Three cases of partial trisomy 7q owing to rare structural rearrangements of chromosome 7

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Abstract

Three cases of partial trisomy 7q are described. One case had duplication of region 7q22.1→q31.2 owing to a de novo direct intra-arm intrachromosomal duplication. The other two cases, first cousins, were trisomic for 7q34→qter, resulting from recombination within the inserted segment of a *dir ins(7;17)(q34;q23.1q25.3)mat*. All three cases had a number of the already recorded manifestations of partial trisomy 7q, namely strabismus, low set ears, depressed nasal bridge, small nose, hypotonia, and mental retardation.

Case histories and possible karyotype/phenotype correlations for partial trisomy 7q have most recently been reviewed by Johnson *et al.*¹ Couzin *et al.*² and Forabosco *et al.*³

We report, to the best of our knowledge, only the fourth case of trisomy for the interstitial region 7q22→q31.2 and two cases of trisomy 7q34→qter, the most distal region yet to be described.

Case reports

CASE 1

Case 1, born 8.12.87, was the first born of twins to a

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31 year old mother and 42 year old father. There was a normal vaginal delivery at 31 weeks. Birth weight was 1192 g with Apgar scores of 7 at one minute and 10 at five minutes. There was mild respiratory distress. Chest x ray was compatible with mild hyaline membrane disease and she was treated with antibiotics for 48 hours and with CPAP nasopharyngeally for 24 hours. By day 6 she was managing well in air.

There was mild jaundice reaching a maximum bilirubin of 152. At 6 days of age her head circumference was 34.5 cm and her weight 2240 g. Initially her hips were subluxable but not dislocatable and she was treated in a pelvic harness. At 4 months her weight was below the 3rd centile, length on the 10th centile, and head circumference on the 50th centile. The anterior fontanelle was wide open, her occipital bones were somewhat prominent, but her facial bones and hands were normal. There was frontal bossing, depressed nasal bridge, epicanthic folds, and a fixed convergent squint (fig 1). Tone was symmetrically depressed in all limbs although movement was normal. The deep tendon reflexes were present but reduced. X rays at that time showed some asymmetry of the cranial vault with the right temporal region more convex than the left and a widely patent anterior fontanelle, but the cranial index was within normal limits. Cerebral ultrasound was normal. At 7 months she showed delay mainly in the gross motor area. At 9 months she has had frequent viral respiratory infections and on one occasion a urinary tract infection. Renal ultrasound failed to detect a left kidney and the right kidney showed some dysplastic features, although there is normal renal function. She has mild developmental delay, poor weight gain, an iron deficiency anaemia, and moderate hearing loss. The rest of her family is normal including her twin brother.

Chromosome analysis with GTG and HRG banding showed her karyotype to be 46,XX,*dir dup*(7)(q22.1→q31.2) (fig 2). Her parents and brother are chromosomally normal.

CASE 2

Case 2 (IV.29, fig 3) was delivered by caesarean section to a 42 year old mother (III.21); gestational

Figure 1 (a) Lateral facial and (b) frontal facial appearance of case 1. Note depressed nasal bridge and convergent squint.

dates and the father's age were not available. The pregnancy was complicated by hyperemesis. Birth weight was 3422 g. He suffered from stridor at birth and at 6 months was admitted for laryngoscopy. A diagnosis of laryngomalacia was made. He wears glasses for the correction of myopia. His ears are low

Figure 2 HRG banded dup (7q) and idiogram of the duplicated segment. Breakpoint is at 7q31.2.

set and simple with a reduction in the normal folds. His nose is small with a depressed nasal bridge and the mouth is open with a thin upper lip. There is positional abnormality of the teeth. The palate is normal (fig 4 a, b). The left testis is absent with an inguinal testis on the right. There is kyphoscoliosis and a congenital bilateral anterior dislocation of the shoulders (fig 4 c, d). The fifth fingers are short with clinodactyly. Height and weight are within the normal range. He is moderately mentally retarded.

Cytogenetic analysis with GTG and HRG banding showed his karyotype to be 46,XY,-17,+rec(17),dup(7)(q34→qter),dir ins (7;17)(q34;q23.1q25.3)mat (fig 5). The mother's karyotype is 46,XX,dir ins(7;17)(q34;q23.1q25.3)mat (fig 6).

CASE 3

Case 3 (IV.30), born 17.5.64, is 25 years old (gestational dates and parental birth dates were not available). Birth weight was 2948 g. She was kept in an incubator for five days and tube fed for two weeks. The skull was narrow in its lateral diameter and slightly long. The fontanelles were wide open. She had a short neck and low hair line. There was hypotonia, hypertelorism, an inner epicanthic fold, strabismus of the left eye, shallow supraorbital ridges, and sparse lower eyelashes. She has large, low set ears, an open mouth, arched palate, furrowed tongue,

Figure 3 Pedigree of family of cases 2 and 3.

and abnormal positioning of the teeth. Her nose is small with a depressed, wide nasal bridge. She has a single palmar crease on her right hand and abnormal palmar creases on her left. The thumbs are finger-like and the nails are normal, but badly bitten. There is clinodactyly of the fifth fingers. She has knock knees and small feet with syndactyly of the second

and third toes. There is no scoliosis or kyphoscoliosis. She is severely mentally retarded.

Chromosome analysis with GTG and HRG banding showed a $46,XX,-17,+rec(17),dup\ 7(q34\rightarrow qter),dir\ ins\ (7;17)(q34;q23.1q25.3)mat$ (fig 5). The mother's (III.24) karyotype is $46,XX,dir\ ins(7;17)(q34;q23.1q25.3)mat$.

Figure 4 (a) Frontal and (b) lateral facies, (c) chest and (d) back of case 2. Note congenital bilateral anterior dislocation of the shoulders and kyphoscoliosis.

Discussion

Direct intra-arm intrachromosomal duplications, such as found in case 1, are very rare events. Unequal interchange in meiosis between homologous chromosomes and unequal intrachange between chromatids of one chromosome by an inversion or insertional translocation can be postulated as possible mechanisms of formation. Chromosomal insertions, either intra- or interchromosomal, occur with an estimated frequency of 1/5000 newborns⁴ and are usually ascertained through carriers (fig 3) having unbalanced offspring or being investigated for reproductive wastage.⁵ Most aneusomes result from segregation and only rarely from recombination,^{6,7} as in cases 2 and 3 of this report. Clinical features common to case 1 and the three previously published cases including region 7q22→q31 are developmental delay, frontal bossing, strabismus, epicanthic folds, low set and

large ears, and small nose. Our case 1 showed, in addition, dysplasia of the right kidney with failure to detect the left, subluxable hips, and hearing loss. Cases 2 and 3, trisomic for 7q34→qter, the most distal region yet described, exhibited features also present in patients with other larger duplicated regions of 7q,¹⁻³ namely short nose, low set ears, developmental delay, hypotonia, strabismus, thin upper lip, and skeletal abnormalities. As discussed by Forabosco *et al*³ clinical features associated with partial dup 7q are uniformly distributed irrespective of the region involved, an observation illustrated well by these findings.

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Figure 5 (a) Partial GTG banded karyotypes from cases 2 and 3. (b) Idiogram of *rec(17)* from cases 2 and 3.

- 1 Johnson D, Michels V, Aas M, Dewald G. Duplication of 7q31.2→7qter and deficiency of 18qter: report of two patients and literature review. *Am J Med Genet* 1986;25:477-88.
- 2 Couzin DA, Hautes N, Watt JL, Johnston AW. Partial trisomy 7 (q32→qter) syndrome in two children. *J Med Genet* 1986;23:461-5.
- 3 Forabosco A, Baroncini A, Dalpra L, *et al.* The phenotype of partial dup (7q) reconsidered: a report of five new cases. *Clin Genet* 1988;34:48-59.
- 4 de Arce MA, Law E, Martin L, Masterton JG. A case of inverted insertion assessed by R and G banding. *J Med Genet* 1982;19:148-51.
- 5 Abuelo DN, Barsel-Bowers G, Richardson A. Insertional translocations: report of two new families and review of the literature. *Am J Med Genet* 1988;31:319-29.
- 6 Jalbert P, Jalbert H, Sele B, *et al.* Partial trisomy for the long arms of chromosome No 5 due to insertion and further 'aneusomie de recombinaison'. *J Med Genet* 1975;12:418-23.
- 7 Martin NJ, Cartwright DW, Harvey PJ. Duplication 5q(5q22→5q33): from an intrachromosomal insertion. *Am J Med Genet* 1985;20:57-62.

Figure 6 Partial HRG banded karyotypes from mother (III.21) of case 2 showing *der ins(7;17)*. Broken lines indicate breakpoints.