

## Short reports

# Antenatally diagnosed subdural haemorrhage in congenital factor X deficiency

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**SUMMARY** The presence of a subdural haemorrhage was observed in a fetus during antenatal ultrasound examination. The infant was found to be a homozygote for factor X deficiency. Prompt recognition permitted replacement treatment from an early stage. Inherited coagulation disorders should be suspected when intracranial haemorrhage is detected antenatally.

Congenital factor X deficiency is a rare coagulation disorder with considerable heterogeneity in its clinical manifestations. Intracranial haemorrhage in early infancy has been observed in a small number of these patients, and this is often associated with a poor outcome.<sup>1</sup> Although antenatal intracranial haemorrhage (including subdural haemorrhage) occurs as an unusual complication of other coagulation defects,<sup>2</sup> it has never been found in association with this disorder. We report a girl with a subdural haemorrhage, diagnosed on ultrasound scans before birth, who was subsequently shown to have factor X deficiency.

### Case report

The girl was born by caesarean section at 37 weeks' gestation. Her parents were first cousins and belonged to a family in which there had been a number of intermarriages. A male sibling had died at another hospital five years previously at 2 days of age from a hypoplastic left heart and had been noted to have an unidentified coagulopathy. The mother, who had a history of easy bruising, was investigated at that time and found to have a prolonged prothrombin time (British comparative ratio 1.5) and concentrations of factor V of 86%, factor VII of 60%, and factor X of 41%. There was no other family history of a bleeding disorder.

In this pregnancy the mother had booked at 22

weeks' gestation. Details of her previous confinement and investigations were not known. An ultrasound scan had shown an appropriately grown fetus with no detectable abnormalities. The pregnancy proceeded uneventfully except for a minor fall down some stairs at 33 weeks. At 35 weeks, however, an ultrasound scan had shown a fluid collection with a straight medial border underlying the left parietal bone and a shift of the midline to the right. This appearance, which was thought to be due to a subdural haemorrhage, was seen on further ultrasound scans up to 37 weeks (fig 1). It did not appear to be enlarging. A caesarean section was performed in order to minimise trauma to the fetal head.

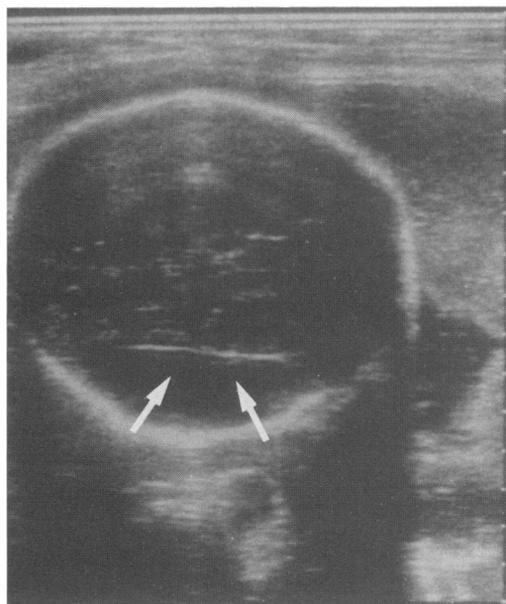


Fig 1 Obstetric ultrasound scan at 37 weeks' gestation. Fetal subdural haemorrhage is shown by the arrows.

At birth the child weighed 2310 g and was clinically well with no evidence of a bleeding disorder. Head circumference was 33 cm, which is on the 50th centile. Cranial ultrasound and computed tomograms of the brain showed a large left subdural haemorrhage with compression of the left lateral ventricle (fig 2). Her packed cell volume and platelet count were normal. Coagulation studies were abnormal: prothrombin time >180 seconds (normal range 13.5–17), partial thromboplastin time 166 seconds (normal range 45–70), and reptilase time 27 seconds (normal <16). Factor X concentrations, measured by the one stage method for activated partial thromboplastin time (APTT), showed less than 1% activity, and <5% factor X antigen by Laurell immunoassay. Factor X concentrations in the normal newborn are generally lower than in older children and adults, usually around 50%. The mother's factor X concentration was 56% and her father's 63% when measured by the one stage APTT method, and 61% and 64% by Laurell immunoassay. These were characteristic of factor X deficiency in the patient and compatible with a heterozygote state in her parents. Specific assays for other clotting factors were normal.

She was treated with infusions of fresh frozen plasma and later with factor IX concentrate. Forty ml of bloodstained fluid were removed in total during three subdural taps. A further cranial

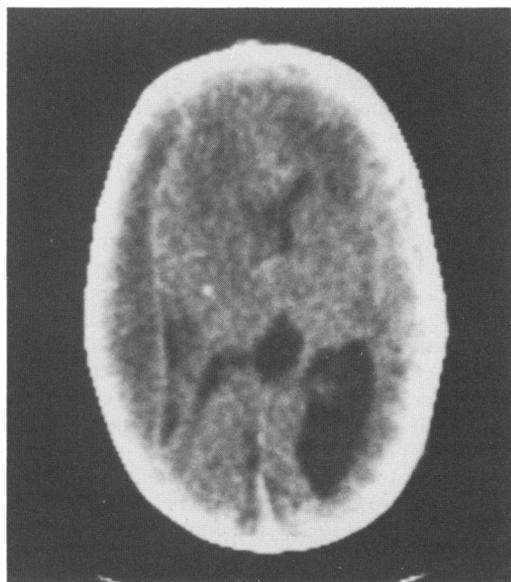


Fig 2 Computed tomogram at 2 days of age. There is a large left subdural haemorrhage with compression of the left lateral ventricle.

computed tomogram at 2 weeks showed no evidence of reaccumulation of the subdural haemorrhage but a later scan at 4½ months of age showed left hemispheric atrophy and a persistent supratentorial midline cyst. Neurological examination at this and later stages was normal with no evidence of any focal deficit. In the succeeding weeks she had a number of episodes of gastrointestinal bleeding and epistaxis that required treatment with factor IX concentrate and blood transfusion. At 2 months of age she was started on a regime of weekly infusions of factor IX concentrate. Although this was not sufficient to maintain her factor X concentration at more than a few per cent for much of the time, she had no further episodes of haemorrhage. She was growing and developing normally with a normal head circumference. At 7 months of age, however, she sustained a new and extensive intracerebral haemorrhage affecting the frontal and parietal regions and died.

### Discussion

Factor X is involved in the formation of prothrombin and is activated by both the extrinsic and intrinsic coagulation pathways. Congenital factor X deficiency is inherited as an autosomal incompletely recessive condition. Immunological and other coagulation methods have shown a number of different forms of factor X defect. Most homozygotes will suffer from minor complications such as easy bruising, haematoma formation, and epistaxes but more serious manifestations including haemarthroses, gastrointestinal bleeding, and cerebral haemorrhage are seen in a small proportion.<sup>3</sup> There are reports of intracranial haemorrhage occurring in infants with factor X deficiency,<sup>1</sup> and in one case haemorrhage occurred in the neonatal period.<sup>4</sup> Our case is the first in which antenatal haemorrhage has been identified.

Treatment by infusions of fresh frozen plasma or factor IX concentrate, which contains appreciable amounts of factor X (around 30 units per ml), is successful in raising the concentrations of factor X and in preventing excessive bleeding in adult patients.<sup>5</sup> Despite regular prophylactic treatment, infants with the disorder often suffer from major and potentially fatal episodes of haemorrhage including intracranial haemorrhage.<sup>1,4</sup> It is possible that these patients, who present earliest in life, have a more severe variant of the disorder.

Antenatal intracranial haemorrhage is a rare complication of coagulation disorders. It has been found in fetal thrombocytopenia, in the infant of a mother who received warfarin throughout pregnancy, and in congenital factor V deficiency.<sup>2</sup> Fetal subdural

haemorrhage due to any cause is extremely rare. It may occur after maternal trauma, although it is rare in the absence of skull fractures or other severe fetal or maternal injuries.<sup>6</sup>

This patient's clotting disorder rendered her more liable to haemorrhage after minor trauma. Her mother's fall down stairs at 33 weeks' gestation was a likely cause of her subdural haemorrhage. Because the haemorrhage had been detected antenatally it was possible to deliver the infant by caesarean section, thus minimising the risk of further trauma. This also permitted a diagnosis to be arrived at and treatment to be instituted within hours of birth. This case emphasises the importance of recognising intracranial haemorrhage on obstetric ultrasound, and the need to identify potentially treatable coagulation disorders in such patients. In some disorders, such as this one, it should be possible to arrive at a diagnosis even before delivery, thus optimising management in the postnatal period.

We thank Professor MG Elder and Dr M Silverman for permission to report these patients who were under their care.

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## Weight, length, and head circumference curves for boys and girls of between 20 and 42 weeks' gestation

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**SUMMARY** The value of available growth curves for preterm infants is limited because they exclude infants of less than 28 weeks' gestation. We describe growth curves for weight, length, and head circumference for boys and girls of between 20 and 42 weeks' gestation.

We have previously reported an analysis of fetal and infant birth weights derived from data from Sheffield from 1976 to 1984, and compiled a weight chart for those between 20 and 42 weeks' gestation.<sup>1</sup> At certain gestational ages there were significant differences between our data and the weight curves in current use, and subsequently the Gairdner-Pearson chart was revised using this and other data.<sup>2</sup>

Despite the considerable developments in neonatology resulting in the treatment of increasing numbers of infants born at less than 28 weeks' gestation, the practical value of most of the available growth charts is limited by the exclusion of this group of infants. We have therefore expanded our

data to include length and head circumference and produced a comprehensive chart suitable for use in neonatal units.

### Sample and methods

The sample was derived from three subgroups from the Sheffield area: live born infants, fetuses from therapeutic abortions, and fetuses from spontaneous abortions; only morphologically normal singletons were included. The following were excluded: hydroptic infants, infants of diabetic mothers, and macerated fetuses. The previously published data were expanded to include fetuses and infants born in 1984 and 1985 at between 20 and 28 weeks' gestation in four local maternity units. This increased the total number of fetuses and infants below 28 weeks' gestation from 192 to 281 and enabled us to provide separate curves for boys and girls.

The data were taken retrospectively from the babies' records. All babies were weighed and measured while still on the labour ward or directly after admission to the special care baby unit. Dead