Cytogenetic Survey of XYY Males in Two Juvenile Court Populations, with a Case Report

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The XYY anomaly has been recognized since 1961 (Dunn *et al*, 1961; Sandberg *et al*, 1961), but in contrast to other sex chromosome aneuploidies, no consistent clinical syndrome associated with it has emerged. The phenotypes are wide ranging, but generally are tall normal males. Most interest in the syndrome has centred on the possibility that abnormal behaviour may be an associated feature.

The first suggestions of behavioural implications of an extra Y chromosome were made following a sex chromatin survey of 942 retarded antisocial male inmates (mean IQ 77.3) at Rampton and Moss Side (Casey *et al*, 1966). The frequency of the XYY karyotype (0.74%) was strikingly high. This finding led Jacobs *et al* (1967/1968) to survey cytogenetically a similar retarded, antisocial population institutionalized at Carstairs. Their survey yielded 9 patients with XYY, one with XYY, and one mosaic XX/XY/XYY among 315 patients, an incidence of Y aneuploidy of 3.5%.

Jacobs' findings implicated an association between Y aneuploidy and antisocial behaviour. Examination of the population of XYY males at Carstairs revealed an onset of criminal behaviour at an earlier age than their XY controls (Price and Whatmore, 1967). Thus it seemed possible that juvenile court populations might contain an increased concentration of XYY males. Accordingly, 2 juvenile court populations were surveyed cytogenetically. Results of this survey are presented, as well as a court-referred case of an XYY male.

Materials and Methods

With parental permission blood samples were obtained for culture and standard cytogenetic analysis from boys aged 13 to 17 years appearing before the Juvenile Courts of the District of Columbia and Prince George's County, Maryland. All boys appearing on

selected days were approached for evaluation; approximately 5% refused. The resulting sample included 326 and 149 successful cultures from the District of Columbia and Maryland, respectively, a total of 475. In addition, 6 boys were studied on referral from psychiatrists and probation officers because of unusual size or abnormal behaviour.

At least 2 metaphases from each subject were examined. Upon detection of an abnormality, an additional 20 cells were studied and a karyotype prepared.

Results

Among the 475 patients randomly selected only one chromosome abnormality was detected. One boy had a supernumerary small metacentric chromosome in all 60 cells analysed in 2 separate cultures (Fig. 1). This abnormality was not present in either of his parents. His physical examination and intelligence were normal. No patients with Klinefelter's syndrome, XYY, or structural rearrangements were detected.

FIG. 1. The upper partial karyotype shows 2 Y chromosomes and autosomes 21-22 of E. Y. The lower portion is a partial karyotype from the one abnormal boy from the juvenile court population and shows a minute centric chromosome between the Y and autosomes 21-22.

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One of the 6 patients (E.Y.) seen on referral was found to have a karyotype of 47,YYY (Fig. 1).

Case Report

E.Y., a 17-year-old Caucasian male, is the product of a term gestation of a 42-year-old, gravida VII para 5 abortus I, mother and a 41-year-old father. The pregnancy was complicated by the onset of diabetes mellitus in the 3rd month, treated with insulin. The delivery went smoothly; birth weight was 3530 g. Developmental milestones are not recalled. From early childhood he was more active and generally larger than his peers, and his behaviour was difficult to control. He stole bicycles and petty cash repeatedly. He experienced visual and auditory hallucinations at age 8 years, and in elementary school a teacher suggested psychiatric referral. Because of persistent behaviour problems, he was placed in a private school for difficult boys at 13 years but was uncontrolled in that setting and was discharged. At age 15 he was twice arrested for molesting children, institutionalized for 4 months, and then transferred to a psychiatric hospital where he remained for 1 year. Following this hospitalization he was improved but continued to experience isolation from his peers and periods of extreme depression. After discharge he was twice accused of molesting children. At 16½ years he was hospitalized for evaluation of chronic leg ulcers. Cytogenetic evaluation done because of his large size revealed a 47,YYY karyotype.

On physical examination, he is a pleasant, cooperative, well orientated boy with a clear sensorium: height 188.2 cm, weight 126.1 kg, head circumference 58.5 cm, span 197.4 cm. There is mild facial acne. A right Sydney crease is present. Violaceous striae radiate from the axillae to the lower abdomen and lateral hips. There are numerous scars on his forearms and legs and chronic ulcers on both legs. Facial hair is underdeveloped with only 5 whiskers, axillary hair is scanty, but pubic hair is present in a fully developed male pattern. The penis is 14.7 cm long, the left testis 5 × 2.7 × 2.2 cm and the right testis 2.5 × 2.5 × 3.5 cm. Neurological examination is completely intact. He lucidly discusses his past experiences of molesting children and being used as the female partner in homosexual relationships. He has never had close friends or a close relationship with a female.

Since evaluation he has continued in psychotherapy and vocational training where his performance has been satisfactory.

Discussion

Data from surveys of newborn children indicate an XYY incidence of 1.92 per 1000 live male births (Dodson, Al-Aish, and Alexander, 1972). In a

sample of 475 males, one XYY would be expected normally. Thus our survey suggests that the incidence of XYYs in a general juvenile court population is not increased.

Absence of XYY males in this survey may be contrasted with the work of Hook and Kim (1970) in Albany, New York. They found 4 XYYs among 337 boys under the age of 16 in institutions for juvenile offenders. The subjects of these 2 studies differ in that the New York group had completed adjudication and was institutionalized while our subjects generally were awaiting trial in custody of their parents. This may suggest a tendency for the XYYs to commit more serious offences leading to their concentration in institutions.

The problem of recognizing and dealing with XYYs is of more theoretical than practical importance in controlling the rate of crime. Even among selected antisocial patients reported in other surveys (Dodson *et al*, 1972) the determined incidence is only 11:886. Hopefully, however, lessons learned will stimulate search for other biological concomitants and foundations of behaviour.

Summary

Chromosome survey of 475 males appearing before 2 juvenile courts demonstrated no cases of the XYY karyotype. Comparison with data from institutional surveys indicating higher than expected incidence of XYYs suggests a tendency for XYYs to commit more serious antisocial offences leading to their concentration in institutions. Nonetheless XYY males are not significant contributors to the bulk of antisocial behaviour.

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