Case Report

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Robinow syndrome: Report of two cases and review of the literature

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SUMMARY

We report two patients with Robinow syndrome, review the published literature and stress the importance and limitations of radiographic examination in the diagnosis of this disorder, which shows extreme clinical and radiographic variability. The radiographic differential diagnosis of Robinow syndrome is discussed.

Key words: *mesomelic dysplasia; Robinow; vertebral malsegmentation*.

INTRODUCTION

Robinow syndrome (RS) is a relatively common disorder – approximately 80 patients were reported up to 1997 – with extremely variable appearances.[1,2–23] The range extends from patients who present only with abnormal faces and genitalia to those with severely dysmorphic faces and extensive bony abnormalities. Radiographic examination can neither prove nor disprove RS in patients without or with minor skeletal abnormalities.[4] The diagnosis depends on clinical examination. However, in moderately or severely affected patients the radiographic diagnosis can be easily made if the observer is familiar with the disease. We describe two patients with severe RS and discuss its radiographic differential diagnosis.

CASE REPORT

Patient 1

This 8-year-old girl was referred to the Department of Paediatric Orthopaedic Surgery because of restriction of pronation and supination resulting in writing difficulties. She was the product of a normal pregnancy and delivery. At birth her length, weight, occipito-frontal circumference (OFC) were approximately at 10th centile. The 31-year-old mother and 36-year-old father were healthy and not related, but were from the same geographical area. The two older siblings were normal. The patient's motor development was delayed, affecting particularly the coordination movements of the upper extremities. She had difficulty in feeding herself and later experienced problems with writing.

At the age of 8 years her height was 105 cm (11 cm below third standard deviation (SD)), weight 22 kg (25th–10th SD), OFC 52 cm (50th centile). She had a dysmorphic face characterized by frontal bossing with a large frontal haemangioma, hypertelorism, flat-saddle nose, anteverted nostrils, long philtrum, cleft upper lip, gingival hypertrophy, microdontia and micrognathia. The eyes were prominent and there was bilateral proptosis. The ears were low set. There was mesomelic shortening of the extremities, with dislocation of the radial head and limitation of pronation and supination. There was Madelung deformity of the wrists. The hands were small with shortened distal phalanges. There was camptodactyly of the fourth and fifth fingers. The nails were hypoplastic/dysplastic with a cleft of the nail of the right thumb and left big toe. There was hypoplasia of the clitoris and labia minora. Her mental development was normal (Fig. 1a,b).

The abdominal, renal and cardiac ultrasound were normal. The pelvic ultrasound showed small ovaries with increased echogenecity. The routine blood and urine examinations and the karyotype were normal.

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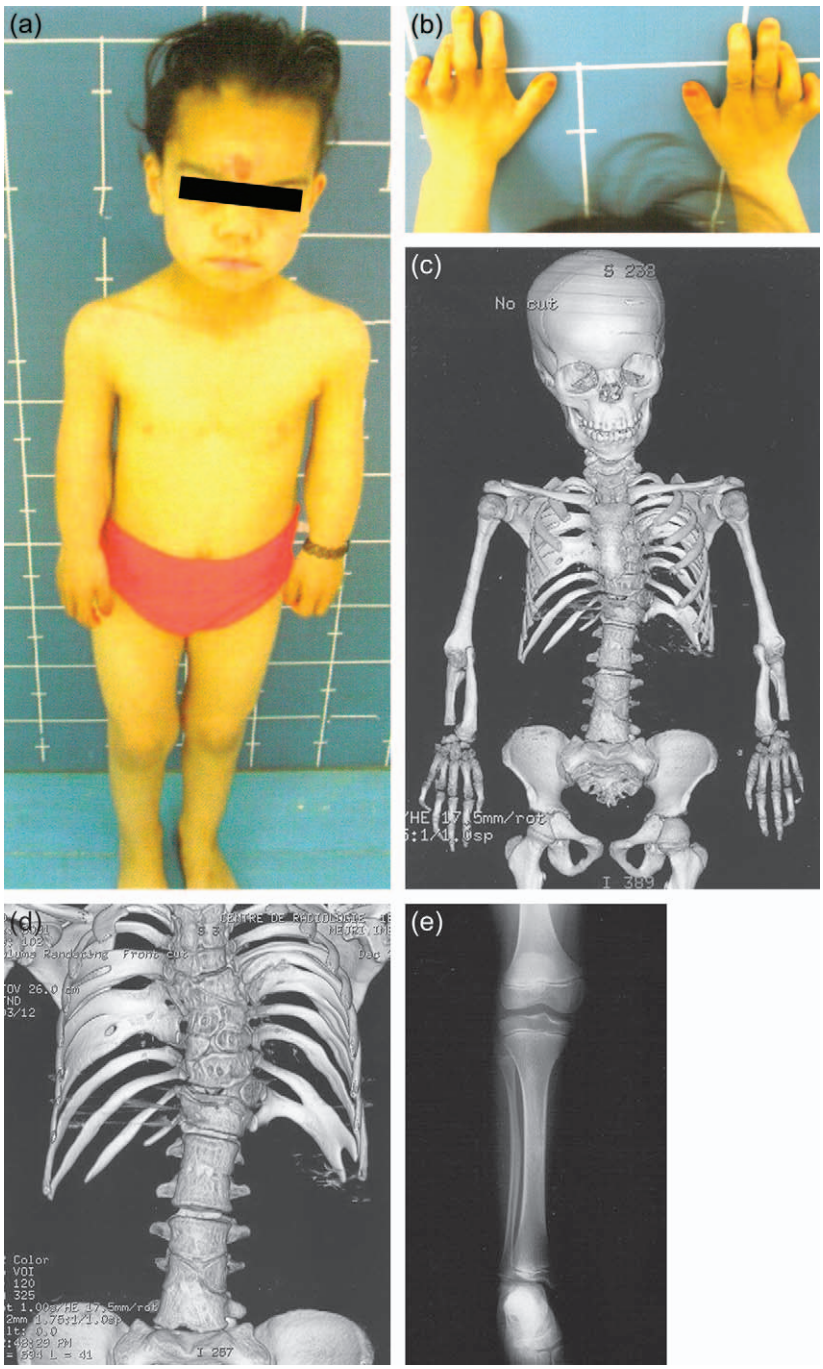

Fig. 1. Patient 1, 8 years old. (a,b). Note dysmorphic face with central frontal haemangioma, mesomelic shortening of the extremities, camptodactyly of the fourth and fifth fingers and short, broad thumb; (c,d) 3-D coronal reformatted CT of the skull, chest, lumbo-sacral spine and upper extremities. Malsegmentation of the thoraco-lumbo-sacral spine. Note block vertebrae L1 and L2 and L4 and L5. Bilateral rib fusion. Mesomelic dysplasia with radial head dislocation and distal shortening of ulna. Short distal phalanges and first metacarpals. Hypertelorism, small mandible. Hypoplastic/dysplastic, peg like teeth; (e) Right leg. The fibula is thin, shortened proximally and bowed medially. The tibia is grossly normal. Note the discrepancy between the severely affected forearm and slightly affected leg.

Radiographic examination documented malsegmentation of the thoraco-lumbar spine. There were two lumbar block vertebrae L1 and L2 and L3–L5. The cervical spine was little affected (Fig. 1c,d). The sacral fourth and fifth vertebrae and the coccyx were hypoplastic/dysplastic. The ribs were dysplastic with bilateral fusion. There was hypoplasia and dislocation of the proximal end of the radius at the elbow joint and hypoplasia of the distal end of the ulna with Madelung deformity. In the hands, there was hypoplasia of the distal phalanges and the first and fifth metacarpals were short. The lower extremities were little affected (Fig. 1c–e).

Patient 2

This girl was the first child of healthy, young parents. The parents were not related, but were from the same geographical area. The pregnancy and delivery were uneventful. The family history was negative for birth defects or genetic disorders. Birthweight was 3200 g (50th centile), length 46 cm (third centile), OFC 35 cm (50th centile). At birth, short stature, short extremities and stubby fingers and toes were noted. She had a dysmorphic face characterized by right upper lid and mid-frontal haemangioma, hypertelorism, flat-saddle nose, broad mouth, high palate and gingival hypertrophy. The labia minora and

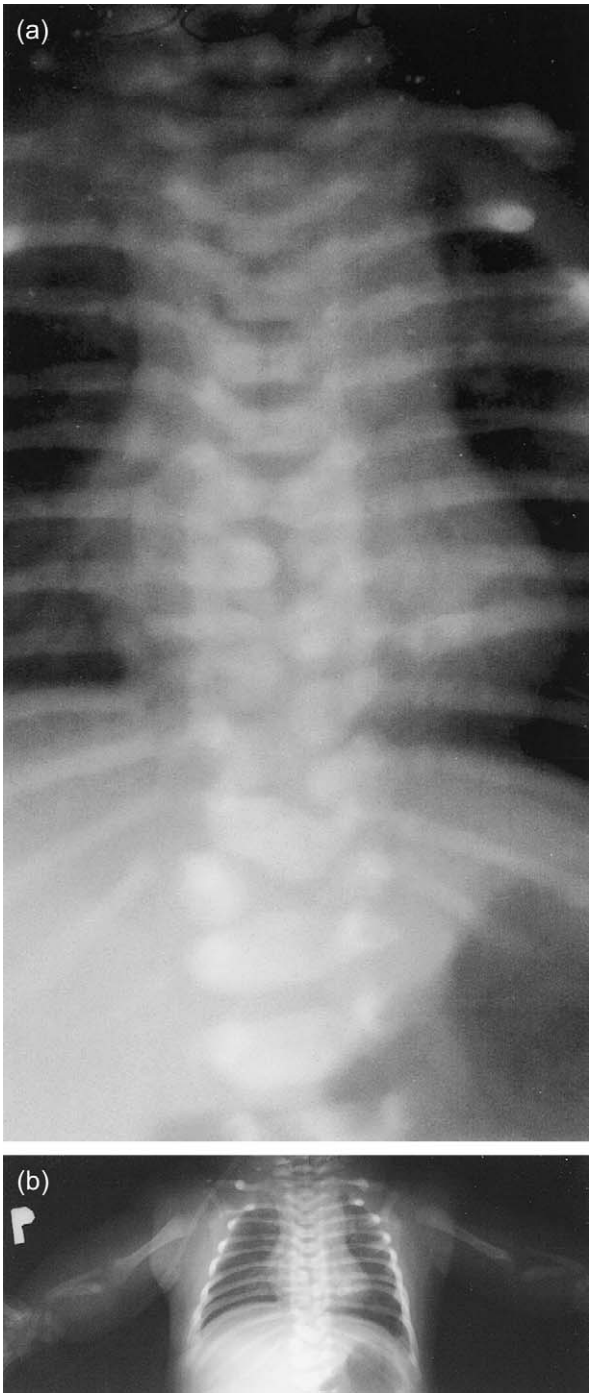

Fig. 2. (a,b) Patient 2, newborn. Malsegmentation of the thoracic and upper lumbar spine: grossly normal ribsand mesomelic shortening of the upper extremities with severe hypoplasia/dysplasia of the radii and ulnae. The lower extremities apart from minor fibular hypoplasia were normal.

clitoris were hypoplastic. Ultrasound and CT of the cranium and the renal and abdominal ultrasound were normal. Bilateral ureteral reflux was noted on cystography. Skeletal survey documented a large cranium in relation to the face, broad cranial sutures, large fontanelles, hypertelorism and crowded teeth buds. There was malsegmentation of thoracic spine. There was mesomelic shortening of the extremities, the ulnae were broad and shortened and there was dislocation of the left radius at the elbow joint. There was minor mesomelia of the legs with the fibulae more severely affected than the tibiae. The tubular bones of the hands and feet were short (Fig. 2).

DISCUSSION

There are two forms of RS, the severe recessive 'short stature',[18] and the mild dominantly inherited 'normal stature' forms.[9] They can be distinguished on dysmorphic examination although there is some overlap.[3] Ten per cent of children with the recessive variety have an early fatal outcome due probably to congenital heart disease,[7] which affects over 10% of children with RS.[2] The radiographic diagnosis of recessive RS is easy. Abnormalities, which are characteristic and should alert the investigator of possibility of RS, consist of malsegmentation of the spine, hypoplastic/dysplastic ribs, mesomelia associated in the upper extremities by severe distal ulnar and proximal radial hypoplasia with radial head dislocation, crowded teeth and brachydactyly. The lower extremities are usually less affected. In the dominant RS, the skeleton is similarly but not so greatly changed. The chest involvement is either limited to a few vertebrae and little-affected ribs, or may be normal.[4,9] Moderate mesomelic shortening is common, but without severe hypoplastic/dysplastic forearm bones and radial head dislocation. Brachydactyly is discreet. Clefting of the distal phalanx of the thumb – if present – is a significant diagnostic sign. Finally, there are patients with uncharacteristic RS in whom the skeletal survey is non-diagnostic. There is rhizomelic[19] instead of mesomelic shortening of the extremities, or the limbs may even be normal.[4] Therefore in the dominant form and especially in the unrepresentative cases, the diagnosis relies heavily on clinical examination. The 'fetal facies', genital hypoplasia and gingival hyperplasia with crowded teeth are three major dysmorphic features decisive for diagnosis in patients with little skeletal involvement. It is possible that patients with the dominant form are often not recognized. With their height in the low normal range, slightly abnormal face and short extremities, they blend (merge) with the normal population.

The radiographic differential diagnosis of RS is by disorders characterized by vertebral malsegmentation, rib dysplasia and hypoplastic/dysplastic forearm bones with radial head dislocation.

Vertebral malsegmentation is a common abnormality usually presenting as a single anomaly or as a part of unclassified or ill-defined, rare malformation disorders.[24,25] There are, however, some well-known bone dysplasias where severe spine malsegmentation with rib anomalies is the major diagnostic feature. These include spondylo-thoracic, spondylo-costal and ischio-vertebral dysplasias and cerebro-facio-thoracic syndrome.[10,17]

Spondylo-thoracic dysplasia is characterized by cervico-thoracic and lumbar spine involvement and bilateral symmetrical fanning of the ribs with posterior fusion. In spondylo-costal

dysplasia the thoracic spine is predominantly affected with hypoplastic/dysplastic asymmetrical rib changes. Ischio-vertebral dysplasia is characterized by variably severe vertebral changes, inconsiderable rib abnormalities and distinctive ischio-pubic synchondrosis. Cerebro-facio-thoracic syndrome is a severely dysmorphic syndrome with cervico-thoracic spine most severely affected. Confusion of *mesomelic dysplasias* with RS is unlikely as the hypoplastic/dysplastic changes in the forearms are different.[10,17] Spine and ribs are usually not affected and the pattern of hand abnormalities – if present – is different. None of the mesomelic dysplasias has comparable facies and genital hypoplasia.

Dysplastic forearm bones with radial head dislocation occurs as a localized anomaly or as an outstanding skeletal syndromal abnormality.[10,17] From the latter group omodysplasia recessive type may cause confusion. However, in omodysplasia rhizomelic shortening of the extremities prevails and the characteristic club deformity of the proximal humerus and femur with distal tapering are distinctive diagnostic features. Finally, the spine and ribs are not affected in omodysplasia. The other syndromes with radial head dislocation would be unlikely diagnoses. The faces of radial head dislocation syndromes are normal or show different dysmorphism. They do not show genital hypoplasia.

Clinical differentiation of dominant RS is with Aarskog syndrome.[26] Both share some phenotypic similarity. Saddle deformity of the scrotum is a distinctive feature of the latter. Malsegmentation of the spine in Aarskog syndrome is usually localized to the cervical spine and there is no mesomelic shortening of the extremities. Our first patient presents one of the most severely affected, surviving patients with RS. Camptodactyly has been rarely reported in RS. The second patient was lost to follow up. To avoid superficial or confusing radiographic reports, the radiologist should insist on a detailed clinical history and/or further radiographic documentation in patients who show any of the following abnormalities: spinal malsegmentation/malformation, mesomelic dysplasia, hypoplastic/dysplastic forearm bones with radial head dislocation or brachydactyly. Radiographic diagnosis of RS eliminates unnecessary examinations and establishes the true nature of the defect. The recessive form of RS is mapped to chromosome 9q22.

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