Journal of Medical Genetics (1971). **8**, 504.

Autosomal Translocation in a Mentally Retarded Male Child with 46,XY,t(2q−;13q+) Complement: Case Report and Review*

PAUL GENEST, ROGER LACHANCE, JACQUELINE POTY, and DAVID JACOB

From the Department of Pathology, Faculty of Medicine, Laval University, and St François d'Assise Hospital, Quebec, Canada

Human chromosome No. 2 is very often involved in chromosomal rearrangements and there are already over 30 reports. Five of them (Lisco and Lisco, 1967; Reisman and Kasahara, 1968; Ricci, Dallapiccola, and Cotti, 1968; Wurster *et al*, 1969; Davison, Bedford, and Dunn, 1970) deal with an exchange between the long arms of one No. 2 and a D group chromosome. The present report describes a translocation between chromosomes No. 2 and 13 found in the blood lymphocytes of a 25-month-old male child with mental retardation and minor congenital malformations.

Case Report

History. This 25-month-old boy was investigated because of abnormal appearance and mental retardation. He was born at term (weight 3487 g) after a normal pregnancy to a 35-year-old mother. Routine chest radiography was performed during the 3rd month of gestation. There was no history of drug ingestion or viral infection. The parents, both French-Canadian, were in good health and nonconsanguineous with no relevant family history. One sib, a girl aged 5 years, was physically and intellectually normal.

At the age of 13 months this boy was admitted to hospital for a right inguinal herniorrhaphy. He weighed 9960 g, was 73 cm in height, and showed a normal stature. He was slightly retarded in development. He could stand alone but could not walk or speak words. His reactions to surroundings appeared normal and his behaviour was that of a 9-month-old infant.

Examination revealed a bizarre facies and a dysmorphic head (Fig. 1). The palpebral fissures were small with deep orbits (enophthalmia), bilateral epicanthic folds and hypertelorism. The eyebrows joined over the bridge of the nose which was depressed and small. The lower extremity of the nasal bone was bifid. The ears

Received 1 December 1970.

* This investigation was supported by grant no. 604-9-280 from the Province of Quebec Department of Health and Social Welfare.

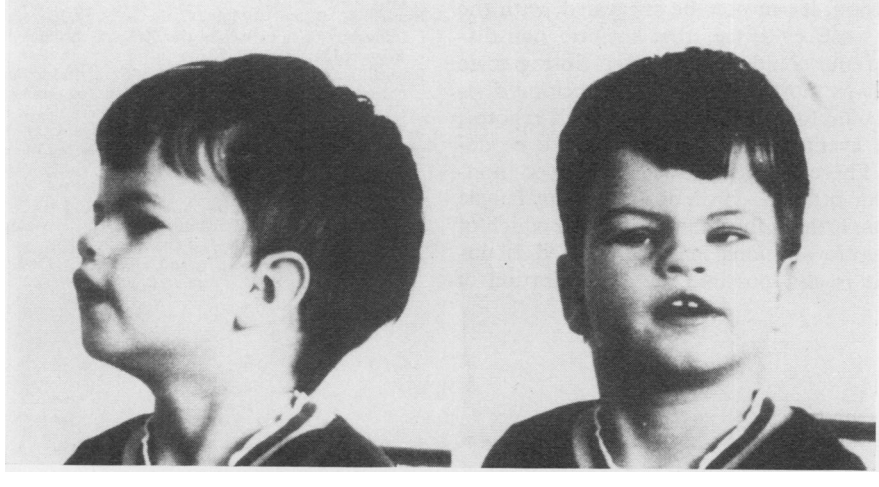

FIG. 1. The patient at age 25 months.

were large and pointed but normally placed. There was slight microretrognathism. The hard palate was elevated and the gums were thickened. The hands were thin with elongated fingers, a single transverse palmar crease, an atrophic hypothenar area and some articular hypermobility.

The electroencephalogram and electrocardiogram were normal. Chest and skull radiographs and intravenous pyelograms were non-contributory. Urinary and blood amino-acid chromatography were normal. Retinal examination revealed generalized pallor of the papilla. In the macula region there was a lack of reflection of the fovea centralis and loss of pigment.

Cytogenetic Analysis. Chromosome preparations were made from short-term microcultures of heparinized whole blood, and enlarged photomicrographs of metaphases were examined for numerical and structural anomalies. Autoradiographic study was performed on cultured lymphocytes after addition of ^{3}H thymidine 5½ hours before termination of the culture. The air-dried cells were stained and coated with Ilford L-4 photographic emulsion which was developed after a 4-day exposure.

Examination of 90 metaphases from the propositus revealed a modal number of 46 with XY pattern. In all cells, a chromosome No. 2 was missing, an extra chromosome was present in the C (6–12–X) group and one D (13–15) group chromosome had an unusually long arm (Figs. 2 and 3). Autoradiographic analysis revealed heavily labelling of the proximal half of the long arm of the long D group chromosome and light labelling of the distal half, indicating the presumed translocation of part of chromosome No. 2 was the distal half of the long arm. It was concluded that the labelling pattern of the abnormal D group chromosome was otherwise characteristic of autosome No. 13 and that the extra chromosome was the remainder of the missing No. 2. The chromosomes of the parents and sister of the propositus were normal.

Discussion

Our report is the sixth in which a portion of the long arm of a chromosome No. 2 is translocated to the distal end of the long arm of a group D chromosome, but it is the first in which a No. 13 is involved. The abnormal chromosome described by Reisman and Kasahara (1968) was identified as a No. 14, and that of Wurster *et al* (1969) as a No. 15 autosome. Autoradiographic studies were not described by Lisco and Lisco (1967), Ricci *et al* (1968) and Davison *et al* (1970) about their t(2q−;Dq+) observations (Table I).

The effect of this chromosomal rearrangement on the phenotype cannot easily be determined. The infertile female described by Lisco and Lisco (1967) probably had a balanced chromosomal rearrangement. The lethal congenital abnormalities in the

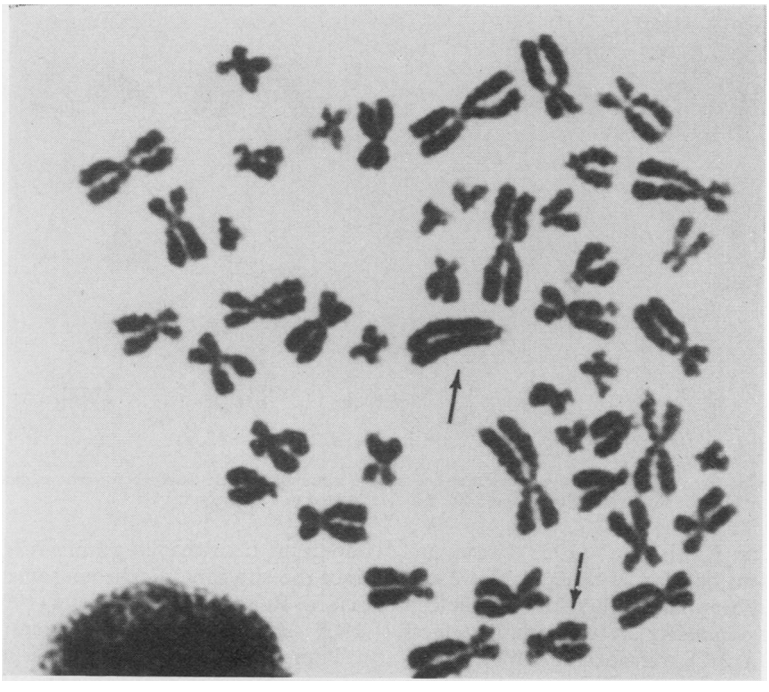

FIG. 2. Metaphase from lymphocyte of the propositus. Arrows point to the abnormal autosomes 2 and 13.

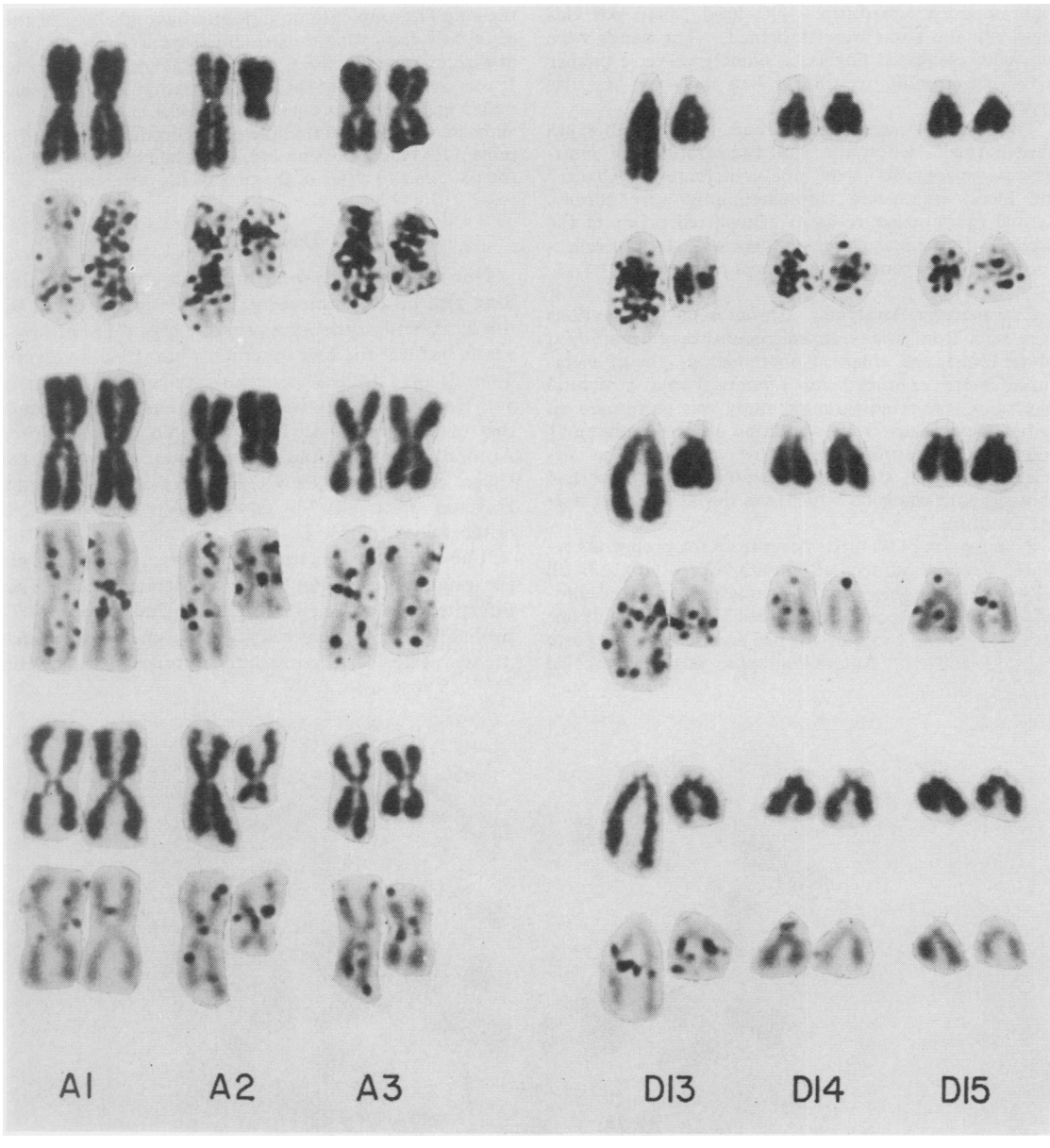

FIG. 3. Partial karyotype from three lymphocyte metaphases with their autoradiographic labelling patterns suggesting that the deleted segment of chromosome No. 2 is translocated to a chromosome No 13.

infant reported by Ricci *et al* (1968) were undoubtedly related to her partial trisomy No. 2 and her phenotypically normal mother had a balanced translocation. If similarity of congenital defects and presence of a 2:D translocation in most reported cases is not coincidental then material lost from chromosome No. 2 should be considered more important than that lost from the D chromosome, since the abnormal D chromosomes involved in the cases of Reisman and Kasahara (1968), Wurster *et al* (1969), and this report are different.

Translocation of a part of the long arm of chromosome No. 2 to the long arm of autosomes other than the D group has also been reported. A

TABLE I

PHENOTYPIC AND FAMILY CHARACTERISTICS OF 6 PATIENTS WITH (2q− :Dq+) TRANSLOCATION

Case	Sex and Age	Translocation	Phenotypic Anomalies	Remarks
Lisco and Lisco (1967)	F, 3 yr	(2q− ;Dq+)	Slight hypothyroidism and infertility	
Ricci *et al* (1968)	F, 45 dy	(Dq+)	Microcephaly, hypertelorism, depressed nasal bridge, micrognathia, low-set ears, systolic murmur, hypotonia, death at 75 days	Balanced (2q−,Dq+) translocation in the normal mother
Reisman and Kasahara (1968)	F, 27 mth	(2q− ;14q+)	Head assymetry, hypertelorism, epicanthic folds, microretrognathia, low-set ears, depressed nasal bridge, bilateral colobomata, joint hypermobility, extra digits, hypotonia, mental retardation, simian creases	Normal chromosomes in mother, presumptive father and 3 sibs,
Wurster *et al* (1969)	F, 12 yr	(2q− ;15q+)	Motor-coordination clumsiness, speech retardation, mental deficiency	Normal chromosomes in parents and twin sister
Davison *et al* (1970)	F, 3 yr	(2q− ;Dq+)	Speech and mental retardation	Normal chromosomes in parents
Present case	M, 25 mth	(2q− ;13q+)	Head dysmorphism, enophthalmia, epicanthic folds, microretrognathia, depressed nasal bridge, joint hypermobility, speech and mental retardation, simian creases	Normal chromosomes in parents and sister

rearranged C group chromosome was observed by Böök, Santesson, and Zetterqvist (1961) in a phenotypically normal female. An unusually long chromosome No. 22 resulting from the fusion of the distal segment of the long arm of chromosome No. 2 was found by Lejeune *et al* (1963) in a female patient exhibiting a typical Turner's syndrome with a haplo-X karyotype. Seven phenotypically normal relatives in three generations were carriers of this translocation. De Grouchy and Lautmann (1968) described a 2½-month-old girl with facial dysmorphia and abnormalities of fingers and toes who had a double translocation (1q− ;Dq+), (2q− ;16q+). Parents were normal. Three other cases of mentally retarded individuals also with a translocation of distal segment of the long arm of chromosome No. 2 were reported. Two of these (German *et al*, 1968; Mantle *et al*, 1969) had a rearranged B group chromosome, and the third one (Masterson *et al*, 1970) had an unusual long chromosome No. 17. The karyotypes of the parents of the first two patients were normal.

Although there are similarities between the phenotypic abnormalities of the present case and those of other observations reported, suggesting a possible chromosomal loss (from autosome No. 2 ?) effect, there is no definite proof that the chromosomal rearrangement found in the propositus is unbalanced.

Summary

Chromosome analysis of blood lymphocyte cultures from a 25-month-old mentally retarded boy with minor congenital abnormalities revealed an abnormally long D group chromosome, an extra C group chromosome and one normal chromosome No. 2 only. Autoradiographic studies showed that the abnormal D group chromosome was a No. 13 with a portion of the long arm of the missing chromosome No. 2 translocated to the distal end of its long arm. The chromosome complement was interpreted as 46,XY,t(2q− ;13q+). Parents and a sister were phenotypically normal with no chromosome anomalies.

The authors express their gratefulness to Dr P. E. Conen, Hospital for Sick Children, Toronto, for his helpful criticisms in the preparation of the manuscript.

REFERENCES

Böök, J. A., Santesson, B., and Zetterqvist, P. (1961). Translocation heterozygosity in man. *Lancet*, **1**, 167.

Davison, B. C., Bedford, J., and Dunn, W. (1970). t(2q− ;Dq+) in a mentally retarded female child. *Journal of Medical Genetics*, **7**, 81–82.

German, J., Walker, M. E., Stiefel, F. H., and Allen, F. H., Jr. (1968). MN blood-group locus: data concerning the possible chromosomal location. *Science*, **162**, 1014–1015.

Grouchy, J. de and Lautmann, F. (1968). Caryotype 46,XX,1q−, 2q−,Dq+,16q+ chez une enfant polymalformée. *Annales de Génétique*, **11**, 129–131.

Lejeune, J., Lafourcade, J., Salmon, Ch., and Turpin, R. (1963). Translocation familiale 2/22. Association à un syndrome de Turner Haplo-X. *Annales de Génétique*, **6**, 3–8.

Lisco, E. and Lisco, H. (1967). A case of balanced 2/D translocation. *Annales de Génétique*, **10**, 42.

Mantle, D. J., Mitchell, P., Kucheria, K., and Wilson, J. (1969). A mentally retarded child with convulsions, agnesis of the corpus callosum, and a translocation involving chromosomes 2 and the B group. *Journal of Medical Genetics*, **6**, 435–437.

Masterson, J., Law, E., MacDonald, A., and Donovan, D. (1970). Congenital abnormalities in a child with presumptive karyotype 46,XX,t(2q − ;17q +). *Irish Journal of Medical Science*, **3**, 1–4.

Reisman, L. E. and Kasahara, S. (1968). An unusual chromosome abnormality. 2/D translocation. *American Journal of Diseases of Children*, **115**, 625–628.

Ricci, N., Dallapiccola, B., and Cotti, G. (1968). Translocation 2/D familiale. *Annales de Génétique*, **11**, 111–113.

Wurster, D. H., Hoefnagel, D., Benirschke, K., and Allen, F. H. Jr. (1969). Placental chorangiomata and mental deficiency in a child with 2/15 translocation: 46,XX,t(2q − ;15q +). *Cytogenetics*, **8**, 389–399.