at 25 years of age she had received no hormonal therapy and had experienced no menstrual bleeding. At 6 years of age she had 'Bright's disease' which resolved after several months' stay in hospital. Her general health thereafter was excellent apart from intermittent, mild peripheral oedema.

Her physical examination showed a height of 155 cm, a weight of 62 kg, a blood pressure of 130/70, moderate obesity, and a grade 2/4 systolic ejection murmur. She had normal sexual development. The pelvic examination was normal apart from failure to palpate either ovary.

Laboratory studies included FSH of 183 IU/l (normal 2.5 to 27), LH of 256 IU/l (normal 3 to 250), T3 uptake of 30%, and T4 of 88 µg/dl. Analysis of peripheral lymphocytes by standard Q, G, and C banding showed a 47,XX,i(Xq) karyotype in all cells. Fibroblasts cultured from a forearm skin biopsy also showed only 47,XX,i(Xq). Late labelling studies with BrdU in lymphocytes and fibroblasts showed two late replicating X chromosomes in all cells analysed, one of which was the i(Xq) chromosome.

Two abnormal events must have given rise to the 47,XX,i(Xq) karyotype: non-disjunction resulting in the aneuploidy (47 chromosomes) and the formation of the isochromosome X. There is no simple explanation to relate the two abnormalities to a single event, or to explain one abnormality as predisposing to the other. Assuming that the 47,XX,i(Xq) karyotype in our patient was related to the premature ovarian failure, this would be difficult to reconcile with the report of King and Schimke.¹ Other explanations can be offered for this apparent discrepancy.

First, the 47,XX,i(Xq) state is not associated with abnormal gonadal function and our patient's gonadal failure is secondary to a cause unrelated to her karyotype. Secondly, the 47,XX,i(Xq) in our patient is the cause of her gonadal failure and the normal phenotype in the patient of King and Schimke occurred as the result of an undetected mosaicism for a normal cell line. Thirdly, the patient of King and Schimke represents the normal phenotypic expression of the 47,XX,i(Xq) karyotype and our patient's gonadal failure was the result of an undetected mosaicism. Either 45,X or 46,X,i(Xq) might be expected to have occurred and either would be an adequate explanation for the premature ovarian failure.

Reconciliation of the difference between these two cases will require additional reports of patients with the 47,XX,i(Xq) karyotype. It will be important that an extensive search for mosaicism is conducted in such cases.

THADDEUS E KELLY*, JOHN W WILKS†, AND
HERMAN E WYANDT*

*Division of Medical Genetics, University of Virginia
School of Medicine, Charlottesville, Virginia; and
†Jefferson Surgical Clinic, Roanoke, Virginia, USA.

References

- King CR, Schimke RN. Pregnancy in a patient with 47,XX,i(Xq) karyotype. *J Med Genet* 1982;19:467-8.

Correspondence and requests for reprints to Dr Thaddeus E Kelly, Box 386, University Hospital, Charlottesville, Virginia 22908, USA.

Necropsy findings in a child with FG syndrome

In 1983, Burn and Martin¹ reported from this unit two male cousins with mental retardation, congenital hypotonia, intractable constipation, failure to thrive, and dysmorphic facies as possible examples of the X linked FG syndrome. Few pathological studies have been reported and we felt that it would be interesting to report the necropsy findings in the proband of Burn and Martin.

The brain. The brain weighed 800 g (normal for age 1100 g) and was brachycephalic. The convolutional pattern was simple with broader and fewer gyri than normal. A very large 'cystic' cavum septi pellucidi was present which communicated with the lateral and third ventricles through large fenestrations (figure). The corpus callosum was present throughout, but thin. Histologically, only acute anoxic changes and one isolated neuronal heterotopia in the cerebellar white matter were observed; no other evidence of migration defect was observed.

The septum pellucidum, which develops as a result of caudal growth of the corpus callosum, often shows a midline cleft-like space, called the cavum septi pellucidi, especially in fetuses and young children. Friede² has suggested that a large cavum septi pellucidi may be a 'form fruste' of agenesis of the corpus callosum and may be associated with a thin corpus callosum. This finding is therefore of interest, since case 2 reported by Opitz and

FIGURE Coronal section of the brain at mammillary body level. A cystic cavum septi pellucidi (S) communicates with the lateral ventricles via large fenestrations (arrowheads). The corpus callosum (CC) is very thin and the gyral pattern slightly simplified.

Received for publication 8 August 1985.

Revised version accepted for publication 30 October 1985.

Kaveggia³ was found at necropsy to have an absent posterior one-third of the corpus callosum, and case 4 reported by Thompson *et al*⁴ had complete absence of the corpus callosum on computerised brain scan.

The appearance of the brain in the necropsy photograph of the original case 1 who died accidentally⁵ is similar to the present case, having fewer and broader gyri than normal. Unlike our case, that patient was reported as having other evidence of a neuronal migration defect and megalencephaly. The brain was normal in necropsies of two other FG patients⁵ and showed non-specific subependymal infiltrates in one other.⁶

Gastrointestinal. Histopathological examination of the colon, ileum, stomach, and oesophagus showed normal smooth muscle. Ganglion cells were present which reconfirmed that Hirschsprung's disease was not the cause of the severe constipation.

Skeletal muscle (frozen 20 hours from death). The fibres of the skeletal muscle were generally small (9 to 13 μ m in diameter; normal 18 to 26 μ m). There was glycogen and lipid accumulation in muscle fibres, the former possibly relating to intravenous dextrose feeding. The muscle was otherwise normal. Histological examination of muscle has not been reported before in FG syndrome, but is important because of the hypotonia which may be severe. We reviewed the muscle specimens of case 1 reported by Thompson *et al* 1984.⁴ These were normal apart from general smallness of fibres. We conclude that it is most likely that the hypotonia in FG syndrome is central in origin.

Other organs were unremarkable, apart from the lung which showed changes of pneumonic consolidation.

The authors wish to thank Dr M H Webster and Dr J Burn for allowing us to report this patient. Dr D G F Harriman, Department of Pathology, University of Leeds, kindly

supplied the original histological slides of the muscle of case 1 of Thompson *et al*.⁴

E M THOMPSON*, B N HARDING†,
B D LAKE†, AND S C SMITH‡

*Department of Clinical Genetics, and

†Department of Histopathology,

The Hospital for Sick Children, Great Ormond Street,
London WC1N 3JH; and

‡Department of Histopathology, Musgrove Park Branch,
Taunton and Somerset Hospital,
Taunton, Somerset TA1 5DA.

References

- 1 Burn J, Martin N. Two retarded male cousins with odd facies, hypotonia, and severe constipation: possible examples of the X linked FG syndrome. *J Med Genet* 1983;20:97-9.
- 2 Friede RL. In: *Developmental neuropathology*. Wien/New York: Springer-Verlag, 1975.
- 3 Opitz JM, Kaveggia EG. Studies of malformation syndromes of man. XXXIII. The FG syndrome. An X-linked recessive syndrome of multiple congenital anomalies and mental retardation. *Z Kinderheilkd* 1974;117:1-18.
- 4 Thompson EM, Baraitser M, Lindenbaum RH, Zaidi ZH, Kroll JS. The FG syndrome: 7 new cases. *Clin Genet* 1985;27:582-94.
- 5 Opitz JM, Kaveggia EG, Adkins WN, *et al*. Studies of malformation syndromes of humans. XXX IIIC. The FG syndrome—further studies on three affected individuals from the FG family. *Am J Med Genet* 1982;12:147-54.
- 6 Riccardi VM, Hassler E, Lubinsky MS. The FG syndrome: further characterisation, report of a third family, and of a sporadic case. *Am J Med Genet* 1977;1:47-58.

Correspondence and requests for reprints to Dr E M Thompson, Department of Clinical Genetics, The Hospital for Sick Children, Great Ormond Street, London WC1N 3JH.