Femoral head dysplasia in Morquio disease type A

Bilateral varus osteotomy of the femur

Toshikatsu Kanazawa[1], Yuji Yasunaga[1], Yoshikazu Ikuta[1], Akira Harada[1], Osamu Kusaka[1] and Kazuko Sukegawa[2]

Departments of [1]Orthopedic Surgery, Hiroshima University, School of Medicine, 2-3, Kasumi 1-choume, Minami-ku, Hiroshima 734-8551, Japan. Tel +81 82 257 5232. E-mail: hmh09@hdsnet.co.jp; and [2]Pediatrics, Gifu University School of Medicine
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Case report

The patient is a man with no perinatal abnormalities and normal intellect. Evaluation of 32 relatives from 3 generations of the patient's family revealed no history of consanguinity or premature osteoarthrosis. The patient's parents and older brother are healthy, except for a slightly short stature of his father (160 cm) and brother (163 cm). At the age of 11, the patient began to experience hip pain during exercise. Radiographs of his femoral heads revealed a central area of absorption (Figure 1). A subsequent diagnosis of Perthes' disease was made at another institution. The patient was treated with weight-bearing abduction orthosis for 6 months. During the following 7 years, the symptoms and radiographic findings did not change.

The patient had periodic bilateral coxalgia when first seen in our department at the age of 18. He had a short neck, short stature of the short-trunk type and normal back. His height was 152 cm mean 171 (2 SD = 11) cm in Japanese males, 1995) and an arm span of 163 cm. His head, face, and teeth appeared normal. He had no ligamentous laxity, but complained of voluntary anterior subluxation of both shoulders. He had pain after walking and standing erect for 30 minutes, which he was able to relieve by abducting his hip while standing. Hip movements were slightly reduced, with flexion of 110°, abduction of 30°, adduction of 15°, internal rotation of 40°, and external rotation of 45° bilaterally.

Radiographs showed an ossification defect in the main load-bearing area of the femoral heads (Figure 2), but no abnormalities in the other joints, and there was no evidence of platyspondyly or odontoid hypoplasia in the spine. An arthrogram of

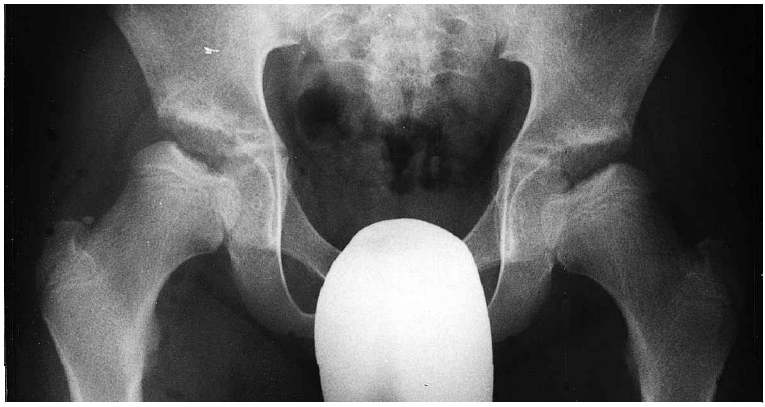

Figure 1. 11 years of age, deformity of both femoral heads, resembling Perthes' disease.

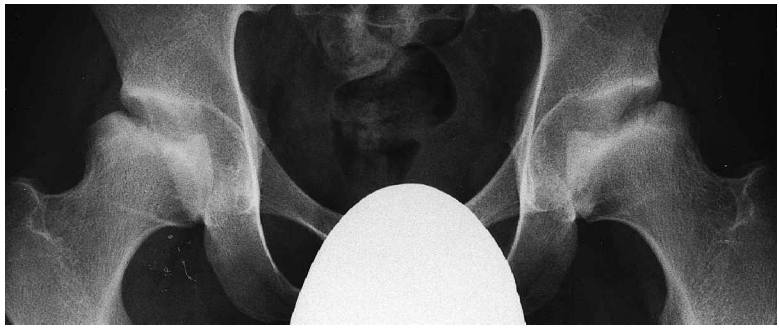

Figure 2. 18 years of age, no bone formation at the site of deformity.

the hips revealed a somewhat rounded surface with no depression in the articular cartilage in the main load-bearing area (Figure 3). We suspected the presence of non-ossified epiphyseal cartilage in the main weight-bearing area of the hips. When the patient became myopic at the age of 11, an ophthalmological examination had revealed an asymptomatic bilateral corneal opacity. On slit-lamp examination, we found a finely punctate corneal opacity distributed mainly in the deep lamellar of the stroma, except on the periphery of the cornea. The visual acuity examination results were 20/200 in RV (20/15 with correction) and 20/200 in LV (20/10 with correction). Pure-tone audiometry revealed normal hearing. Echocardiography showed asymptomatic mild tricuspid valve regurgitation, but cardiac function was normal. The results of routine hematological and urine analysis were normal. Analysis of bone marrow histiocytes did not suggest gangliosidosis.

Laboratory analysis of urinary mucopolysaccharides revealed normal excretion of uronic acid but electrophoresis showed that 2% of total glycosaminoglycans was excreted as keratan sulfate. Activity of lysosomal enzymes β-galactosidase and β-hexosaminidase was normal, but the activity of N-acetylegalactosamine-6-sulfate-sulfatase was reduced (0.1, normal 2.7 ± 1.4 nmol/mg protein/hr), which suggested a diagnosis of Morquio disease type A.

To reposition the affected part of the epiphyses to the secondary load-bearing area, and the less affected part of the lateral epiphyses in the main load-bearing area, trochanteric curved varus osteotomy (Sugioka et al. 1980) was performed bilaterally. 6 months postoperatively, bone formation began in the affected epiphyses and has proceeded gradually since then. It is now 5 years and 4 years and 6 months since the operations were done on the patient's right and left hips, respectively. He has no hip pain and hip movement has increased, with flexion of 130°, abduction of 35°, internal rotation of 60°, and external rotation of 45° bilaterally. On radiographs, the femoral heads appear to be fairly concentric, but there is no continuity between the newly-ossified bone and the femoral heads (Figure 4).

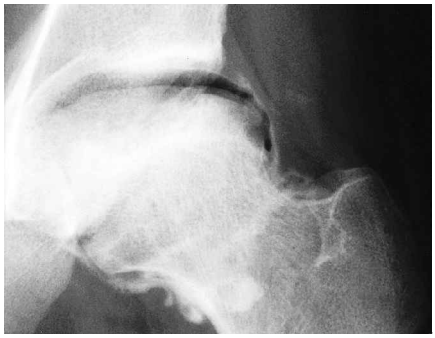

Figure 3. Arthrogram. No depression in cartilage.

Discussion

Morquio disease is caused by absence or reduction in the activity of lysosomal enzymes involved in the degradation of keratan sulfate in glycosaminoglycans, a ground substance of connective tissue, especially in the cartilage, cornea, intervertebral disk, and nucleus. Initially, keratan sulfate accumulates excessively in lysosomes in the cells and later in the extracellular matrix with cellular metabolism. From early childhood, patients with

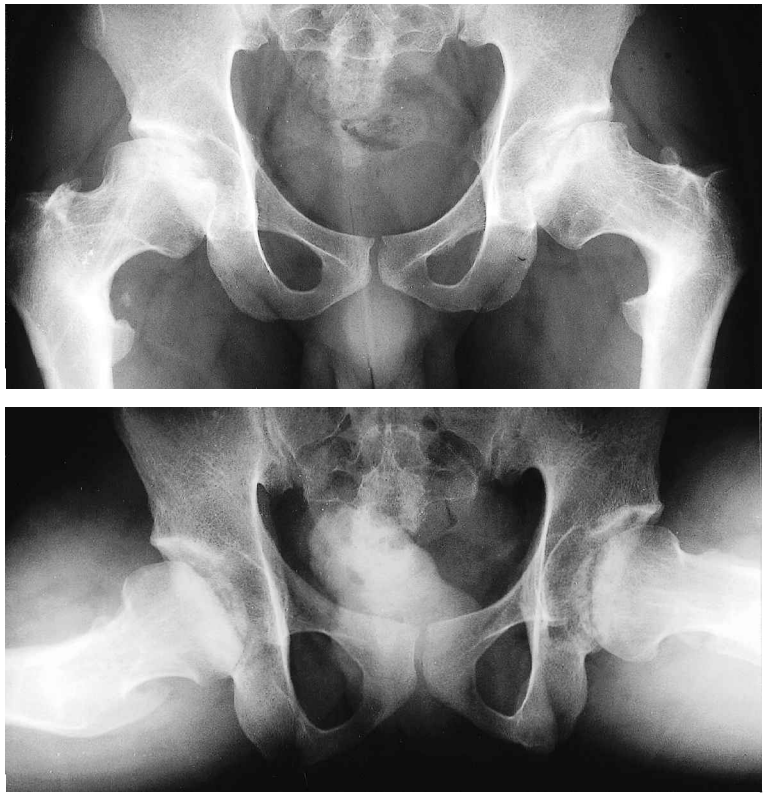

Figure 4. A satisfactory contour has been restored 5 years postoperatively on the right side and 4 years and 6 months postoperatively on the left side.

Morquio disease have coarse facial features, short stature, spondyloepiphyseal dysplasia, and corneal opacity. The subtypes of this disease are type A, with a defect of N-acetyle-galactosamine-6-sulfate-sulfatase, and type B, with a defect of β-galactosidase. Although there are mild clinical variants of Morquio disease type A (Beck et al. 1986), our case was so mild, with deformities limited to the hips, that we believe the clinical and the biochemical phenotype of Morquio disease type A needs to be extended.

Although mild forms of Morquio disease tend to be misdiagnosed as disorders of the hip, such as Perthes' disease (Fang-Kircher et al. 1995), in cases of bilateral coxarthropathy, bone dysplasia should be suspected first, and radiographs of other joints, spine, hands, and feet, along with physical examination and family history, should be studied. We believe ophthalmoscopic examination is important. Our patient, who had a very mild form of Morquio disease, was diagnosed as having had corneal opacity as a child and had characteristic corneal clouding (Iwata and Kaiser-Kupfer 1994).

Epiphyseal dysplasia is caused by incomplete endochondral ossification of epiphyseal cartilage. Cartilage with an abnormal ossification process is fragile, and joints with such cartilage tend to degenerate rapidly and develop early arthrosis, especially in the loaded lower extremities, which necessitates early joint replacement surgery in adults (Northover et al. 1996, de Waal Malefijt et al. 2000). In our case, osteotomy of the patient's femurs promoted ossification in the affected epiphyses and seemed to be useful in preventing the progression of osteoarthrosis, despite the discontinuity between newly ossified bone and the femoral head on radiographs of the hips 5 years after surgery.

To date, the capacity for regeneration of epiphyseal dysplasia has not been well documented. Cigala and Iammarrone (1982) described this capacity in a report of two patients (an 11-year-old

and a 14-year-old) who were thought to have multiple epiphyseal dysplasia. The patients underwent corrective osteotomy of the legs, which caused regeneration of the epiphyses of the tibia and femur. Ransford et al. (1996) reported two patients with Morquio disease in whom the cartilaginous dens and the anterior arch of C1 ossified after posterior occipitocervical fusion, which they attributed to postoperative stability. In epiphyseal dysplasias, including Morquio disease, weight and joint instability can retard or prevent ossification of the epiphyses. Reduction in load and instability should be attempted surgically to promote ossification and improve articular congruency.

Although we obtained a good short-term outcome in our patient with bilateral varus osteotomy of the femur. Long-term follow-up is indicated because the articular cartilage is fragile due to an excessive accumulation of keratan sulfate.

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