Shwachman syndrome associated with de novo reciprocal translocation t(6;12)(q16.2;q21.2)

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Abstract
We describe a de novo apparently balanced reciprocal translocation t(6;12)(q16.2;q21.2) in an 18 month old girl with Shwachman syndrome, characterised by exocrine pancreatic insufficiency and bone marrow dysfunction. The cause of this syndrome is unknown, although autosomal recessive inheritance has been proposed. The translocation breakpoints in the present patient may be candidate regions for a gene responsible for Shwachman syndrome.


Shwachman syndrome (MIM *260400) is a rare genetic disorder characterised by exocrine pancreatic insufficiency, growth retardation, bone marrow dysfunction resulting in neutropenia, and metaphyseal chondrodysplasia. In some instances, psychomotor development is impaired. At the present time, the cause of this syndrome is unknown, although autosomal recessive inheritance has been suggested.

A similar constellation of the digestive abnormalities, haematological changes, and metaphyseal chondrodysplasia is seen in cartilage-hair hypoplasia (MIM *250250), which has been shown to be linked to 9p21-p13. A gene for Fanconi anaemia (MIM *227650) characterised by skeletal abnormalities and progressive bone marrow failure has been cloned, with no significant homology to any of the database sequences. It has been localised to 9q22.3.

Here we report a patient with Shwachman syndrome associated with a de novo reciprocal translocation t(6;12)(q16.2;q21.2). The possibility that one of the chromosome breakpoints includes the critical region for Shwachman syndrome is discussed.

Case report
The female proband was born at 38 weeks of gestation after an uneventful pregnancy, labour, and delivery. The 26 year old primigravid mother was unrelated to her 30 year old husband. The birth weight of the proband was 2940 g, length 47.0 cm, and occipitofrontal circumference (OFC) 30.0 cm. Right incomplete cleft of the upper lip and hypertelorism were noted at birth. The early neonatal period was complicated by pneumonia. She had had chronic diarrhoea with recurrent steatorrhea since 2 months of age.

She was first evaluated by us at the age of 3 months because of failure to thrive and liver dysfunction was found at that time. She lifted her head at the age of 4 months. At 7 months, hepatosplenomegaly was noted. She was able to sit up unaided at 9 months. At 10 months, she was admitted to our hospital for clinical investigation. Her weight was 5882 g (−2.9 SD), length 65.0 cm (−2.5 SD), and OFC 40.5 cm (−2.6 SD). Her muscle tone was normal. She was found to have a haemoglobin (Hb) level of 11.4 g/dl, a platelet count of 28.7 × 10^4/μl, and a range of white cell count of 4800–11 400/mm^3 (neutrophils 184–2052/ mm^3), indicating cyclic neutropenia. Hb electrophoresis showed a mild increase in the proportion of Hb F (4.2%). A bone marrow examination showed a slightly hypocellular marrow without maturation arrest. The range of liver transaminases was increased (AST 75–228 IU/l; ALT 72–232 IU/l). A systemic skeletal survey showed a mildly hypoplastic thoracic cage, slight expansion of the anterior ends of the ribs, and metaphyseal dysplasia of the proximal femur. CT scan of the abdomen showed a pancreas that was totally replaced by fatty tissue (HU −91–4). Both liver and spleen were moderately enlarged with a normal density. In addition magnetic resonance imaging of the abdomen was performed. The pancreas included normal exocrine pancreatic tissue and adenopathy. The glucose tolerance test was normal. Immunological tests were normal including serum IgG, IgA, IgM, C3, and C4 concentrations, lymphocyte responses to phytohaemagglutinin (PHA) and concanavalin A, and relative counts of T subset lymphocytes. Thyroid function, alpha-1 antitrypsin, serum amino acids, lactate and pyruvate, ammonia, and blood gas analysis were normal. The ophthalmological findings and cardiac evaluation were unremarkable. Based on the above findings, a diagnosis of Shwachman syndrome was made. She was managed with pancreatic extracts for her malabsorption.

She could walk without support at 15 months. At 18 months, she was 74.0 cm (−1.9 SD) in height, weighed 8605 g (−1.3 SD), and had an OFC of 49.5 cm (−2.1 SD). She had frequent febrile episodes, which were successfully treated with antibiotics.
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Although the translocation in this patient appears to be balanced, the possibility that subtle chromosome material is deleted from one or both the chromosomes involved is not excluded. The present patient is a sporadic case with typical Shwachman syndrome except for incomplete cleft lip. Cleft lip and palate was described in a patient with interstitial deletion of 12q13.3-q21.1.12 Cutaneous syndactyly and hypertelorism are rarely found in Shwachman syndrome,2 but are observed in patients with an interstitial deletion or apparently balanced translocations involving the breakpoints of 12q15-q21.2.13-15 Therefore, the present patient may have a submicroscopic deletion at 12q21.2 and the locus of the gene responsible for Shwachman syndrome seems to be at 12q21.2 rather than 6q16.2, if the translocation results in a gene mutation leading to this syndrome.

Careful cytogenetic studies in other patients with Shwachman syndrome will be of great interest to establish whether the present association is fortuitous or whether it is an indication for the localisation of this autosomal recessive syndrome at 6q16.2 or 12q21.2.

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