Electronic letter

Agenesis of cruciate ligaments and menisci causing severe knee dysplasia in TAR syndrome

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EDITOR—The syndrome of thrombocytopenia and absent radius (TAR syndrome) is an autosomal recessive condition characterised by congenital hypomegakaryocytic thrombocytopenia and bilateral radial aplasia with the presence of thumbs.^{1,2} Associated abnormalities include other skeletal defects, cardiac malformations, and gastrointestinal disorders.¹⁻⁴ Lower limb abnormalities, such as coxa valga, ankylosis of the knee, tibial torsion, and hip dislocation have been reported,^{2,4,5} but severe knee dysplasia has rarely been described. We report a case of TAR syndrome presenting with phocomelia of the upper limbs and marked knee dysplasia owing to complete agenesis of the cruciate ligaments and severe hypoplasia of the menisci.

Case report

The male proband, the first child of young, healthy, unrelated parents, was born at term by caesarian section after a normal pregnancy. Birth weight was 2760 g (3rd-10th centile) and head circumference was 34 cm. Birth length was only 45 cm (below the 3rd centile) because of irreducible flexion of the knees. Severe phocomelia of the upper limbs and a petechial rash on the trunk were noted at birth. The white blood cell count was 35 400/mm³, haemoglobin 18.8 g/dl, and platelet count 32 000/mm³. Anaemia (7.1 g/dl) with erythroblastopenia developed from the end of the first month, requiring four blood transfusions. Bone marrow aspirations during the first months showed severely reduced megakaryocytes. His platelet count ranged from 3000 to 60 000/mm³ during the first six months of life, and remained subnormal from six years of age (120 000/mm³). Severe diarrhoea and failure to thrive, as a result of cow's milk intolerance, occurred on day 6 of life, and required parenteral nutrition for six weeks. His face was not dysmorphic and his intelligence was normal. Chromosomes were normal, with no breaks or rearrangements. Orthopaedic abnormalities of the upper limbs consisted of phocomelia with a normal thumb and four functional fingers on each hand, and mild bilateral clinodactyly of the third and fifth fingers. X rays showed bilateral absence of the ulna and radius, the humeri limited to short rounded bones between the scapulae and the hands, and brachymesophalangism of the fifth fingers. The clavicles, scapulae, and wrist

bones were present on both sides. Genu varum and valgus of the feet were discovered at 3 years. The genu varum progressively increased, more marked on the right side, with internal rotation deformity of the lower limbs, and he developed walking instability (fig 1). On examination he had marked knee laxity and the Lachman test was positive with anterior and posterior drawer signs and medial/lateral instability. Arthroscopy of the knees at the age of 5 showed complete bilateral agenesis of the anterior and posterior cruciate ligaments and nearly absent menisci, which were reduced to rudimentary bands. The intercondylar notch was poorly developed and empty and there was no intercondylar eminence. There was no popliteal muscle. The patella was normal. A tibial osteotomy was performed on both sides at 5 years and he was operated on for his valgus feet at 7 years. However, recurrence of the genu varum was observed from 10 years (fig 2) with progressive multidirectional instability of both knees, and new osteotomies were performed at

Figure 1 Severe genu varum at the age of 5 years.

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Figure 2 X ray at the age of 14 years.

14 years. At 16 years, he still had anteroposterior laxity of the knees but walking was stable.

Discussion

Malformations of the upper limbs are well documented in TAR syndrome.¹⁻⁴ Bilateral absence of the radius with the presence of thumbs has been reported in almost 100% of cases. Associated skeletal deformities are always present. The ulnae are usually short and malformed and may be absent. The humeri are often abnormal but phocomelia is rare.⁵⁻⁸ The hands are radially deviated, sometimes with limited extension of the fingers and hypoplasia of the carpal and phalangeal bones. The thumbs are present, often adducted, but may be hypoplastic. Abnormalities of the lower limbs are usually milder and present in about 50% of cases.²⁻⁴ They include hip dislocation, coxa valga, subluxation of the knees, femoral or tibial torsion, stiff knees, abnormal tibiofibular joint, dislocated patella, valgus and varus foot deformities, and abnormal toe placement. Severe reduction abnormalities of the lower limbs have been reported in a few cases.⁵⁻⁸ The severity of skeletal changes in the lower limbs correlates with the severity of abnormalities of the upper limbs. Anomalies of the knee joint, with genu varum of varying severity, have been reported^{2-4,9-12} with varying frequencies such as 20%,² 31%,⁴ or 90%,⁹ usually with no indication of the mechanism. However, the cruciate ligaments were present in one patient

who had malformation of the knee joints with no menisci and who developed varus deformity in addition to flexion contractures of the knees.¹¹ In one orthopaedic series of 21 patients with TAR syndrome, 18 had genu varum of varying severity.¹³ Only six underwent arthroscopy which documented intra-articular abnormalities. Posterior cruciate ligaments were absent in two cases and hypoplastic in one. The medial menisci were absent or hypoplastic in all six cases, femorotibial articulation was abnormal, and the intercondylar eminence markedly underdeveloped. The patellae were absent on surgery in three patients (five knees). Our patient had more severe knee dysplasia, with complete absence of the anterior and posterior cruciate ligaments, associated with severely hypoplastic menisci. The intercondylar eminence and notch were markedly underdeveloped, presumably as a result of the absence of the cruciate ligaments. Congenital absence of the menisci and the cruciate ligaments has already been reported in one TAR patient who, like our case, had flexion contractures of the knees at birth and later developed instability of both knees, with marked genu varum and internal rotation of the lower limbs.¹⁴

Congenital absence of the cruciate ligaments is a very rare malformation, most often involving the anterior ligament. It is usually associated with other lower limb defects, particularly around the knee, such as congenital short femur, knee dislocation, absent or abnormal menisci, dislocation of the patella, and tibial/fibular hypoplasia.¹⁵ Hypoplasia of the tibial spines, the lateral femoral condyles, and the medial part of the tibial plateau may be seen. Flattening of the intercondylar eminence and hypoplasia of the intercondylar notch are considered to be secondary anomalies. Agenesis of both anterior and posterior cruciate ligaments has been reported in only a few cases,¹⁵⁻¹⁷ and it is therefore noteworthy that our patient and the patient of Tolo *et al*¹⁴ had this malformation, which may have been overlooked in TAR syndrome and may be significantly associated with it. Although the upper limb abnormalities in TAR syndrome are initially the most striking, these two cases and those described in the series of Schoenecker *et al*¹⁴ show that the knee problems have a particular significance in TAR syndrome and that awareness of this problem is essential in the management of the patients.

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