digital anomalies with nail hypoplasia especially of the fifth fingers. Our patient did have all of these characteristics. The patients described as having Coffin-Siris syndrome have had no demonstrable chromosomal abnormalities; yet, our patient did have an abnormal karyotype of 47,XX, +9q-. The significance of the resemblance of our patient to those with the Coffin-Siris syndrome obviously cannot be determined until more cases with both types of abnormalities have been reported.

As previously noted, a patient with trisomy 9 was reported by Feingold and Atkins (1973). Their patient survived 28 days and showed microcephaly, low set malformed ears, enophthalmos, a bulbous nose, severe micrognathia, low hairline, heart defects, missing phalanges from toes two to five, abnormal external genitalia, and deformities of the central nervous system. In 1973, Haslam et al. described a 9-year-old boy with severe mental retardation, short stature, hypotonia, heart defects, genital anomalies, and brain abnormalities. Genotypically he was found to be a trisomy 9 mosaic. Others (Rethore et al., 1970; Hoehn, Engel, and Reinwein, 1971) have reported patients with trisomy of the short arm of chromosome 9. Collectively these patients revealed severe mental retardation, enophthalmos, mild hypertelorism, bulbous noses, and anomalies of the ear and phalanges. Our patient does indeed resemble these patients, having many of their features; yet, her chromosomal pattern is different. In fact, this is probably the first reported case of trisomy 9 with partial deletion of its long arm.

It is of great interest that our patient resembled those with the Coffin-Siris syndrome as well as those with trisomies for chromosome 9. Again the relevance of these relationships must await further case reports before any speculations can be made.

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References


Pure partial trisomy for long arm of chromosome 9

Summary. A case of a 4-year-old boy with trisomy of the long arm of chromosome 9 is described (46,XY,der(9), t(9;9)(q32;q12)). The trisomy is probably the result of a translocation of the long arm of the chromosome from one homologue to the other in a parental gonad. The clinical features of the child which include severe developmental retardation, bird-like facies, tapered fingers, and flexion contractures of the legs are similar to those of the few cases described of trisomy of the whole chromosome.

Trisomy 9 has been reported very rarely in living individuals. It has been found in all the cells examined in a newborn child with multiple congenital abnormalities (Feingold and Atkins, 1973) and also in a proportion of the cells of a newborn infant (Bowen, Ying, and Chung, 1974) and a child of 9 years (Haslam et al., 1973) both of whom had severe congenital abnormalities.

We wish to report a boy with multiple congenital abnormalities and severe developmental retardation in whom all cells examined contained an abnormal chromosome 9 which had a substantial portion of the long arm (q12–q32) present in duplicate. As only chromosome 9 was involved this was a case of pure trisomy for this segment of chromosome. We are not aware of any previous reports of partial trisomy for the long arm of chromosome 9.

Case report

This child, a boy of birthweight 1730 g, was born by spontaneous vertex delivery at 36 weeks’ gestation after an uneventful pregnancy. Incubator care was required until 2 months of age; he was discharged at 3 months weighing 2250 g. Subsequent clinic attendances showed developmental milestones to be greatly delayed.
Physical examination at 4 years 4 months of age showed a uniformly dwarfed child of 8390 g weight, 79 cm height, and head circumference 44 cm, all measurements being below the third centile. The facies were bird like, with a beaked nose (Fig. 1). The ears were of simple shape, the palate high-arched and there was conspicuous retrormicrognathia. The fingers were tapering, with slight incurving of the fifth digits, and simian creases were present bilaterally. Flexion contractures of both hips and knees were noted with obvious limitation of abduction at the hips. Reflexes were uniformly brisk but the tone normal. Testes were present in the inguinal canal; the scrotum was hypoplastic.

The remainder of the physical examination, which included a complete orthopaedic assessment, was within normal limits. There was severe mental retardation, developmental age being assessed at 10 months (Gesell Inventory). Vocalization was limited to an unmodulated tone, with no attempt at variation. He responded to being lifted and comforted, had a social smile, and expressed displeasure when a toy was removed.

**Cytogenetic observations.** All cells from cultures of peripheral blood, taken at 10 months of age and again at 4 years of age, contained an abnormal chromosome approximately the size and shape of a member of the B group but of very characteristic appearance because of a pronounced constriction on the long arm (Fig. 2a). Trypsin-giemsa banding (Seabright, 1971) showed this chromosome to be no. 9 with a substantial portion of the long arm duplicated. The proximal part of the long arm was apparently intact as far as q32. The material beyond this point was indistinguishable in size and banding pattern from the complete long arm of chromosome 9 beyond, but probably not including, q11 (Fig. 2b). Staining by the C-banding technique (Arrighi and Hsu, 1971) showed the presence of two C band regions, and the G11 staining technique (Bobrow, Madan, and Pearson, 1972) showed both bands to be characteristic of chromosome 9 (Fig. 2c). It is concluded that the cells were trisomic for q12→q32 of chromosome 9.

The karyotypes of both parents and the younger sib were normal. The mother, however, was found to have more than 10% of her cells showing structural damage.

**Family history.** The maternal and paternal ages at the time of the patient's birth were 27 and 29 years, respectively. He was the fourth of five sibs who are all alive and well. There was no history of abortion, stillbirth, or neonatal death.

After the discovery of chromosome structural damage
in the maternal blood, inquiry indicated no unusual history of drugs or irradiation. There was an abdominal x-ray examination to determine fetal position and development shortly before the birth of this patient and a similar investigation for a previous pregnancy.

Discussion

The main physical features of this child are compared in the Table with those of the reported cases of trisomy 9, all of which were male. Only one case of complete trisomy 9 has been reported (Feingold and Atkins, 1974) and this infant died shortly after birth. The two other cases of trisomy for the whole of chromosome 9 were mosaics with only 8% (Haslam et al., 1973) and 12% (Bowen et al., 1974) of abnormal cells in cultures derived from the peripheral blood. The only case to survive the neonatal period was that with the smallest percentage of abnormal cells. Features of our case common to the others are dwarflike stature, microcephaly, beaked or prominent nose, high arched palate, simple or malformed ears, receding chin, tapered fingers, transverse palmar creases, hypoplastic genitilia, and some abnormality of hip movement. Perhaps the most striking common feature is abnormality of the lower limbs. Our case appears to have only flexion contractures but the abnormalities in the other cases vary from dislocations of the knees to severe hypoplasia and dysplasia of skeletal elements. Unlike the cases of trisomy for the whole chromosome, our case does not appear to have any cardiac abnormality.

Rethore et al (1973) and Zaremba et al (1974) have reviewed the features of trisomy for the short arm of this chromosome. Further cases have been reported by Newton et al (1972), Baccichetti and Tenconi (1973), Podruch and Weiskopf (1974), Fujita et al (1974), and Dinno, Silvey, and Weiskopf (1974). Several of these cases have break points on the long arm of the chromosome and are therefore trisomic for some or all of the secondary constriction region also. There does not, however, appear to be any obvious difference between those trisomy 9p cases with this part of the long arm and those without; none of the features of our case seems to be shared only by those with breaks on the long arm.

The abnormal chromosome is presumed to have arisen in one or other of the parental gonads by a translocation between homologous chromosomes. Neither parent has any detectable abnormality of chromosome 9 in peripheral blood cells. The mother was found to have random structural abnormalities in 10% of her cells which may indicate exposure to a mutagen. She was found to have had two diagnostic abdominal x-ray examinations for obstetric reasons, but nothing else of note was discovered in her history.

The physical examination of this child does not

<table>
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<tr>
<th>Reference</th>
<th>Partial Trisomy 9q</th>
<th>Trisomy 9</th>
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<td>9</td>
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<tr>
<td>Weight (g)</td>
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<td>50.8</td>
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</tr>
<tr>
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<td>32.5</td>
<td>49</td>
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<tr>
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</tr>
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<td>Bulbous</td>
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<tr>
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<td>Dislocated knee</td>
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<td>Heart</td>
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</table>
indicate any feature that can be regarded as characteristic of trisomy 9q. However, when more cases are reported a syndrome may become recognizable.

We thank Margaret Sinclair, Mary Sturrock, and Dorothy Mentiply for their help.

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Note added in proof
Since submitting this report two cases of trisomy 9q have been described by Turleau et al (1975). The similarity in the appearance of these patients and of ours is striking.

REFERENCES

Pseudohermaphroditism due to XY gonadal absence syndrome*

Summary. A 21-year-old phenotypic female with a 46,XY chromosome complement and gonadal absence was studied. Basal levels of plasma immunoreactive luteinizing hormone (LH), follicle stimulating hormone (FSH), testosterone, and oestradiol were measured. Pituitary sensitivity and reserve was evaluated by the exogenous administration of synthetic luteinizing hormone-releasing hormone. The episodic release of gonadotrophins was assessed by measuring plasma LH and FSH in plasma samples obtained at 20-minute intervals for a 4-hour period. Endocrine gonadal function was evaluated by a stimulation test with human chorionic gonadotrophin for 3 days. The results showed: a) persistently raised plasma levels of both LH and FSH; b) a pulsatile pattern of release of both gonadotrophins and a normal pituitary response to the synthetic hypotalmic decapetide; and c) extremely low levels of circulating testosterone and oestradiol with a lack of response to the HCG stimulus. A careful exploratory laparotomy revealed absence of uterus, Fallopian tubes, the Müllerian portion of the vagina, and gonads. No Wolffian derivatives were found. A dissociation of testosterone and the so-called Jost substance effects during early sexual development may explain the findings in this unusual abnormality. The term ‘XY gonadal absence syndrome’ including five types of variants to designate this condition is proposed.

Agonadism in phenotypically female individuals with a 46,XY chromosome complement results in an incomplete form of male pseudohermaphroditism. This clinical condition has been recently designated

* This study was supported in part by grants from the World Health Organization (WHO) and International Development Research Center (IDRC).
Pure partial trisomy for long arm of chromosome 9.

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