Trisomy D/Trisomy E Mosaicism in an Infant Male

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The rarity of double autosomal trisomy has been pointed out by Porter, Petersen and Brown (1969). The patient reported here is the third case of double autosomal trisomy as a mosaic for the group D and E chromosomes (47,XY,D+ /47,XY,E+).

Case Report

The patient, a male, was the third child of a 41-year-old mother and 45-year-old father. The pregnancy was terminated after a 39-week gestation by a Caesarean section for elective sterilization.

Apart from the development of polyhydramnios (estimated 5 l), the pregnancy was uneventful. There was no history of viral infection, drug ingestion, or radiation exposure. The mother had previously given birth to two normal children (both by Caesarean section) when she was 19 and 40 years old, respectively. Family history was negative for congenital malformations.

The birthweight was 2000 g, and body length was 44 cm. The child was cyanotic and in extreme respiratory distress. No breath sounds were heard over the left thorax or over the right anterior thorax. He lapsed into periodic apnoeic spells and died within one hour.

A complete necropsy was performed, excepting the eyes, 3 hours after expiration. Externally, there were multiple anomalies. Both auricles were low-set and slanted posteriorly. The antihelix was absent (Fig. 1). There was a right cleft lip and an ipsilateral posterior cleft palate (Fig. 2). Both hands showed marked radial deviation and there was a simian crease across each widened palm (Fig. 3). The thumbs were relatively hypoplastic, and all fingers were flexed with deviation of the index and fifth fingers towards the longitudinal axis of the hand. The nails of the fingers and the toes were narrow and hyperconvex. There were rocker-bottom feet with prominent heels (Fig. 4).

Exposure of the thoracic and peritoneal cavities revealed that most of the anterior abdominal cavity was occupied by a large symmetrical liver (Fig. 5). Most of the small intestine had herniated through a large posterolateral (Bochdalek) defect of the left hemidiaphragm. The mediastinum was deviated to the right, and the heart occupied most of the anterior right thoracic cavity.

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FIG. 1. The ear; note the absent antihelix.

FIG. 2. The face; note the cleft lip and palate.

Posterior to the herniated small bowel was a compressed hypoplastic left lung (2 g in weight and 2 cm in greatest dimension). The right lung weighed 12 g, was atelectatic and compressed behind the displaced heart. There were a patent foramen ovale and patent ductus arteriosus. There was a small accessory spleen adjacent to the splenic artery near the splenic hilum. There was no Meckel's diverticulum in the small bowel, but due to malrotation

of the colon, the caecum was attached by the mesocolon to the left posterior abdominal wall. The only urogenital anomaly was an intra-abdominal left testicle.

Extensive cerebral subarachnoid hemorrhages were found, but the central nervous system was morphologically normal, both on gross examination and on microscopy.

FIG. 3. The palm; note the simian crease, deviation of wrist and fingers.

FIG. 4. The feet; note the prominent heel and rocker-bottom appearance of feet.

9—J.M.G.

FIG. 5. At necropsy; note the large liver and displacement of intestine into thoracic cavity.

Cytogenetics. Peripheral lymphocytes were cultured for chromosomes. Seventy-six cells were analysed and all contained 47 chromosomes (Table I). Karyotype analyses revealed a mosaic pattern (47,XY,D+/47,XY,E+) (Fig. 6).

Discussion

Two cases of double autosomal trisomy for the group D and E autosomes have been reported. The first had 3 cell lines (47,XX,D+/47,XX,E+/48,XX,D+,E+) and showed a mixture of the clinical features of trisomy D and trisomy E (Baikie, Garson, and Birrell, 1965; Garson *et al*, 1969). The other karyotyped like our patient (47,XY,D+/

FIG. 6. Composite karyotype of D and E group chromosomes from one cell trisomy for group D (top) and one cell trisomy for group E (bottom).

TABLE I
CHROMOSOME ANALYSES
FROM PERIPHERAL BLOOD

Total Cells Analysed	Trisomy E	Trisomy D
76	61	15

47,XY,E+) and showed the clinical features of trisomy D (Zellweger and Abbo, 1967). Our patient, like the first, showed a mixture of the phenotypes.

The singular notable complication in the prenatal course of our patient was polyhydramnios. Polyhydramnios was reported in another instance of double autosomal trisomy, a case of 47,XY,D+/47,XY,G+/48,XY,D+,G+ (Porter *et al*, 1969). Advanced maternal age was present in our case and has been a factor twice before with double autosomal trisomies (Hsu *et al*, 1965; Smith, Tips, and Howard, 1965). The relationship between advanced maternal age and trisomy G, as well as other aneuploid abnormalities, has long been acknowledged.

Double autosomal mosaicism could arise as the result of either meiotic or mitotic packaging errors. This type of mosaicism can most simply be explained by two nondisjunctional events at the two-cell stage of the zygote. One would have to hypothesize that one cell disjoined in the E group; the other in the D group, and the resulting monosomic cells died. More complicated schemes have been devised (Zellweger and Abbo, 1967), but this is the simplest

and involves the fewest karyokinetic mistakes. Aberrant karyokinetic events later during the formation of the zygote would result in the existence of normal cells, but none were found in the blood of our patient. The early demise of the patient precluded our culturing other tissue for the presence of normal cells.

Summary

A patient is described who had two trisomic cell lines, 47,XY,D+/47,XY,E+. The necropsy findings are given in detail. A possible mechanism for double autosomal trisomy is discussed.

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