	—	—
11	17	GH	4	3	7	—	6	15	7
		Glucose	80	55	30	—	50	63	77
12	16	GH	3	3	8	17	0	22	70
		Glucose	70	52	23	32	40	50	80
13	17	GH	4	5	3	2	1	6	5
		Glucose	64	46	20	16	34	50	54
14	14½	GH	1	6	3	6	2	8	11
		Glucose	63	39	25	13	10	25	35
15	17	GH	8	9	45	>70	—	>70	>70
		Glucose	81	52	38	37	—	71	71

— indicates that no estimation was made.

Cases 10–15 which had cyclical hormone therapy did not differ from the others.

XO subjects with dysgenetic ovaries do not grow normally even though they have normal growth hormone levels. They may lack a factor needed for growth other than growth hormone; alternatively their growth hormone may be different or there may be a lack of tissue response to normal growth hormone. This last hypothesis was supported by the finding of high fasting growth hormone levels in 8 dwarfed adults with Turner's syndrome by Lindsten *et al.* (1967), but our data do not confirm that finding. The results of administering growth hormone to a few children with 'Turner's syndrome' have been reported. Both Forbes *et al.* (1960) and Escamilla *et al.* (1960) reported nitrogen retention after growth hormone was administered, though it was less than occurred in hypopituitary patients similarly treated. The increase in linear growth reported by Forbes *et al.* (1960) after growth hormone was also less than would be expected in hypopituitary children.

Summary

Growth hormone secretion was estimated in 15

XO subjects with ovarian dysgenesis and Turner's syndrome in response to insulin-induced hypoglycaemia. The increases in plasma growth hormone level were comparable to those that have previously been described in small but otherwise normal children.

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