Abnormal children of a 47,XYY father

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SUMMARY Abnormal children of two 47,XYY men were studied. One of these men had 2 normal daughters and a child, 45,X/46,XY, with gonadal dysgenesis. The other man had 2 normal sons and a child with Down’s syndrome. The extra chromosome 21 of this child came from the mother. Another 47,XYY man had 4 normal children.

Numerous studies have been made of the XYY chromosome combination. However, little has been said concerning the offspring of such individuals. Hauschka et al. (1962) observed an XYY subject who had a child with Down’s syndrome.

We have had the opportunity to study the offspring of three XYY fathers who had 10 children in all, 2 of whom had chromosomal anomalies.

Case reports

CASE 1
This man was born on 17.6.45. Apart from his large stature (1·85 m) he had no particular health or medicolegal problems. In 1970, while staying in Switzerland, he had relations with a girl who bore him a son whom the father refused to acknowledge. The mother consequently sued for paternity and blood tests showed that he was the father of the child. The child was normal. In the meantime he returned to France where he married. In January 1974 his wife bore him a son who had Down’s syndrome. The baby’s karyotype was 47,XY, +21. This chromosomal abnormality led to the study of the chromosomes of the father, whose karyotype was 47,XYY, and of the mother, aged 24, whose karyotype was normal. As shown in Fig. 1, the extra chromosome 21 was maternal in origin. In May 1977 the subject’s wife bore him a second son whose karyotype was normal (46,XY).

The karyotype performed on her lymphocytes was 45,X/46,XY with 80% 45,X mitoses. The same karyotype was found in her fibroblasts, but the proportion of 45,X mitoses was 28%. There were no Barr bodies in buccal lining cells or in the fibroblasts. Fluorescent Y bodies, however, were discovered. After 3 years of age, the uterus and fallopian tubes were found to be normal during laparotomy. On the left side, a tissue study of an oval formation showed seminiferous tubules of normal diameter with Sertoli tissue and spermatogonia. On the right side, there was a fibrous white formation. The vagina was normal. Apart from the hypertrophy of the clitoris, the clinical examination was normal. No typical signs of Turner’s syndrome were found. The karyotypes of the child’s sisters and that of the mother were normal.

CASE 2
This man was admitted to a neurology clinic in 1971 at the age of 54, because of a right frontopolar arteriovenous aneurysm. He had three daughters and one son. A karyotype was performed because of his large stature (1·92 m) and it turned out to be 47,XYY. The karyotypes of the children were normal.

Discussion

Offspring of XYY men were studied by Le Maret al. (1977), who placed XYY subjects into categories.

(1) Those who had normal offspring. There were 14 XYY men who had 26 children with normal phenotypes (14 boys, 10 girls, and 2 children of undisclosed sex). Thirteen karyotypes were performed and they were all normal. To this group we can add our case 3, in which one normal boy and three normal girls were born of an XYY father.
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(2) Those who had anomalies among their offspring. There were 34 pregnancies in 12 couples in which the husband was 47,XYY. Twelve of these pregnancies resulted in a normal child (7 boys and 5 girls). The other 22 did not result in the birth of normal children: there were 8 miscarriages and stillbirths, or deaths soon after birth as a result of serious malformations (5 cases, 2 of which were associated with anencephaly and spina bifida (Wilton and Lever, 1967; Le Marec et al., 1977). The other pregnancies resulted in live but handicapped offspring: there were 2 trisomy 21 (Hauschka et al. 1962; S. Gilgenkrantz, 1977, personal communication), 3 XYY karyotypes (Tzoneva-Meneva et al., 1966; Boucharat and Jalbert, 1969; Sundquist and Hellstrom, 1969), and 2 mosaics (Hauschka et al., 1962; Wiener et al., 1968). Included in the last group are our 2 patients (47,XY, +21 and 45,X/46,XY).

(3) Those who had no offspring. In this last group, the 47,XYY karyotype was discovered during examinations in search of the cause of sterility.

To our knowledge, the birth of a 45,X/46,XY child has not been observed before in the offspring of 47,XYY men. It is probable that this mosaic resulted from a 46,XY zygote with the loss of a Y chromosome during one of the first divisions of the fertilised ovum.

Hauschka et al. (1962) described the occurrence of a child with Down’s syndrome in the offspring of a 44-year-old, 47,XYY man. However, the trisomy could have resulted from the age of the mother which was not given. The patient of S. Gilgenkrantz (1977, personal communication) was the first child of young parents. Our observation is the third of this type. The mother was 24. To support the conclusion

Fig. 1 Chromosome 21 and 22 of the father, the mother, and their trisomic 21 son (case 1): R-banding (top); C-banding (bottom).
of an eventual interchromosomic effect, it would have been necessary to prove the paternal origin of the supernumerary chromosome 21. However, it is not the case in our observation, since the third chromosome 21 of the child came from the mother.

Our personal data and those in published reports show that when 47,XYY subjects are not sterile, their offspring are not always normal. However, there is a statistical bias, since XYY men who have normal offspring are not usually seen. The only ones studied are those who have abnormal children. With

the latter, the prenatal diagnosis proposed by Le Marec et al. (1977) seems to be necessary to uncover a chromosomal anomaly, as in two of our cases, or in the case of a lesion of the neural tube as reported by Wilton and Lever (1967) and Le Marec et al. (1977). However, if we look at our observation of a boy with Down's syndrome, the son of a 47,XYY father, the supernumerary chromosome 21 was transmitted by the mother. The question of the necessity of amniocentesis remains an open one.

References


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