A Girl with Mosaicism for a Dicentric X Chromosome
(45,X/46,X,dic(X) (Xqter-p22 : : p22-qter))

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Summary. A 12-year-old girl was examined for growth retardation and a few very discrete dysmorphologic stigmata of Turner's syndrome; the genitalia were infantile yet both ovaries possessed functioning follicles. R- and C-banding techniques and BrdU treatment demonstrated a 45,X formula in 95% of lymphocytes, with 5% presenting a 46,X,dic(X) formula. Cytogenetic and clinical problems raised by this observation are discussed in relation to data from the literature.

Introduction

Translocations involving the X chromosome are rare, especially those between two X chromosomes. New identification techniques, notably C-banding and the use of BrdU, have led in a few cases to specifying the precise nature of the anomaly and to demonstrating the presence of two centromeres. In this communication we report a new case of mosaicism for a dicentric X chromosome studied by such techniques.

Case Report

The proband, the 12-year-old daughter of young parents, was the product of a full-term and uncomplicated pregnancy. An 11-year-old sister was normal. The family history was negative. Both parents died accidentally. The patient was hospitalized for growth retardation (height: 124 cm; weight: 24 kg; cranial circumference: 52 cm; thoracic circumference: 66 cm; lower body segment: 57 cm; span: 124 cm). She presented with a prominent rounded forehead and convergent strabismus. Aside from a moderate cubitus valgus other dysmorphologic stigmata of Turner's syndrome were absent. The external genitalia were infantile and breast tissue, axillary and pubic hair were absent (Fig. 1). Intellectual development was normal. X-ray studies revealed a bone-age of 10 years and anvil-shaped hypertrophy of the medial tibial condyles. Endocrinologic examination was normal for 24-h urinary output of 17-ketosteroids and 17-hydroxyxorticosteroids, thyroid function (TSH, T3, T4, PBI, HI), the LH-RH response for her age, the arginine 1-Dopa test and insulin challenge.
Excluding a discrete nonspecific intraerythrocyte enzyme hyperactivity, laboratory values were normal (hemogram; serum glucose; proteins; blood urea nitrogen, phosphate, calcium, cholesterol, immunoglobulin A, G, and M; no proteinuria). The electroencephalogram, electrocardiogram, and intravenous urogram were all normal.

Exploration of the internal genital organs revealed a normal uterus, an atresic right ovary and a larger left ovary. Examination of the right ovary revealed small follicles whose granulosa was hemorrhagic and contained vacuolized cells with fairly large nuclei; the theca folliculi was poorly separated from the granulosa; at the periphery the stroma was still rather cellular, yet deeply infiltrated by fibrosis and some edema; the capsule was not thickened, and no primordial follicles were observed. On the left side the follicles presented a thinned granulosa and the theca interna contained large, vacuolized cells. In summary, the ovaries were hypogonadic with presence of functional follicles.

Dermatoglyphic examination revealed an ab space much greater than the normal (107), and a very high total ridge count (217); the axial triradii and palmar creases were normal.

The karyotype performed on cultured lymphocytes demonstrated the presence of two cell clones. 95% of the cells examined belonged to the clone with a 45,X composition, while the other contained 46 elements wherein one of the two X chromosomes was replaced by a larger element, twice the size of a normal X chromosome.

R-Banding demonstrated that the short arm of this chromosome corresponds to the long arm of a normal X chromosome, while the long arm carried successively the marking of the short arm of a normal X chromosome up to p22, followed by another short-arm segment from p22 up the centromere, and finally the long arm of an X chromosome from centromere to telomere (Fig. 2). The chromosomal formula can thus be written: 45,X/46,X,dic(X)Xqter–p22: p22–qter.

Although conventional staining techniques only demonstrated one centromere, analysis of the C-band patterns showed the usual staining at the site of the primary constriction plus an additional marker on each chromatid at the site corresponding to the 'centromere' of the second X chromosome (Fig. 2). Thus, it is reasonable to consider this rearrangement a mirror-image duplication resulting in inactivation of one of the centromeres.

Following Brdu treatment and acridine orange staining, the normal X chromosome was condensed and contained several fluorescent bands, its appearance corresponded to that of an