skull and a short vertebral column in the middle, which was connected at its lower end to a pelvic girdle. The lower limb skeletons, which were complete, arose from the pelvic girdle.

Histologically, the specialized tissues found were skin with hair follicles and sweat glands. Sebaceous glands were conspicuous by their absence. Also cartilage, bone marrow, adipose tissue, fibrous tissue, muscle tissue, nerves, and blood vessels were found.

At the base of the sac there was tissue resembling primitive chorionic villi (Fig. 4).

Discussion

A *fetus in fetu* is a parasitic twin within its fellow. In contrast, a teratoma is a true neoplasm which arises from the embryonic pleuroperitoneal cells with benign or malignant properties. The most likely explanation is that it is a monozygotic twin of its bearer.

The criterion for diagnosing *fetus in fetu* was adopted by Willis (1935). He emphasized the presence of an axial skeleton with a vertebral axis with an appropriate arrangement of other limbs and organs, with respect to the axis. This would distinguish *fetus in fetu* from a teratoma. Most of the described cases have been intra-abdominal. Of these, except for 2 cases, all have arisen from the retroperitoneal tissues of the upper abdomen. One case described by Lee (1965) arose from the pelvis. Another reported by Numanoglu, Gokdemir, and Oztop (1970) arose from the mesentery of the ileum. Our case arose from the retroperitoneal tissue of the upper abdomen.

An unusual feature about our case was the presence of well-differentiated limbs with nails but with absence of well-differentiated internal organs. Possibly it consisted of two fused fetuses as suggested by the presence of multiple limbs.

An interesting feature was the presence of tissue resembling chorionic villi, with a central core containing blood vessels, attached to the base of the sac.

While most cases have been in infants, our patient was 1 year 8 months old at time of diagnosis and had had symptoms for only 2 months.

Summary

A case of *fetus in fetu* is described. It was found enclosed in a sac arising from the retroperitoneal tissues of the upper abdomen in a 20-month-old girl. Dissection of the specimen revealed a vertebral spine with a pelvis and well-differentiated limbs complete with nails.

Previously reported cases are reviewed.

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Plasma Growth Hormone in Patients with Chromosomal Anomalies*

Since the advent of the radioimmunoassay method for measurement of human growth hormone in peripheral blood, several studies have been performed on individuals with growth retardation. Though many of the known chromosomal anomalies are associated with disorders of growth, only in a few instances have results of growth hormone assays in patients with these disorders been reported (Frasier, 1967; Hillman and Colle, 1969; Lundberg and Wahlström, 1970).

The purpose of this report is to present results of plasma growth hormone measurements for individuals with chromosomal anomalies.

Method

Twenty-six subjects with chromosomal anomalies were studied. Karyotypes were performed on peripheral blood leucocytes (Moorhead *et al.*, 1960).† The subjects represented two chromosomal categories; 14 had anomalies in the number of X and Y chromosomes, and 12 had autosomal aneuploidy.

The plasma growth hormone (PGH) was measured by the radioimmunoassay method.‡ Individual capacities

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‡Performed by the Bio-Science Laboratories, Van Nuys, California, U.S.A.

to produce PGH were evaluated by the arginine provocative test (intravenous administration of L-arginine monochloride* over a 30-minute period at a dose level of 0·5 g/kg, with blood samples obtained at 0, 30, 60, 90, and 120 minutes after the beginning of the infusion) (Parker, Hammond, and Daughaday, 1967). A positive response was considered to be a minimum rise of 5 ng/ml for PGH above the baseline level at any time during the test (Best, Catt, and Burger, 1968; Baker, Best, and Burger, 1970). If there was an inadequate response of PGH concentration to the arginine stimulus, the patient was primed with oestrogen (5 mg stilboestrol twice a day for 3 days) before a second arginine test (Merimee, Rabinowitz, and Fineberg, 1969). If again the PGH did not increase, an insulin tolerance test (0·1 U insulin IV) with measurement of PGH was performed (Raiti, Davis, and Blizzard, 1967).

*Supplied by Cutter Laboratories, Inc., Berkeley, California, U.S.A.

Results

The baseline and peak PGH responses in the patients with chromosome disorders are shown in the Table. In most of the 14 cases with sex chromosome anomalies the PGH responses to the arginine test were normal. However, Cases 7 and 8 required oestrogen priming before showing a positive response to the arginine stimulus.

In the group of 12 cases with autosomal anomalies, Case 15 did not increase the PGH to the arginine stimulus; however, the baseline PGH level was 28 ng/ml. Unfortunately this individual was not available for retesting. Cases 16 and 24 failed to respond to the arginine test initially, but after oestrogen priming adequate responses to arginine were achieved. We were not able to perform further testing on Case 17 who had an inadequate response to the arginine test: he died of an acute

TABLE

Plasma Growth Hormone (PGH) Response to Various Tests (A: Arginine Test; OEA: Oestrogen Primed Arginine Test; I: Insulin Test) in Patients with Chromosomal Anomalies

Case No.	Phenotype	Age (yr)	Height (cm)	Height Age (yr)	Karyotype	PGH ng/ml		
						Test	Baseline	Peak
Sex chromosome disorders								
1	M	12·0	154·4	13	49, XXXXY	A	2·0	16·0
2	M	17·3	185·4	—	48, XXYY	A	3·0	28·0
3	M	22·8	177·8	—	47, XXY	A	4·0	18·0
4	M	25·7	185·5	—	49, XXXXY	A	2·0	22·0
5	M	18·5	170·2	16·2	47, XXY	A	2·0	47·0
6	M	16·3	171·5	16·3	47, XXY	A	7·0	29·0
7	M	5·4	102·0	3·9	49, XXXXY	A	2·0	4·0
						OEA	2·0	20·0
8	M	13·0	138·4	10·1	46XY/47XXY	A	0·5	4·0
						OEA	3·0	10·0
9	M	16·4	180·3	—	47, XXY	A	5·0	10·0
10	M	24·1	180·4	—	48,XXYY	A	0·5	13·0
11	M	15·7	154·9	13·1	47, XXY	A	1·6	22·0
12	F	24·6	145·0	11·3	45, X/46, XX	A	7·0	15·0
13	F	15·3	127·0	8·0	45, X	A	2·0	30·0
14	F	16·4	142·2	10·5	46, X, G+/47, XX, G+	A	3·0	25·0
Trisomies								
15	M	4·4	95·8	2·9	47, XY, D+	A	28·0	*
16	F	7·5	101·0	3·7	47, XX, E+	A	3·0	4·0
						OEA	2·0	22·0
17	M	6·7	98·0+	3·3	46, XY/47, XY, ?F+	A	4·0	5·0
18	F	16·6	98·0	3·4	46, XX/47, XX, ?D+	A	2·0	5·0
						OEA	2·0	5·0
						I	2·0	5·0
19	F	12·5	128·0	8·2	46, XX/47, XX, ?F+	A	2·0	17·0
20	M	12·6	128·0	8·3	47, XY, G+	A	4·0	10·0
21	M	11·3	138·0	10·0	47, XY, G+	A	2·0	19·0
22	M	12·0	135·0	9·5	47, XY, G+	A	4·0	19·0
23	F	10·2	141·5	10·4	47, XX, G+	A	4·0	49·0
24	F	9·1	127·2	8·1	47, XX, G+	A	6·0	*
						OEA	6·0	16·0
25	M	10·6	125·0	7·8	47, XY, G+	A	28·0	28·0
26	F	18·9	148·0	11·6	47, XX, G+	A	6·0	24·0

*The PGH value declines throughout the test.

infection. Since Case 18 failed to respond adequately to either arginine alone or arginine with oestrogen priming, an insulin response test was performed, and she also failed to respond to this.

Discussion

The majority of subjects with chromosomal anomalies also have a disorder of growth. Tall stature in males with multiple X chromosome disorders, and short stature in subjects with the XO syndrome or autosomal aneuploidies are characteristic. No adequate explanation for these disorders of growth in subjects with chromosomal anomalies has been advanced. Plasma growth hormone has not been studied in these subjects except in a few patients with the XO and XXY syndromes (Frasier, 1967; Hillman and Colle, 1969; Lundberg and Wahlström, 1970) in whom the PGH responses were not different from those in normal control subjects.

In the present study all subjects with anomalies of the sex chromosomes had positive PGH responses (Table). It is of interest that among this group the 2 subjects who required more than one test for demonstration of a positive PGH response also had marked growth retardation (more than 2 SD below the mean).

Among the subjects with autosomal aneuploidy, 3 failed to respond adequately to the initial arginine stimulation test. Two of these (Cases 16 and 24) did exhibit adequate PGH responses when the test was repeated with oestrogen priming. In one case (Case 18), a 16·6-year-old female who had a height age of 3·4 years and mosaicism for a cell line with possible trisomy D, none of the 3 stimulation tests (arginine, arginine with oestrogen priming, insulin) resulted in an adequate response of 5 ng/ml above baseline. These results suggest an anomaly of growth hormone production in this patient which probably contributed to her dwarfism.

The average height of adult patients with Down's syndrome is approximately 151 cm for males and 141 cm for females (Penrose and Smith, 1966), both values being 3 SD below the mean height for normal subjects. The mean height of 50 adult male subjects with X chromosome anomalies (Klinefelter's syndrome) reported by Hambert (1966) was 180·3 cm ± 6·8 cm, which is nearly 1 SD above the mean height for normal adult males. Since the groups of subjects with Klinefelter's and Down's syndromes in our study had normal PGH responses, the characteristic short stature in subjects with Down's syndrome and the tall stature in males with multiple X chromosome anomalies are probably not related to anomalies of growth hormone production.

Summary

Twenty-six subjects with chromosomal anomalies were studied for responsiveness of plasma growth hormone levels to one or more stimuli (arginine, oestrogen priming followed by arginine, and insulin-induced hypoglycaemia). 4 of these subjects required more than one test to demonstrate a positive growth hormone response, and one subject failed to respond to any of 3 tests. It is concluded that the production of growth hormone in these patients is usually normal.

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Folic Acid Replacement in Folate-deficient Children on Anticonvulsants

Reynolds (1967) found that folic acid reversed the retarding effect of anticonvulsants in 22 out of 26 folate-deficient adult patients, and Neubauer (1970) noted a similar improvement in 28 out of 50 children. Reynolds (1967) also reported an in-